National Library of Canada
Collections Development Branch

Canadian Theses on
Microfiche Service

Bibliothèque nationale du Canada
Direction du développement des collections

Service des thèses canadiennes
sur microfiche

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us a poor photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de mauvaise qualité.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

Ottawa, Canada
K1A 0N4

NL-339 (Rev. 8/80)

Low Quality Film Boiling at Intermediate and Elevated Pressures

by

J.C. Stewart

Submitted to the School of Graduate Studies

of the University of Ottawa

in partial fulfillment of the requirements for the degree of

MASTER OF APPLIED SCIENCE

in

Mechanical Engineering

July, 1981

© James C. Stewart, Ottawa, Canada, 1981

ACKNOWLEDGEMENTS

The author would like to thank K.E. Wilson for a great deal of computer analysis work and for the preparation of many figures in this thesis. He would also like to thank Dr. D.C. Groeneveld, Professor S.C. Cheng, D.E. Bullock, I.P.L. Macdonald, F. Mancini, J.H. Woodall, T.A. Kennedy and R.J. Cowhey for many helpful suggestions and continued interest and involvement in this work. Evelyn Gehlert is especially thanked for accepting the task of typing this manuscript.

This work was funded in part by Atomic Energy of Canada Limited, who provided the research facilities, and in part by the United States Nuclear Regulatory Commission, who provided the author's salary.

ABSTRACT

Film boiling heat transfer coefficients have been measured at low quality and subcooled conditions over a wide range of pressures and mass fluxes in the vertical upward flow of water in a uniformly heated tube. The trends of the data are examined and described with respect to the system parameters such as heat flux, inlet subcooling, pressure, and mass flux. The effects of various contributing factors are discussed in relation to specific trends in the data.

A comparison of existing heat transfer correlations with the data indicates that no correlation adequately characterized the trends of the data over the complete range of flow conditions. However, the Groeneveld-Delorme correlation [13] appears to approach the data at the highest qualities ($X \geq 30\%$), and Berenson's correlation [4] has approximately the correct pressure dependence.

The temperature below which the heated surface can no longer support film boiling has also been measured over a wide range of flow conditions (minimum film boiling temperature). The major trends of this temperature with respect to quality and

pressure are studied and a correlation in terms of these two parameters is developed. This correlation predicts the minimum film boiling temperature over the complete pressure range from atmospheric to 22 MPa.

TABLE OF CONTENTS

		Page
ACKNOWLEDGEMENTS		
ABSTRACT		
CONTENTS		
LIST OF FIGURES		
LIST OF TABLES		
NOMENCLATURE		
CHAPTER 1.	INTRODUCTION	1
1.1.	Film Boiling	1
1.2.	Hot Patch Technique	3
1.3.	Minimum Film Boiling Temperature	4
CHAPTER 2.	THEORETICAL CONSIDERATIONS	6
2.1.	Flow Regimes	6a
2.1.1.	Heat Transfer - General	8
2.1.1.1.	Temperature Profile in Laminar Flow	9
2.1.1.2.	Temperature Profile in Turbulent Flow	10
2.1.2.	Wall Temperature Determination	11
2.1.2.1.	Vapour Layer Thickness	11
2.1.2.2.	Turbulent Mixing in the Vapour Layer	12
2.1.2.3.	Vapour Superheat - Thermodynamic Non-equilibrium	12
2.1.3.	Axial Wall Temperature Distribution	13
2.1.3.1.	General	13
2.1.3.2.	Heat Transfer Coefficient	15

		Page
2.2.	Parametric Effects	16
2.2.1.	Heat Flux Effect	16
2.2.2.	Void Fraction Trends	19
2.2.3.	Inlet Subcooling Effect	20
2.2.4.	Thermophysical Properties	22
2.2.5.	Flow Rate and Quality Effects	23
2.2.6.	Pressure Effect	26
2.3.	Correlation Methods	27
2.3.1.	Two Phase Reynolds Number	29
2.3.2.	Vapour Superheat - Thermodynamic Non-equilibrium	31
2.3.3.	Heat Transfer by Conduction	33
2.3.4.	Non-equilibrium Correlation Methods	34
CHAPTER 3.	EXPERIMENTAL APPARATUS	35
3.1.	Loop Facility	35
3.2.	Data Acquisition System	36
3.3.	Preheater	36
3.4.	Hot Patch	37
3.5.	Test Section	38
3.5.1.	Thermocouple Installation	39
3.5.2.	Thermocouple Wiring	40
3.5.3.	Insulation	41
3.5.4.	Hot Patch Wiring	42
3.5.5.	Test Section Power Supply	42

		Page.
CHAPTER 4.	EXPERIMENTAL METHOD	44
4.1.	Initial Preparation	44
4.2.	Hot Patch Temperature	45
4.3.	Dry Patch Propagation	45
4.4.	Data Collection	48
4.5.	Power Reduction	48
4.6.	Quenching	49
4.7.	Heat Balance and Zero Power Runs	49
CHAPTER 5.	RESULTS - MINIMUM FILM BOILING TEMPERATURE DATA	51
5.1.	General	51
5.2.	Rewetting Mechanism	52
5.3.	Minimum Film Boiling Temperature Data	53
5.4.	Correlation	55
5.5.	Discussion	56
CHAPTER 6.	RESULTS - HEAT TRANSFER COEFFICIENT DATA	58
6.1.	General Comments	58
6.2.	Heat Flux Effect	61
6.2.1.	"Cross Over Effect"	62
6.2.2.	Pressure	64
6.2.3.	Higher Flows and Higher Inlet Subcoolings	66
6.2.4.	Much Higher Flows (2750 $kg \cdot m^{-2} \cdot s^{-1}$)	68
6.3.	Pressure Effect	69

		Page
6.4.	Inlet Subcooling Effect	72
	6.4.1. High Quality Region	72
	6.4.2. Low Quality Region	73
	6.4.3. Pressure Effects	75
6.5.	Mass Flux Effect	76
	6.5.1. Higher Mass Fluxes	77
	6.5.2. Lower Mass Fluxes	77
	6.5.3. Quality Trends	79
CHAPTER 7.	COMPARISON WITH EMPIRICAL CORRELATIONS	81
7.1.	Highest Flow Results	82
7.2.	Moderate Flows (923 $kg \cdot m^{-2} \cdot s^{-1}$ - Fig. 7.2)	82
7.3.	Lower Flows (359 $kg \cdot m^{-2} \cdot s^{-1}$ - Fig. 7.3)	83
7.4.	Lowest Flow Data (120 $kg \cdot m^{-2} \cdot s^{-1}$ - Fig. 7.4)	84
7.5.	Summary	85
CHAPTER 8.	SUMMARY OF RESULTS AND CONCLUSIONS	86
APPENDIX A.	RADIATION	89
A.1.	Radiative Heat Transfer	89
A.2.	Energy Balances	91
A.3.	Simplified Equations	97
A.4.	Emissivity of Inconel	99
A.5.	Emissivity of Water Vapour	99
A.6.	Empirical Correlation of Emissivity	102
A.7.	Void Fraction	104
APPENDIX B.	ZERO POWER AND HEAT BALANCE DATA	105
B.1.	Zero Power Runs	105
B.2.	Heat Balance Runs	107

		Page
APPENDIX C.	EVALUATION OF THE INSIDE WALL TEMPERATURE	108
APPENDIX D.	DATA TABLES	110
D.1.	Wall Temperature	110
D.2.	Minimum Film Boiling Data	112
BIBLIOGRAPHY		114

LIST OF FIGURES

Figure		Page
1.1	Boiling Curve	119
2.1.0	Film Boiling Regimes	120
2.1.1	Laminar and Turbulent Regions in Inverted Annular Flow Film Boiling	121
2.1.2	Vapour Temperature Profile in Laminar Inverted Annular Flow Film Boiling	122
2.1.3	Developing Velocity Profiles	123
2.1.4	Temperature Profile Across the Vapour Layer when the Bulk of the Vapour Flow is Turbulent	123
2.1.5	Vapour Temperature and Vapour Layer Thickness as a Function of Axial Distance (Quality)	124
2.1.6	The Heat Transfer Coefficient Based on the Wall Temperatures Shown in Figure 2.1.5	125
2.2.1	The Temperature and Pressure Dependence of the Property Group	126
2.2.2	The Quality and Pressure Dependence of the Void Fraction	127
2.2.3	The Temperature Dependence of the Void Fraction at 8 MPa	128
2.2.4	Variation in the Vapour Layer Thickness Along the Test Section with Different Subcoolings at the Dryout Point	129
2.2.5	The Temperature Dependence of the Conduction Heat Transfer Coefficient (8 MPa)	130
2.2.6	The Effect of Mass Flux on the Heat Transfer Coefficient	131

Figure		Page
3.1	MR-1 FLARE Loop Flow Diagram	132
3.2	Test Section Instrumentation	133
3.3	Hot Patch and Test Section Showing the Details of the Thermocouple Connections to the Test Section	134
3.4	Thermocouple Wiring Schematic	135
3.5	Insulated Test Section Showing the Thermocouple Wiring and Test Section Power Supply Cables (Top and Bottom)	136
3.6	Hot Patch with the Insulation Removed Showing the Power Connections to the Cartridge Heaters	137
3.7	Test Section Power Supply Connection. The Two Nickel Plated Copper Plates can be seen Sandwiched Between the Power Supply Cable Termination Plates	138
5.1	The Effect of Quality on the Minimum Film Boiling Temperature Data, Together with the Correlation Equation 5.1	139
5.2	The Effect of Quality on the Minimum Film Boiling Temperature Data, Together with the Correlation Equation 5.1	140
5.3	The Minimum Film Boiling Data and Correlation Equation 5.1	141
6.2.1	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 359\ kg \cdot m^{-2} \cdot s^{-1}$	142
6.2.2	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 923\ kg \cdot m^{-2} \cdot s^{-1}$	143
6.2.3	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 215\ kg \cdot m^{-2} \cdot s^{-1}$	144
6.2.4	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 120\ kg \cdot m^{-2} \cdot s^{-1}$	145

Figure		Page
6.2.5	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 359\ kg \cdot m^{-2} \cdot s^{-1}$	146
6.2.6	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 524\ kg \cdot m^{-2} \cdot s^{-1}$	147
6.2.7	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 524\ kg \cdot m^{-2} \cdot s^{-1}$	148
6.2.8	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 923\ kg \cdot m^{-2} \cdot s^{-1}$	149
6.2.9	The Effect of Heat Flux on the Heat Transfer Coefficient Over a Range of Pressures $G = 2750\ kg \cdot m^{-2} \cdot s^{-1}$	150
6.3.1	The Effect of Pressure on the Heat Transfer Coefficient at Different Flow Rates $\Delta H_{in} = 100\ kJ \cdot kg^{-1}$	151
6.3.2	The Effect of Pressure on the Heat Transfer Coefficient at Different Flow Rates $\Delta H_{in} = 182\ kJ \cdot kg^{-1}$	152
6.3.3	The Effect of Pressure on the Heat Transfer Coefficient at Different Flow Rates $\Delta H_{in} = 100\ kJ \cdot kg^{-1}$	153
6.4.1	The Effect of Inlet Subcooling on the Heat Transfer Coefficient Over a Range of Pressures $G = 215\ kg \cdot m^{-2} \cdot s^{-1}$	154
6.4.2	The Effect of Inlet Subcooling on the Heat Transfer Coefficient Over a Range of Pressures $G = 359\ kg \cdot m^{-2} \cdot s^{-1}$	155

Figure		Page
6.4.3	The Effect of Inlet Subcooling on the Heat Transfer Coefficient Over a Range of Pressures $G = 524\ kg \cdot m^{-2} \cdot s^{-1}$	156
6.5.1	The Effect of Mass Flux on the Heat Transfer Coefficient Over a Range of Pressures $H_{in} = 255\ kJ \cdot kg^{-1}$	157
6.5.2	The Effect of Mass Flux on the Heat Transfer Coefficient Over a Range of Pressures $\Delta H_{in} = 180\ kJ \cdot kg^{-1}$	158
6.5.3	The Effect of Mass Flux on the Heat Transfer Coefficient Over a Range of Pressures $\Delta H_{in} = 100\ kJ \cdot kg^{-1}$	159
6.5.4	The Effect of Mass Flux on the Heat Transfer Coefficient Over a Range of Pressures $\Delta H_{in} = 50\ kJ \cdot kg^{-1}$	160
7.1	Comparison of Experimentally Measured Heat Transfer Coefficients with Four Correlations $G = 2750\ kg \cdot m^{-2} \cdot s^{-1}$	161
7.2	Comparison of Experimentally Measured Heat Transfer Coefficients with Four Correlations $G = 923\ kg \cdot m^{-2} \cdot s^{-1}$	162
7.3	Comparison of Experimentally Measured Heat Transfer Coefficients with Four Correlations $G = 359\ kg \cdot m^{-2} \cdot s^{-1}$	163
7.4	Comparison of Experimentally Measured Heat Transfer Coefficients with Four Correlations $G = 120\ kg \cdot m^{-2} \cdot s^{-1}$	164
A.1	Radiation Heat Flux at 6 MPa as a Function of Wall Temperature and Quality. The Heat Flux in the Subcooled Region was Set Equal to the Value at X = 0	165

Figure		Page
A.2	Emissivity of Water Vapour from McAdams [25]	166
A.3	A Comparison of the Empirical Correlation of Emissivity with Data Interpolated from Figure A.2	167
B.1	Zero Power Heat Loss Data	168
B.2	Heat Balance Data	169
B.3	Heat Balance Results Corrected for Heat Loss at the Two Power Clamps According to Equation B.2	169

LIST OF TABLES

Table		Page
8.1	Run Matrix	170
D.1	Wall Temperature Data	172
D.2	Minimum Film Boiling Data	192

Symbol	Description	Units
A	area	m^2
D	tube diameter	m
F	geometric view factor	
F	pseudo view factor	
G	mass flux	$kg \cdot m^{-2} \cdot s^{-1}$
h	enthalpy	$kJ \cdot kg^{-1}$
H	heat transfer coefficient	$kW \cdot m^{-2} \cdot {}^{\circ}C^{-1}$
k	thermal conductivity	$kW \cdot m^{-1} \cdot {}^{\circ}C^{-1}$
K	slip ratio	
L	length	
Nu	Vapour Nusselt number $H \cdot D \cdot k_g^{-1}$	
P, p	pressure	kPa
Pr	Vapour Prandtl number $Cp_g \cdot \mu_g \cdot k_g^{-1}$	
Q	power	kW
r, R	radius	m
Re	Reynolds number $G \cdot D \cdot \mu_g^{-1}$	
T	temperature	°C
W	mass flow rate	$kg \cdot s^{-1}$
x, X	quality	

Greek	Description	Units
α	void fraction	
γ	absorptivity of the vapour	
δ	vapour layer thickness	m
ε	emissivity	
μ	viscosity	$kg \cdot m^{-1} \cdot s^{-1}$
ρ	density	$kg \cdot m^{-3}$
	or reflectance $(1 - \varepsilon)$	
σ	Stefan-Boltzman constant	$kW \cdot m^{-2} \cdot {}^{\circ}K^{-4}$
τ	transmittance	
ϕ	heat flux	$kW \cdot m^{-2}$

Subscripts

a	actual value
e	equilibrium
f	saturated liquid
fg	difference between saturated liquid saturated vapour
g	saturated vapour
ℓ	liquid
sat	saturation value
v	vapour

CHAPTER 1

INTRODUCTION

1.1. Film Boiling

Film boiling heat transfer occurs when the heated surface temperature is above the Leidenfrost temperature (also known as the minimum film boiling temperature, rewetting temperature). The liquid can no longer wet the surface under these conditions, and the surface is covered by a vapour blanket. The liquid is present in the form of a liquid core (pipe flow, inverted annular flow regime) or as droplets entrained in the vapour phase (dispersed flow regime). In Fig. 1.1 a typical boiling curve has been drawn, showing the film boiling region [15].

Film boiling is of particular importance in the analysis of certain failures in nuclear reactor cooling systems. For example, during a loss of coolant accident (LOCA), film boiling could occur during the initial blowdown phase (depressurization), and in the subsequent reflooding phase (injection of emergency core cooling water). It could also occur during a "loss of

regulation" (LOR) accident where the reactor power accidentally increases.

Prediction of the fuel cladding wall temperatures during these accidents is then dependent upon a knowledge of the film boiling heat transfer coefficients under the flow conditions of the specific accident.

The data obtained in this study are especially applicable to the subcooled and low quality film boiling region. Due to the limits of the test apparatus (boiling water level control and pump cavitation), the lower pressure limit of the data is 2 MPa, which may be somewhat above a typical LOCA pressure. Data were also obtained up to 9 MPa and over a wide range of mass fluxes. These data will fill a gap in the previously existing data base of film boiling results. The higher pressure and higher mass flux data have some applicability to CANDU LOR reactor safety analysis.

1.2. Hot Patch Technique

Water film boiling data are very difficult to obtain using conventional heat flux controlled systems. In this type of system the test section heat flux is increased until the critical heat flux is exceeded. At this point the wall temperature increases drastically as shown on Fig. 1.1 from point A to B [15]. This large increase is generally sufficient to cause a failure of the test section (heater). This is especially true at low qualities and subcooled conditions where the critical heat flux is much higher and hence the post-CHF temperature rise is much larger [16]. Since the physical integrity of the test section is difficult to maintain, little data have been (previously) obtained in this area.

A relatively new technique [16] is used in this experiment, where a copper hot patch is silver brazed onto the test section. The heat flux of the hot patch is controllable separately from the remainder of the test section downstream. As a result, the hot patch heat flux can be set sufficiently high to exceed the critical heat flux, and the test section heat flux can be set much lower, which will in turn limit the test section

temperature. This method then allows the investigation of the film boiling region between point B and point C along the test section downstream of the hot patch (Fig. 1.1).

In this experiment the hot patch method is applied over a wide range of pressures (2 to 9 MPa) and mass fluxes (120 to 2750 $kg \cdot m^{-2} \cdot s^{-1}$). Film boiling achieved in this manner is a very stable phenomenon and can be maintained for hours with no change. As a result, the experimental data are believed to be very reliable and free from any transient effects.

1.3. Minimum Film Boiling Temperature

Below a certain temperature, the heated surface can no longer support film boiling (point C of Fig. 1.1). Film boiling quickly changes to much more efficient transition boiling, and then nucleate boiling. It is important to accurately predict this temperature in reactor safety analysis since the rate of heat transfer greatly increases below this temperature.

The minimum film boiling temperature as measured in this study was relatively unaffected by axial conduction in the wall since the test section spontaneously quenched at a point, without the presence of a previous rewetting front. Subsequent to the initial quench, rewetting fronts propagated both upstream and downstream. These measurements are thought to be the only stable minimum film boiling temperature data available which were obtained at elevated pressures.

CHAPTER 2

THEORETICAL CONSIDERATIONS

In this chapter the general theory of film boiling heat transfer will be presented. Some of this description applies specifically to certain trends seen in the experimental data (Chapter 6) and to that extent this chapter "anticipates" some of the results of Chapter 6. This approach was chosen in order to avoid overcrowding Chapter 6 with detailed theoretical discussions of various data trends. Instead, a brief discussion of the data trend is presented in Chapter 6 with a reference to the relevant section of Chapter 2, where applicable.

This method improves the readability of Chapter 6 and allows all of the theory to be presented in one chapter.

2.1. Flow Regimes

In flow film boiling of this experiment, several flow regimes are expected to occur as the quality increases downstream. These flow regimes are shown qualitatively on Fig. 2.1.0 [8]:

Section 1.

This is the area upstream of the hot patch where the liquid is subcooled. Some nucleate boiling will occur in this area since there is a portion of the test section heated length upstream of the hot patch.

Section 2.

The upstream limit of Section 2 corresponds to the beginning of the hot patch. At this point the relatively cold water flowing up the test section comes into contact with the high temperature wall ($\Delta T = 400°C$). A certain amount of vapour is generated at this point, which forms a blanket over the entire heated surface. The vapour specific volume is much greater than that of the liquid, consequently the vapour expands rapidly and accelerates downstream. This leads to a high velocity ratio (slip ratio) between the vapour and the liquid.

The liquid is still subcooled in this region and flows as a core in the centre of the tube (inverted annular flow regime). In this region the actual quality is positive, by definition of quality since there is a vapour flow rate, however, the thermodynamic equilibrium quality is negative. The thermodynamic equilibrium quality is evaluated from the enthalpy of the fluid at the inlet plus the enthalpy added, due to the wall heat flux $\left(\text{i.e., } X_e = \frac{h_{in} - h_f}{h_{fg}} + \frac{\phi \cdot \pi D \cdot L}{W \cdot h_{fg}}\right)$. This quality remains negative until enough heat has been added to the fluid to raise the enthalpy up to the saturation value at that pressure. The thermodynamic equilibrium quality begins to increase above zero at this point and gradually approaches the actual quality downstream.

Unfortunately there is no way to determine the actual quality (in this experiment) and therefore the thermodynamic equilibrium quality will be used for all comparisons of the data against quality. This method is quite satisfactory as long as it is realized that the actual quality is never less than zero in film boiling.

Section 3.

As the liquid core approaches saturation, the interface between the vapour and liquid will likely become wavy and highly distorted [8]. This will promote the breakup of the core into droplets which will lead to dispersed flow.

Section 4.

In this flow region the liquid is present as droplets entrained in the vapour (dispersed flow). These droplets are readily accelerated by the vapour to near the vapour velocity [15], thus reducing the velocity ratio (slip ratio) between the two phases.

2.1.1. Heat Transfer - General

Heat is transferred from the wall to the liquid by both convection and conduction across the vapour layer. The effects of conduction heat transfer are the strongest in Section 2 at low void fractions, when the vapour layer is the thinnest, and the vapour flow is laminar [7]. Convection augments the heat transfer process at higher qualities, when the vapour layer becomes turbulent and especially when the flow regime becomes dispersed (Sections 3 and 4). On Fig. 2.1.1 the regions of vapour laminar and turbulent flow have been drawn in accordance with

similar figures in the references [22],[7]. As the vapour accelerates, the laminar vapour layer becomes turbulent. This turbulence increases downstream, causing a reduction in the thickness of the laminar region at the wall. It is acknowledged in ref. 22 that this conception of the film boiling process is somewhat oversimplified but immensely more practical for their purposes of developing a semi-theoretical heat transfer relation.

2.1.1.1. Temperature Profile in Laminar Flow

The bulk of the vapour initially generated at the start of the film boiling length will be near the saturation temperature. The vapour near the wall will be close to the wall temperature. As the vapour moves downstream, the temperature of the bulk of the vapour will rise due to the conduction of heat from the wall into the vapour layer [23]. Fig. 2.1.2 shows the expected changes in the temperature profile across the vapour layer as a function of axial distance from the dryout point. Due to the higher vapour velocity in the central region of the vapour layer, some flattening of the temperature profile will occur, since the heat is also transported downstream by the vapour flow.

2.1.1.2. Temperature Profile in Turbulent Flow

The vapour velocity will continue to increase downstream in the central region of the vapour layer, eventually producing a turbulent region [22]. Fig. 2.1.3 shows the vapour velocity profiles as a function of axial distance. The temperature gradient in the turbulent area (in the middle region of the vapour layer) would tend to decrease due to the added convective heat transfer [22]. The expected temperature profile across the vapour layer is shown in Fig. 2.1.4 [9].

In this figure laminar sublayers are shown on the wall-vapour interface and at the vapour-liquid interface. It is in these areas that the greatest portion of the wall-liquid temperature difference exists, since the only mode of heat transfer in these areas is conduction. The laminar sublayer at the vapour liquid interface will probably occur when the liquid core is highly subcooled and the interface is smooth. When the liquid core reaches saturation, the interface will likely be wavy and the laminar layer will disappear [8].

2.1.2. Wall Temperature Determination

Three major mechanisms which affect the wall temperature, and hence the heat transfer coefficient, based on $T_{wall} - T_{sat}$ are as follows:

1) vapour layer thickness
2) turbulent mixing in the vapour
3) vapour superheat

The sections below will describe these mechanisms in turn.

2.1.2.1. Vapour Layer Thickness

In the case where conduction is the dominant form of heat transfer through the bulk of the vapour layer, a thicker vapour layer results in a higher wall temperature for a given heat flux. This situation is likely to occur during subcooled film boiling at low void fraction where the vapour layer is thin, and the flow is laminar [5].

Convection dominates the heat transfer process through the bulk of the vapour in the dispersed flow regime. In this case the vapour layer no longer exists as it did in inverted annular flow, since the liquid is now entrained in the vapour phase as droplets [15]. Therefore changes in the void fraction

(vapour layer thickness) are not expected to have as strong an effect on the wall temperature, as they did when the void fraction was low.

2.1.2.2. Turbulent Mixing in the Vapour Layer

Higher vapour Reynolds numbers are expected to improve the mixing in the vapour layer and hence improve the convective heat transfer. This will therefore reduce the temperature gradient in the bulk of the vapour layer [9], and wall temperature. The Reynolds number increases as the vapour velocity increases and as the vapour layer thickness increases (i.e., $Re = v_v \rho_v \delta / \mu_v$ in a thin vapour layer).

Since the laminar sublayer thickness is inversely related to the Reynolds number [9], higher vapour velocities (Reynolds numbers) will also tend to reduce the thickness of the laminar sublayers. This will in turn reduce the temperature drop across these zones and ultimately reduce the wall temperature.

2.1.2.3. Vapour Superheat - Thermodynamic Non-equilibrium

All of the wall heat flux will not in general be transferred to the liquid core. Some of the heat will be

retained by the vapour, causing the vapour temperature to increase. Measurements by Nijhawan et al [26] have shown that the vapour superheat can be very large (greater than 60% of the wall superheat ($T_{wall} - T_{sat}$)). As the vapour temperature increases the wall temperature must necessarily increase in order to maintain the same heat transfer rate across the vapour laminar sublayer (i.e., the slope of the temperature gradient is approximately constant for a given heat flux assuming constant vapour thermophysical properties). Increasing the wall temperature will thus lead to a reduction in the overall heat transfer coefficient, which is based on $T_{wall} - T_{sat}$.

2.1.3. Axial Wall Temperature Distribution

2.1.3.1. General

The above remarks of Section 2.1.2 can be used to deduce the expected axial wall temperature profile. The general trend is shown in Fig. 2.1.5 where vapour superheat, vapour film thickness and length (quality) are the three co-ordinate axes.

At location 1, near the beginning of the film boiling length, laminar flow is present and the vapour temperature

is high only near the wall (Section 2.1.1.1). It is supposed that most of the heat flux reaching the liquid core will tend to raise the temperature of the liquid rather than generate vapour (until the liquid core reaches saturation), therefore the vapour film thickness will remain relatively constant. The vapour temperature will increase in the downstream direction and this increase will cause an increase in the wall temperature [26].

At location 2 the vapour layer becomes turbulent, and both conduction and convection are present. This tends to reduce the temperature gradient in the central region as discussed in Section 2.1.1.2.

At location 3 convection is the primary mode of heat transfer across the bulk of the vapour (relatively flat temperature profile). The liquid core has reached saturation and the void fraction begins to increase as a result of vapour generation. The height of the plateau in the vapour-temperature profile (average vapour-superheat) is dependent upon the temperature drop across the zone near the vapour-liquid interface.

2.1.3.2. Heat Transfer Coefficient

The general shape of the overall heat transfer coefficient curve based on the wall temperature of Fig. 2.1.5 is shown in Fig. 2.1.6. The overall heat transfer coefficient is calculated based on the temperature difference between the wall and the saturation temperature, i.e.,

$$h = \phi/(T_{wall} - T_{sat}) \qquad (2.1)$$

At low void fractions conduction dominates the overall heat transfer process. As the quality is increased the void fraction increases (and hence the vapour film thickness) resulting in a decrease in the heat transfer coefficient. Convection begins to contribute to the heat transfer mechanism when the film becomes turbulent, causing a levelling in the curve. (Without convection, the heat transfer coefficient would follow the dotted line as labelled on the plot).

The heat transfer coefficient continues to show a decrease as the quality is increased further due to the increase in the vapour temperature (vapour superheat). This causes an

increase in the wall temperature and a decrease in the heat transfer coefficient as defined above.

2.2. Parametric Effects

The qualitative effects of heat flux, void fraction, inlet subcooling, vapour thermophysical properties, mass flux, quality and pressure on the heat transfer coefficient will be discussed below.

2.2.1. Heat Flux Effect

The effect of heat flux on the heat transfer coefficient is due to various mechanisms. Four important mechanisms are discussed below.

I. Increased heat flux is expected to increase the void fraction at any given quality especially in the low quality region. This occurs because the vapour specific volume increases with vapour temperature which will in turn cause an increase in the void fraction (Section 2.2.2).

II. Higher heat flux will result in a greater vapour generation rate [8]:

$$\text{i.e., } dX = \frac{\phi \cdot hp \cdot dL}{W \cdot h_{fg}} \qquad (2.2)$$

where hp = heated perimeter

For a constant incremental length, dL, the amount of vapour generated, dX, increases as the heat flux increases ( ). This leads to an increase in the vapour thrust force and vapour flow rate, both of which will tend to widen the vapour layer. This effect tends to decrease the heat transfer coefficient with increasing heat flux.

III. The vapour Reynolds number is expected to increase as the vapour layer thickness increases, since the Reynolds number is a function of the vapour layer thickness. This will tend to increase the convective heat transfer component.

IV. The higher vapour temperature encountered as a result of the higher heat flux levels is expected to affect the convective heat transfer mechanism to some extent since the

thermophysical properties of the vapour are functions of temperature (k_v, Cp, μ_v). These properties determine the convection and conduction heat transfer coefficient between the wall and the vapour. Fig. 2.2.1 shows a plot of a property group ($k_v \cdot Pr^{0.33} \cdot \mu_v^{-0.8}$) against temperature. It should be noted that this property group is proportional to the convective heat transfer coefficient and was derived from the general form of the single-phase heat transfer relation [9]:

$$Nu = A \cdot Pr^{0.33} \cdot Re^{0.8} \qquad (2.3)$$

At higher pressures the group displays a minimum, therefore, depending upon the vapour temperature, an increase in the heat flux, and hence the vapour temperature can cause either an increase or decrease in the convective heat transfer coefficient. At lower pressures the minimum is not so pronounced, and an increase in the vapour temperature always leads to an increase in the group, except near saturation. Therefore, at higher qualities increasing the heat flux could increase the heat transfer coefficient. This would occur through increases in the thermophysical properties and increases in the Reynolds number (due to a thicker vapour layer).

2.2.2. Void Fraction Trends

Changes in the void fraction are expected to affect the heat transfer coefficient through changes in the vapour film thickness. Void fraction is both a function of quality and pressure. To show these general trends, void fraction has been plotted against quality, for several pressures [8].

$$\alpha = \frac{X_a}{X_a + K \cdot (1 - X_a)\rho_g/\rho_f} \qquad (2.4)$$

where K = slip ratio

X = actual quality based on the vapour mass flow rate, i.e. $X_a = \frac{W_V}{W_T}$

where W_T is the total mass flow rate, and

W_V is the vapour mass flow rate.

Allowing the slip ratio to vary according to the density ratio to the power of 0.2, approximately accounts for the pressure effect in flow situations prior to dryout, according to ref. 2. Examining the results of Fung [12], suggests that a slip ratio of 8.0 at the atmospheric pressure is the most appropriate value. Therefore, an empirical relation for the slip ratio, based upon the best information available to the author is:

$$K = \frac{8.0(\rho_g/\rho_f)^{0.2}}{4.39} \qquad (2.5)$$

A plot of the above void fraction relation (equation 2.4) including Fung's empirical fit to his void fraction data [12] is shown in Fig. 2.2.2. It can be seen that at higher pressures (8 MPa) the rate of change of void fraction with quality is smaller than that for lower pressures in the 0 to 5% quality range.

It is very likely that the slip ratio is a function of void fraction since the slip ratio is large in inverted annular flow and then tends toward unity at high velocities in the dispersed flow regime as the liquid droplets are accelerated up to the vapour velocity [15].

Since the void fraction is a function of vapour temperature (through the vapour density), the void fraction is expected to increase as the vapour temperature is increased. This trend is shown in Fig. 2.2.3, where the vapour density of equation 2.4 was evaluated at the temperature indicated on the plot.

2.2.3. Inlet Subcooling Effect

In the present test section, at the start of film boiling, void is generated more or less instantaneously when the

liquid flowing up the test section comes into contact with the high temperature area under the hot patch (Section 2.1). The amount of void present (i.e., the vapour film thickness) is thought to depend upon the local bulk fluid temperature (subcooling) at the dryout location. The lower the bulk temperature (higher subcooling) the less void that will be present. This seems reasonable since some of the hot patch heat flux will be required to raise the water to saturation temperature, as well as evaporate it.

In subcooled film boiling, if most of the heat delivered to the liquid core tends to increase the liquid temperature rather than generate vapour, then the vapour layer thickness will remain relatively constant and equal to the initial value. This suggests that the vapour film thickness is a function of inlet subcooling as shown in Fig. 2.2.4. When the bulk of the liquid reaches saturation then the vapour film thickness begins to increase. This ignores the fact that superheating of the vapour will tend to increase the void fraction to some extent through decreasing the vapour density (Section 2.2.2).

From the above discussion it is evident that the initial vapour film thickness (i.e., at the upstream axial limit of film boiling) and hence the subcooling at the start of film

boiling could have a significant effect on the heat transfer downstream (until the bulk of the liquid reaches saturation).

2.2.4. Thermophysical Properties

Since the void fraction (vapour film thickness) and the thermal conductivity are functions of temperature, the vapour temperature can affect the heat transfer coefficient. In the case of subcooled film boiling immediately downstream of the hot patch, the vapour temperature is probably somewhat above saturation, and increasing. Most of the heat is transferred by conduction under these conditions, and the heat transfer coefficient can be approximated as follows:

$$h = k_v/\delta \qquad (2.6)$$

where k_v is the vapour thermal conductivity evaluated at the vapour temperature

δ is the vapour film thickness also evaluated at the vapour temperature; from the void fraction:

$$\delta = r(1 - (1 - \alpha)^{\frac{1}{2}}) \qquad (2.7)$$

r = tube radius

α is defined by equation 2.4.

Since both the thermal conductivity and the vapour density are functions of temperature, an increase in vapour temperature will affect the heat transfer coefficient. k_v/δ has been plotted against vapour temperature (Fig. 2.2.5), to show this effect. In this plot both k_v and vapour density (ρ_v) were evaluated at the temperature of the x co-ordinate. The figure shows that the heat transfer coefficient decreases with temperature, reaches a minimum and then increases again.

2.2.5. Flow Rate and Quality Effects

Higher vapour flow rates increase the vapour Reynolds number and therefore are expected to improve the convective heat transfer coefficient component across the vapour layer due to better mixing in the vapour layer which occurs at higher Reynolds numbers [9].

The vapour flow rate can be increased in two ways. Firstly, increasing the total mass flux will increase the vapour flow rate (given X), and secondly increasing the quality will increase the vapour flow rate (given the total mass flux).

Increasing the quality will also tend to increase the vapour superheat (for a given total mass flux) since increasing the quality means moving axially downstream. This increase in the vapour superheat will tend to raise the wall temperature and reduce the overall heat transfer coefficient. Therefore the net effect on the heat transfer coefficient, of increasing the quality, will be the result of two opposite competing mechanisms:

1) higher vapour flow causing a higher Reynolds number (better mixing) and a higher heat transfer coefficient;
2) higher vapour temperatures causing higher wall temperatures, and a lower heat transfer coefficient.

It is expected that mechanism 1) will dominate at higher mass fluxes since the vapour Reynolds number will increase more quickly with quality at higher mass fluxes. This can be shown mathematically by calculating the derivative of the vapour Reynolds number with respect to quality, and then examining the mass flux dependence of the result:

$$Re = G \cdot D \left\{ \frac{X}{\alpha \cdot \mu_v} \right\}$$

$$= \frac{G \cdot D (X + K\ (1 - X) \rho_v / \rho_f)}{\mu_v} \qquad (2.8)$$

(see Section 2.3.1)

therefore

$$\frac{dRe}{dX} = \frac{G \cdot D(1 - K\rho_v/\rho_f)}{\mu_v} \qquad (2.9)$$

The rate of change of the vapour Reynolds number with quality (dRe/dX) is directly proportional to the mass flux. Consequently, convection heat transfer increases at a greater rate (with quality) at higher mass fluxes (i.e., mechanism 1 is stronger at higher G). The vapour temperature increase with quality (dT_v/dX) (which tends to offset the Reynolds number increases) may actually be less with at higher mass fluxes due to the higher Reynolds number, and resultant better mixing (i.e., mechanism 2 may decrease). Therefore, at higher mass fluxes the convective heat transfer improvement with quality (due to the increase in the Reynolds number) could exceed the negative effects of the vapour superheat, thus leading to an increase in the overall heat transfer coefficient (based on $T_{wall} - T_{sat}$).

In addition to the above, the rate of increase of vapour temperature with quality (dT_v/dX) is expected to reduce downstream as the vapour temperature increases, since a higher vapour temperature will tend to drive more heat from the vapour to the liquid. Less heat will then be retained by the vapour and the vapour temperature will increase at a lower rate. This suggests

that the overall heat transfer coefficients will probably show an increase downstream first, since dT_v/dX is less in this area (because the vapour superheat is approaching a constant value).

Fig. 2.2.6 shows the expected trends in the heat transfer coefficient when the flow rate changes. Note that the heat transfer coefficient increases in the higher quality region of the higher flow case, due to the larger value of dRe/dX.

2.2.6. Pressure Effect

Pressure affects the values of the thermophysical properties of the vapour and consequently affects the heat transfer process. The vapour thermal conductivity and Prandtl number increase with pressure contributing to the lower wall temperature and higher heat transfer coefficient at higher pressures. The latent heat and density ratio are also functions of pressure which could contribute to changes in the heat transfer coefficient with pressure.

2.3. Correlation Methods

Typically high quality film boiling heat transfer data have been correlated by means of some sort of modified Dittus Boelter equation:

$$Nu = ARe^{a} \cdot Pr^{b} \tag{2.10}$$

where

$$Nu = \frac{h \cdot D}{k_v} \quad \text{(Nusselt number)} \tag{2.11}$$

$$Pr = \frac{C_v \mu_v}{k_v} \quad \text{(Prandtl number)} \tag{2.12}$$

In many correlations of this form the vapour properties are evaluated at the vapour film temperature [5]:

$$T_{FILM} = (T_{WALL} + T_{SAT})/2 \tag{2.13}$$

A tabulation of many correlations of this form can be found in Groeneveld [14].

The heat transfer coefficient can be defined in two ways depending on whether vapour superheat is present:

i.e. 1) $$h = \frac{\phi}{T_{WALL} - T_{SAT}} \qquad (2.14)$$

2) $$h = \frac{\phi}{T_{WALL} - T_{VAP}} \qquad (2.15)$$

Formulation 1) assumes that equation 2.10 characterizes the overall heat transfer process between the wall and the liquid. The saturation temperature is used for the liquid temperature because the liquid temperature at the vapour-liquid interface is probably near saturation even if the bulk of the liquid is subcooled [5].

Formulation 2) assumes that some of the wall heat flux is retained by the vapour thus causing the vapour temperature to rise. Equation 2.10 then characterizes the heat transfer process between the wall and the vapour. A further correlation is then required to evaluate the vapour liquid heat exchange process in order to determine the overall heat transfer coefficient [15]. This then results in a two-step heat transfer process: wall-vapour, and vapour-liquid. The application of formulation 2) is discussed further in Section 2.3.2.

Assuming for the moment that equation 2.10 adequately characterizes the heat transfer between the wall and the liquid, the basic trends of this equation can be examined by evaluating the two-phase Reynolds number.

2.3.1. Two-Phase Reynolds Number

In order to account for the generation of vapour and the consequent increase in the vapour mass flux, the Reynolds number can be evaluated as follows:

$$Re = G \cdot D \cdot \frac{X_a}{\alpha \mu_v} \qquad (2.16)$$

where $G\frac{X}{\alpha} = G_{VAP}$, the vapour mass flux [8].

X_a = actual quality including the effects of thermodynamic nonequilibrium (vapour superheat)

α = void fraction

G = mass flux

μ_v = vapour viscosity

D = the diameter of the tube when the flow regime is dispersed (high quality). In inverted annular flow this value is equal to the vapour film thickness (δ).

The void fraction can be expressed in terms of the local (actual) quality as shown in equation 2.4. Therefore, substituting this into equation (2.16) results in equation 2.8 (repeated here for clarity):

$$Re = \frac{G \cdot D \cdot (X_a + K(1 - X_a)\rho_v/\rho_f)}{\mu_v} \qquad (2.8)$$

It is clear from the form of this term that the Reynolds number will increase linearly with quality (assuming that the slip ratio is constant). Substituting this value for the Reynolds number into equation 2.10 shows that the Nusselt number predicted by equation 2.10 will also increase with quality.

Some of the data do show this increase in the heat transfer coefficient with quality. This trend occurs primarily at higher qualities and higher mass fluxes, suggesting that the two-phase Reynolds number is applicable in this region. However, most of the data (which were obtained at lower flows and lower qualities) show the opposite trend; a decrease in the heat transfer coefficient with increasing quality. In this region other mechanisms may be present (vapour superheat) which tend to offset the improvement in the heat transfer coefficient caused by the two-phase Reynolds number increase with quality.

2.3.2. Vapour Superheat - Thermodynamic Non-equilibrium

Thermodynamic non-equilibrium or superheating of the vapour phase can occur during film boiling and this can cause a decreasing trend in the heat transfer coefficient as the wall temperature increases. Measurements of vapour temperature during film boiling by Nijhawan et al. [26] have shown that a significant amount of vapour superheat can exist at low thermodynamic equilibrium quality. Assuming that a method is available to calculate the vapour superheat (i.e., the vapour liquid heat exchange process), its effect can be included in equation (2.10).

Equation (2.10) gives the value of the heat transfer coefficient between the wall and the vapour (H_{cor}). However, this heat transfer coefficient is based on the temperature difference between the wall and the vapour. To compare this value meaningfully with the experimentally determined heat transfer coefficient, the value must be based on the wall-liquid temperature difference, as follows. The wall heat flux is therefore:

$$\phi = H_{cor} \cdot (T_{wall} - T_{vap}) \qquad (2.17)$$

Using this heat flux, the predicted heat transfer coefficient, based on the wall liquid temperature difference, can be evaluated:

$$H^* = \frac{\phi}{T_{wall} - T_{sat}}$$

$$= H_{cor} \frac{(T_{wall} - T_{vap})}{(T_{wall} - T_{sat})} \qquad (2.18)$$

As the vapour temperature increases, then the predicted heat transfer coefficient decreases (for constant wall temperatures). This therefore results in the same trend as seen in the data; a decrease in the heat transfer coefficient with an increase in quality (assuming that the vapour temperature increases with quality).

2.3.3. Heat Transfer by Conduction

In addition to convective heat transfer, conduction can play an important role when the void fraction is low (inverted annular flow regime). The conduction heat flux is simply related to the vapour layer temperature gradient, i.e.:

$$\phi = k_v \frac{\Delta \tilde{T}}{\delta} \qquad (2.19)$$

Therefore, when the vapour layer is thin, the conduction heat transfer coefficient is given approximately by:

$$h = \frac{k_v}{\delta} \qquad (2.20)$$

where δ is the vapour layer thickness.

At low void fractions in laminar vapour flow, conduction will probably dominate the heat transfer process, and the heat transfer coefficient (k_v/δ) will increase as the void fraction (δ) decreases [22].

2.3.4. Non-equilibrium Correlation Methods

Several empirical correlations have been developed which attempt to account for superheating of the vapour phase. The correlation by Groeneveld and Delorme [13] was based on film boiling data obtained at higher qualities and for that reason it does not predict the trends of the data of this study very well (Section 7).

Various models have been developed in an effort to predict the low quality film boiling heat transfer [7], [22]. Owing to the complexity of the film boiling phenomenon most of the models contain a number of empirically determined constants. Evaluation of some models can be quite time consuming, making them less than ideal candidates for inclusion in reactor safety analysis codes.

A model recently published by Chan and Yadigaroglu [7] appears promising since it shows similar trends to the data of this study, however insufficient time was available to compare in detail the model with the data of this study.

CHAPTER 3

EXPERIMENTAL APPARATUS

In the following sections the major components of the experimental apparatus will be described.

3.1. Loop Facility

The experimental program was performed in the MR-1 FLARE loop at Chalk River Nuclear Laboratories. The basic loop components are shown in Fig. 3.1. The loop as set up in this experiment was capable of 2-10 MPa pressure range and 25-650 kg/h flow rate range. The flow rate was controlled by the opening of the two flow control valves, as shown on the diagram. Depending upon the flow rate, the appropriate orifice-DP cell combination was valved in. The resulting signal from the pressure transducer was routed to the on-line computer data acquisition equipment for processing and display.

3.2. Data Acquisition System

Wiring from the field was routed into analog to digital converters. Here the instrument signals were digitized and sent to the computer for processing. A Perkin-Elmer 7/32 minicomputer was used to convert the signals to engineering units and display the results on a video display terminal. Flow and enthlapy calculations were also performed by the computer. At any time, the data could be stored on a magnetic tape for further processing.

3.3. Preheater

The test section inlet temperature was set to the proper value by adjusting the power level in the preheater. Since this was a manual adjustment, the inlet temperature had to be constantly monitored by the experimenter, and the preheater power adjusted accordingly in order to maintain the correct inlet temperature.

The temperature of the water flowing into the test section was monitored by two thermocouples inserted directly into the flow. Fig. 3.2 is a diagram of the test section instrumentation. It shows the inlet thermocouples located just upstream of the test section inlet flange. Installing the thermocouples in this location rather than on the test section itself reduced the interference of the test section voltage on the thermocouple signals.

The signals from the two inlet thermocouples were fed to a reference junction maintained at 0°C and then to the on-line computer system. Observing and comparing both of these temperatures provided a good means to check the validity of the inlet temperature measurement. The temperatures seldom differed by more than 0.5°C. For calculation purposes the inlet temperature was taken as the average of the two values.

3.4. Hot Patch

A copper patch 10.1 cm in length and 8.98 cm in diameter was silver soldered onto the test section using a high

melting point silver solder (approx. 820°C). A photograph of the installation is shown in Figure 3.3. The hot patch was fitted with twelve heaters, 500 watts each. Power was supplied by two 220 volt 20 ampere auto transformers (Variacs) which were mounted in the control room for easy access. Each Variac controlled the power to half of the heaters (six).

Three thermocouples were mounted in holes drilled through the hot patch to within 3 mm of the inner surface. These thermocouples were spaced to allow measurement of any axial temperature gradients in the hot patch. During the experiments the two thermocouples located at the downstream end and at the centre of the hot patch sensed essentially the same temperature. The one at the upstream end read about 5% lower. This indicated that the dryout location was close to the upstream end of the hot patch.

3.5. Test Section

The test section itself was constructed of nominal 7/16 inch (1.11 cm) OD Inconel 600 tubing (ID = 0.8928 cm).

3.5.1. Thermocouple Installation

Chromel-alumel thermocouples were spot welded onto the exterior of the tubing at regular intervals as shown in Fig. 3.2. A photograph of several thermocouples in Fig. 3.3 shows the details of the thermocouple connection to the test section.

Each thermocouple was wrapped half way around the tubing, along what would be approximately a constant temperature line. In this way heat conduction from the thermocouple tip could be minimized. The tip was spot welded to the test section to ensure good thermal contact. The thermocouple lead was then bent parallel to the test section for approximately 2 cm and then it was bent again at 90° to bring the thermocouple connection radially away from the test section. This 2 cm section parallel to the test section was insulated with a ceramic sleeve and then strapped to the test section using thin metal ties spot welded to the tube. The main purpose of bending the thermocouple parallel to the test section was to improve the physical endurance of the thermocouple tip connection under the stresses of the insulation procedure and wiring procedure.

The thermocouples themselves were sheathed in 0.1 cm (0.04 inch) stainless steel tubing with MgO insulation inside the tubing between the thermocouple and the sheath. Bending of the thermocouples during the installation procedure often caused a deterioration in the insulation, reducing the resistance between the leads and the sheath to a value below 2 megohms. This comparatively low resistance would allow pick-up of the test section voltage, which in turn could cause erroneous temperature readings. Consequently the resistance to ground of all of the thermocouples was checked before insulating the test section, and any thermocouples with a resistance less than infinity (approximately 10 Megohms on the digital voltmeter being used) were replaced. This usually represented about 30% of the thermocouples.

3.5.2 Thermocouple Wiring

In order to reduce common mode signal pick-up and retain the high common mode rejection capability of the computer input stage, the exact wiring connections of the thermocouples were critical. Each input to the computer was equipped with a guard terminal, but unfortunately this connection did not extend to the test section due to economical wiring practices. As a result, a compromise three wire guarded input wiring scheme was

used. In this method the low side of each test section thermocouple was connected to the local ground (not the test section). This connection ensured that the thermocouple output signal was close to the computer input system ground, and not floating somewhere far above it.

Fig. 3.5 shows diagramatically the connection of two thermocouples from the test section through the reference junction to the computer input. A complete wiring diagram would consist of two 24 conductor cables with one shield around each set of 24 wires (12 pairs).

3.5.3. Insulation

A high temperature ceramic fibre insulation was used immediately against the test section. Fibreglass insulation was used around this insulation. This resulted in about 6.5 cm of insulation around the tube. Reflective paper and tape were used on the exterior surface to hold the insulation together and reduce the radiant heat losses. The insulated test section is shown in Fig. 3.5. Thermocouple wires were supported by leads hanging from the rafters in an effort to improve the physical endurance of the spot weld connection between the thermocouple tip and the test section.

3.5.4. Hot Patch Wiring

The wiring to the hot patch was supported by two semicircular asbestos plates. Terminal strips were attached to the support and the heater wires were connected to the closest terminals. In this way the wires could be brought out radially from the heaters and thereby avoid crossing other wires (Fig. 3.6).

At the high operating temperatures of the hot patch the insulation on the heater wires deteriorated rapidly and therefore any wires which were touching each other tended to short and either blow a fuse or burn out one or both of the wires. Jumpers were connected to the appropriate terminals around the hot patch so that each of the two power supplies was connected to every other heater. This ensured more even heating of the hot patch if the two power supplies were not set to the same power level.

3.5.5. Test Section Power Supply

The tube was heated by direct current from a 2000 ampere power supply. The power leads to the test section can be seen in Fig. 3.5. The power clamps themselves consisted of two copper plates (11.5 by 10.0 cm, each with a semicylindrical groove

cut in it. The test section tube was sandwiched between the two plates and the plates in turn were sandwiched between the power lead terminations (Fig.3.7). Six bolts were used to securely tighten the assembly together. All parts were nickel plated before assembly to reduce oxidization during operation. No auxiliary heating of the power clamp leads was employed, consequently the cables represented a considerable heat loss to the system. This heat loss was evaluated and included in all calculations (Appendix B).

The power delivered to the test section was determined by measuring the voltage drop between the power clamps and measuring the voltage drop across a shunt resistor of a known value placed in series with the test section. The on-line computer system multiplied these two values together with the appropriate constant to evaluate the power. The current and voltage wave forms were examined to ensure that reasonably pure DC without significant ripple or spikes was being sent to the computer. Measurements indicated that the power supply had good filtering since there was very little evidence of the SCR switching (spikes) on the wave forms. The accuracy of the power measurement was confirmed by heat balance and zero power runs (Appendix B).

CHAPTER 4

EXPERIMENTAL METHOD

The hot patch technique as originally developed by Groeneveld [16], was used to achieve film boiling along the length of the test section. This method allows film boiling to be established without the large temperature rise associated with exceeding the critical heat flux. The application of this method and general experimental procedure are outlined below.

4.1. Initial Preparation

The loop was pressurized and brought up to its operating temperature. The approximate flow rate for the run was established through the test section, using flow control valve 1 (Fig. 3.1). The preheater was switched on at a relatively high power to bring the test section inlet temperature up to saturation. The hot patch power was also switched on at approximately 85% full power, since 100% full power tended to overload the cartridge heater wires and burn out the wiring.

The hot patch temperature rose sharply, but eventually levelled off somewhat above the saturation temperature (due to the good heat transfer during nucleate boiling). The purpose of switching on the hot patch at this time was to reduce the time required to bring the hot patch up to 750°C after the flow was cut off.

4.2. Hot Patch Temperature

After the inlet temperature reached the saturation temperature the flow was cut off using flow control valve 2. The hot patch temperature was allowed to rise to approximately 720-760°C, over the course of several minutes. During this time there was very little or no flow through the preheater, and the preheater power was also off. Consequently the preheater cooled and the inlet temperature dropped. By raising the inlet temperature to near saturation before shutting off the flow the extent of this cooling could be minimized.

4.3. Dry Patch Propagation

With the hot patch temperature approaching 730°C flow control valve 2 was fully reopened. Flow control valve 1 was

previously set so that the correct flow for that run would pass through the test section. The preheater and the test section power supplies were switched on at this point, and the hot patch power was reduced to about 25% full power (1.5 kW).

At this point film boiling existed only under the hot patch. This dry area was spread downstream to the upper power clamp, by adjusting three variables: inlet temperature, flow rate, and test section power. In general the inlet temperature was raised to near saturation and the test section power was set about 30-40% higher than the maximum value for that run, since the dry patch spread more rapidly at higher powers. This was possible while film boiling occurred over the upstream portion of the test section. As it propagated downstream the power had to be continuously reduced to avoid exceeding the test section maximum wall temperature of 780°C.

As the downstream extent of the dry area approached the halfway point the preheater power was gradually reduced to adjust the inlet temperature to the correct value for the run. This process of setting the inlet temperature could be quite time consuming, especially at low flows, due to the high thermal inertia of the loop piping. During a typical run it would take

thirty minutes for the dry patch to spread downstream. At low pressures and flows, it became much more difficult and time consuming to spread the dry patch downstream.

During some low flow runs it was possible to spontaneously dry out the entire test section. This was accomplished by increasing the inlet temperature to near saturation, and with the hot patch in film boiling, the test section power was quickly increased to three or four times the maximum value for the run. The test section temperature rose very rapidly so that a quick hand on the power control knob was a necessity. If the whole test section temperature increased significantly above the saturation temperature ($\Delta T \geq 100°C$), before it became necessary to reduce the power (because one or more temperatures were approaching 750°C) then film boiling could be in general maintained. It was important to keep the whole test section in film boiling and not allow part of it to quench. If it quenched at some point then generally the downstream half of the test section eventually rewetted, and the process had to be repeated.

This process was ideal when it worked since it could save a significant amount of time that would otherwise be

needed to propagate the dry patch downstream. However, the attendant dangers of destroying the test section may have exceeded the potential benefits of time saved.

4.4. Data Collection

Once film boiling had been established along the length from the hot patch to the upper power clamp, the flow conditions for the run were carefully set to their nominal values for that run. Analogue temperature recorders were connected to selected thermocouples to record their temperature-time history. When these temperatures showed no fluctuation over approximately 10 minutes, then several (4) computer data scans were initiated approximately once every 1.5 minutes. Data were thereby stored onto magnetic tape for future processing.

4.5. Power Reduction

The test section power was reduced by approximately 10% and conditions were allowed to stabilize for approximately 10 minutes. Computer data scans of the instrument signals were initiated again.

4.6. Quenching

The process of power reductions and data scans was repeated until the test section quenched at some point, usually thermocouple 16 or 17 (Fig. 3.2). As the minimum film boiling temperature was approached the power step size was reduced in an effort to accurately determine this temperature. Interpolation from the temperature-time charts was used to accurately determine the temperature immediately before quenching.

4.7. Heat Balance Runs and Zero Power Runs

In order to estimate the heat losses from the test section, heat balance runs and zero power runs were taken. During the heat balance runs, the outlet temperature was maintained at greater than 5°C below the saturation temperature. The electrical power added to the fluid was compared with the fluid enthalpy rise as calculated from the inlet and outlet temperatures. These results are presented in Appendix B.

Zero power runs were taken while the loop was being heated up to normal operating temperature. The difference between

the inlet and outlet temperatures indicated the heat loss from the test section. This heat loss calculated from the zero power runs was compared with the heat loss evaluated from the heat balance runs.(Appendix B).

CHAPTER 5

RESULTS - MINIMUM FILM BOILING TEMPERATURE DATA

5.1. General

The minimum film boiling temperature provides a limit to the applicability of film boiling heat transfer correlations, and the start of transition boiling correlations. It is very important in reactor safety analysis to know this minimum temperature accurately since the heat transfer improves drastically below this temperature in transition boiling and nucleate boiling.

Other experimenters have studied the minimum film boiling temperature during the propagation of a rewetting front. The steep axial temperature gradients in the region of a rewetting front complicated the results.

In this study the minimum film boiling temperature was measured without the presence of a rewetting front, and therefore without the large axial conduction effects. For this reason these measurements are believed to be the world's first steady-state forced convective minimum film boiling temperature data obtained in water.

During this study the test section quenched spontaneously at a point along the test section (usually thermocouple 16 - Fig. 3.2). The test section temperture immediately before the quench, at the location of the quench, was the minimum film boiling temperature.

5.2. Rewetting Mechanism

Most of the minimum film boiling temperature data were obtained at low qualities or subcooled conditions. In the subcooled region the flow regime was likely inverted annular. Therefore, liquid contact with the heated surface occurred as a result of a spontaneous collapse of the vapour film. This collapse occurred after the wall temperature had been slowly reduced in a step-wise fashion (through a reduction in the heat

flux). This type of rewetting was not dependent upon the properties of the wall since no rewetting front was present prior to the initial quench.

At high qualities in the dispersed flow regime, rewetting was thought to occur as a result of liquid droplets impinging on the heated surface and eventually lowering the temperature enough to rewet the surface.

5.3. Minimum Film Boiling Temperature Data

These temperatures, together with those data of Fung [33] obtained at atmospheric pressure, have been plotted against the thermodynamic equilibrium quality in Figs. 5.1 and 5.2. Each plot shows data obtained at a different pressure. Also shown on the plot is an empirical correlation of the data, as a function of pressure and quality. This correlation wsa derived from the following general trends in the data:

1) The minimum film boiling temperature decreases as the quality increases, in the subcooled region.
2) In the positive quality region the minimum film boiling temperature remains relatively constant, to a first approximation.
3) No significant effect of mass flux on the minimum film boiling temperature is observed over the rather wide range of mass flux (120 - 2750 $kg \cdot m^{-2} \cdot s^{-1}$).
4) The difference between the minimum film boiling temperature and the saturation temperature decreases as the pressure is increased, at a given subcooling, suggesting that the minimum temperature appears to be approaching the saturation temperature as the pressure increases.

Fung's data show similar trends to the data obtained in this study in the subcooled region, in that the minimum film boiling temperature increases with higher subcooling. His data also fit into the pressure trend as displayed by the data of this study, i.e., that the minimum film boiling temperature increases more rapidly with increasing subcooling at lower pressures (compare Figs. 5.1a and 5.1b).

5.4. Correlation

This correlation was developed by a combination of several least squares regressions performed on selected subsets of the data. It suffices to say that since the correlation was designed to fit only the major trends of the data, the fitting procedure is therefore only approximate. It is acknowledged that better fits to the data are possible, especially if the mass flux and other dependencies can be properly determined and incorporated.

The empirical correlation of the minimum film boiling data, as a function of pressure and quality is given below:

$$X \leq 0 \quad P < 9 \text{ MPa} \quad T_{min} = 284.7 + 44.11P - 3.72P^2 - \frac{X \cdot 10^4}{2.819 + 1.22P} \qquad (5.1a)$$

$$X > 0 \quad P < 9 \text{ MPa} \quad T_{min} = 284.7 + 44.11P - 3.72P^2 \qquad (5.1b)$$

P = pressure in MPa

T_{min} = minimum film boiling temperature in °C

Fig. 5.3 shows the data, including those of Fung [33], on a plot of pressure against the wall temperature. The general trend of the correlation with pressure can be seen from the plot. At the higher pressures the correlation appears to be approaching the saturation line. Although no data were obtained above 9 MPa, it is reasonable to simply fit a straight line between the value of the correlation at 9 MPa and the critical temperature of 375°C at 22 MPa since at this point the difference between the liquid and the vapour ceases to exist.

This then leads to the following equation for the minimum film boiling temperature at any pressure (P) between 9 MPa and the critical pressure (22.1 MPa):

$$P > 9 \text{ MPa} \quad T_{min} = (T_{min}(9 \text{ MPa}) - T_{sat}(9 \text{ MPa})) \cdot \frac{(22.1 - P)}{13.1} + T_{sat}(P) \qquad (5.2)$$

5.5. Discussion

The minimum film boiling temperature data have been tabulated in Appendix D. From these data it can be seen that the test section normally quenched at thermocouple 16. This occurred because the test section temperature was the lowest in that area.

Upstream of thermocouple 16 axial conduction from the hot patch tended to increase the wall heat flux, which in turn increased the wall temperature, towards the hot patch. This increasing wall heat flux towards the hot patch also tended to increase the vapour layer thickness in that direction, which further increased the wall temperature. This effect is the same as the effect of heat flux on the heat transfer coefficient as discussed in Section 2.2.1.

Downstream of thermocouple 16 location the increased vapour superheat and vapour generation led to an increase in the vapour layer thickness and an increase in the wall temperature. Therefore, thermocouple 16 was near the minimum temperature of the test section and also probably near the minimum vapour layer thickness. Hence rewetting occurred preferentially at this location.

Although correlations have been recommended in the literature, many lack an adequate data base. The correlation of this study was developed from a relatively large data base (51 points), and it is expected to be a valuable addition to present reactor safety analysis codes.

CHAPTER 6

RESULTS - HEAT TRANSFER COEFFICIENT DATA

The trends in the data will be discussed in a general sense, followed by a more detailed discussion with respect to the specific effects of heat flux, pressure, inlet subcooling, mass flux. These trends will be related to the physical mechanisms as they are outlined in Section 2.

6.1. General Comments

A series of plots have been generated in order to display the data graphically. In Fig. 6.2.1 to 6.2.9, the heat transfer coefficient has been plotted against the thermodynamic quality, where the heat transfer coefficient was calculated from the inside wall temperature of the tube as follows:

$$H = \frac{\phi}{T_{wall} - T_{sat}(P_{out})}$$

ϕ = wall heat flux

$= \phi_T - \phi_R$

where ϕ_T = test section power/heated area

ϕ_R = radiation heat flux as evaluated from equation (13) of Appendix A.

$T_{sat}(P_{out})$ = saturation temperature evaluated at the outlet pressure.

It should be noted that the actual data points were plotted on the figures (although no symbols were used) and no smoothing of the data was employed.

Also shown on these plots is the wall temperature, appearing as the dashed lines. Several sets of data have been plotted on these figures, each at a different heat flux. The highest heat flux was generally limited so that the maximum test section temperature remained below 750°C. The lowest heat flux was determined by the quenching of the test section at some point. The heat flux associated with each wall temperature curve was marked on each figure. To determine the heat flux associated with any of the heat transfer coefficient curves (solid lines) it must be remembered that the highest wall temperatures (dotted curves) correspond to the lowest values of the heat transfer coefficient (solid curves).

Some of the data plots show evidence of axial conduction from the hot patch. Referring to Fig. 6.2.2b, the reductions in the heat transfer coefficient curves at the lowest qualities are a result of the hot patch raising the temperature of the first thermocouple (lowest quality) and causing a decrease in the overall heat transfer coefficient.

On Figs. 6.4.1 to 6.4.3 the heat transfer coefficient has been plotted against quality and axial position. The inclusion of the axial position plot allows some evaluation of any entrance effects.

In general, the heat transfer coefficient during film boiling decreases with increasing quality at low to moderate mass fluxes. This is most likely due to the formation of vapour superheat [26]. At higher mass fluxes the same trends are present except that in the higher quality region the heat transfer coefficient increases with quality. A discussion of the reasons for this increase was presented in Section 2.2.5.

In the lower quality region ($X < 0.02$) the heat transfer coefficient increases sharply with decreasing quality (Fig. 6.2.2) due to the reduction of the vapour layer thickness. This increase is greater at lower heat flux levels.

In the sections below, these effects and others will be discussed in relation to changes in the system parameters such as heat flux, pressure, inlet subcooling and mass flux. An effort has been made to qualitatively indicate the range of the effects with respect to the relevant flow variables. However, owing to the complexity of the film boiling process, and the interconnection of effects, rigid limits cannot be set. Generally, a brief summary of the observed data trends will be given, followed by a discussion of possible causes.

6.2. Heat Flux Effect

Observations

(1) The lower the heat flux, the higher the film boiling heat flux heat transfer coefficient.

In the low and negative quality region, decreasing the heat flux always leads to an increase in the heat transfer coefficient (Fig. 6.2.1). This effect occurs over the range of pressures from 2 MPa to 8 MPa, in the low quality region. At higher qualities this trend changes somewhat with pressure (Section 6.2.2).

Discussion

The effect of heat flux on the heat transfer coefficient in the low quality region and subcooled region is at least in part caused by the changes in the conduction heat transfer rate, due to changes in the vapour film thickness. Therefore, by decreasing heat flux the vapour layer thickness decreases causing a reduction in the wall temperature and an increase in the overall heat transfer coefficient (based on $T_{wall} - T_{sat}$). In addition, the heat flux is expected to affect the vapour superheat, and therefore the vapour temperature could lead to an increase in the thermophysical property group (Section 2.2.1) and hence an increase in the heat transfer coefficient.

6.2.1. "Cross Over Effect"

Observations

(1) There is a minimum in the effect of heat flux on the heat transfer coefficient.

(2) There is a "cross over" in the effect of heat flux on the heat transfer coefficient.

Referring to Fig. 6.2.2, the effect of heat flux on the heat transfer coefficient reaches a minimum at approximately 0.005 quality at 2 MPa. Although it may not be obvious from the figure, at this quality the heat flux effect appears to "cross cover". At qualities greater than 0.005, an increase in the heat flux increases the heat transfer coefficient. Below this quality, increases in the heat flux decrease the heat transfer coefficient.

Discussion

As explained in the theoretical section 2.2.1, an increase in the heat flux tends to decrease the conduction heat transfer component (due to a thicker vapour layer). An increase in the heat flux tends to increase the convective heat transfer component through increases in the Reynolds number and changes in the vapour thermophysical properties (due to the higher vapour temperature).

The cross over point could be the region where the rate of decrease of the conduction component equals the rate of increase of the convective component.

6.2.2. Pressure

Observations

(1) Increased pressure appears to prevent the occurrence of the "cross over" effect

(2) At high wall temperature and higher pressure, heat flux does not appear to strongly affect the heat transfer coefficient.

The 4 MPa data of Fig. 6.2.2 show the "cross over" effect, but to a lesser degree than the 2 MPa data. The 6 and 8 MPa data do not show the effect. Referring to the data obtained at 8 MPa, the three highest heat flux curves do not show an effect of heat flux on the heat transfer coefficient. The same effect is present in the 6 MPa data shown on Fig. 6.2.2. It is also observable to some extent on Figs. 6.2.1, 6.2.3 and 6.2.6 at 8 MPa.

Discussion

Higher pressures could reduce the cross over effect through changes in the vapour thermophysical properties. At higher pressure an increase in the vapour temperature does not necessarily lead to an increase in the thermophysical properties.

In fact it could cause a decrease (Section 2.2.1). Therefore, increasing the heat flux would tend to decrease the conduction component (due to a thicker vapour layer) and could also decrease the convection component (due to a resultant decrease in the thermophysical properties group). The fact that the convection component decreases would prevent any cross over effect.

In addition, since the void fraction does not increase as quickly with quality at higher pressures (see Fig. 2.2.2) the decreasing conduction component would persist to higher qualities. This decreasing trend could obscure any increases in the convective heat transfer component.

The fact that the heat flux does not affect the heat transfer coefficient at the highest wall temperatures (observation (2)) could indicate that the vapour temperature is in the area of the minimum in the vapour thermophysical properties curve (Section 2.2.1). Consequently, the vapour temperature could vary over a range with comparatively little change in the thermophysical properties, and hence, little change in the heat transfer coefficient. In addition, it suggests that changes in the vapour layer thickness due to changes in the heat flux are not affecting the heat transfer coefficient. This could occur if the bulk of the vapour layer was turbulent and hence the heat transfer coeffi-

cient between the wall and the liquid would not depend upon the vapour layer thickness (i.e., as it does in the laminar flow).

Some of the higher pressure runs do not show the effect as strongly as other runs because the wall temperature (and hence the vapour temperatures) were probably below the region of the minimum in the thermophysical properties curves (Fig. 2.2.1).

6.2.3. Higher Flows and Higher Inlet Subcoolings

Observations

(1) The heat transfer coefficient decreases very quickly with quality at high local subcooling (i.e., X = -0.10 to -0.15).
(2) A minimum in the heat transfer coefficient curve occurs near -0.06 quality at the higher heat fluxes.
(3) Above 0 quality the heat transfer coefficient decreases again.

Fig. 6.2.8 shows four sets of data obtained at high flow and high inlet subcooling. The flow rates are the same, but the pressure and inlet subcoolings vary from one plot to the next.

All of the plots of Fig. 6.2.8 show the above effects, but the plots with higher inlet subcooling (c and d, labelled left to right and top to bottom) show the effects most strongly. Evidence of this effect is present on other plots, but to a lesser extent. Figs. 6.2.6 and 6.2.7 show similar trends. The flow rates are about half of those in Fig. 6.2.8, and as a result the wall heat fluxes had to be maintained considerably lower in order not to exceed the maximum wall temperature of 750°C. Fig. 6.2.9 shows two sets of data obtained at higher mass fluxes where the same trends are present.

Discussion

The observed trend may be at least in part explained by considering the variation of vapour properties with vapour temperature. In subcooled film boiling, the flow regime is inverted annular according to the flow regime map (Fig. 2.1.0). In this region, changes in the vapour temperature affect the thermal conductivity and density of the vapour layer. These changes in turn affect the conduction heat transfer as discussed in Section 2.2.4. A plot of these effects (Fig. 2.2.5) shows similar trends to Fig. 6.2.8c in the quality range from -0.14 to -0.03, i.e., a sharp decrease in the heat transfer coefficient followed by a minimum and then an increase.

As the heat flux is decreased the vapour temperature will also decrease, at a given quality. According to Fig. 2.2.5, at lower temperatures, the het transfer coefficient will be higher (if the vapour temperature is below the minimum in the curve). This is the same trend as shown by the data of Fig. 6.2.8.

6.2.4. Much Higher Flows (2750 $kg \cdot m^{-2} \cdot s^{-1}$)

Observations

Fig. 6.2.9 shows two plots of data obtained at much higher flow rates (approximately three times that of Fig. 6.2.8). Essentially the same trends are present as on Fig. 6.2.8. The notable exception is the continued increase in the heat transfer coefficient at qualities greater than 0, whereas the runs of Fig. 6.2.8 showed a definite decrease in this region. Upon closer examination of the Fig. 6.2.9 it can be seen that the heat transfer coefficient increases less quickly above approximately -0.02 quality.

Discussion

It is thought that this reduction in the slope (near -0.02 quality) corresponds to the bulk of the liquid reaching saturation and therefore net vapour generation.

The increase in the void fraction tends to reduce the heat transfer coefficient. However, the increase in the vapour flow rate is high (see Section 2.2.5 for a discussion of the effect of flow rate on the rate of increase of the Reynolds number). The net result is an increase in the heat transfer coefficient, but at a lesser rate.

6.3. Pressure Effect

Fig. 6.3.1a shows four sets of data obtained at different pressures but otherwise the same conditions. Several heat flux values were selected for plotting in order not to overcrowd the plots. Most of the data on these plots are shown on separate plots of Figs. 6.2.1 to 6.2.9, with all of the heat flux levels.

Observations

(1) The heat transfer coefficient varies directly with pressure

(2) Low pressure (2 MPa) data indicate a sharper increase in the heat transfer coefficient with quality than do the higher pressure data (at higher qualities).

Discussion

Pressure affects the heat transfer mainly through changes in the thermophysical properties. This agrees with the trends in the thermophysical properties as described in Section 2.2.1. However, the magnitude of the pressure dependence on the experimental data is considerably larger than the pressure dependence predicted by a correlation of the form used to generate Fig. 2.2.1. This suggests that other dimensionless groups may be involved such as the density ratio ρ_g/ρ_f.

Observation (2) above could be attributed to the fact that the Reynolds number increases more quickly with quality at lower pressures (at the same flow rate). As outlined in Section 2.2.5 the increase in vapour Reynolds number with quality (dRe/dX) is directly proportional to the term $G \cdot D \cdot (1-K \cdot \rho_g/\rho_f)/\mu_g$. Due to the pressure dependence of ρ_g/ρ_f and μ_g this term will be larger at lower pressures (assuming constant slip). Calculations indicate that the difference is approximately 20%, between 2 MPa and 8 MPa, assuming the same slip ratio. The fact that the slip ratio decreases with increasing pressure will tend to reduce the term, but not change the basic trend.

Observations

(1) The heat transfer coefficient increases more rapidly with decreasing quality in the low quality region, at lower pressures, than at higher pressures.

Fig. 6.3.1b shows four sets of data obtained at a lower flow rate than Fig. 6.3.1a. Both Figs. 6.3.1a and 6.3.1b show a sharper increase in the heat transfer coefficient in the low quality region at lower pressures, i.e., dH/dX becomes more negative at lower pressures, with decreasing quality.

Discussion

The increase in the heat transfer coefficient at low qualities is due to the thinner vapour layer and the presence of conduction from the wall to the liquid core. Therefore, the sharper increase in the heat transfer coefficient at lower pressures (2 MPa) compared with higher pressures (8 MPa), indicates that the void fraction is varying more quickly with quality at lower pressures. This is exactly the expected trend in void fraction as discussed in Section 2.2.2. Figs. 6.3.2a and 6.3.2b show further data obtained at a greater inlet subcooling. These data show similar trends to those described above.

6.4. Inlet Subcooling Effect

The effect of inlet subcooling on the heat transfer coefficient is shown in Figs. 6.4.1, 6.4.2 and 6.4.3. Two, three or four runs obtained at the same flow rate, pressure and heat flux, but different inlet subcoolings were plotted on the same figure. Also shown in dotted lines is the heat transfer coefficient plotted against axial location, where 0.0 represents the downstream end of the inlet power clamp, and the hot patch length has been omitted. These curves were included to help isolate any effect of length on the heat transfer coefficient.

6.4.1. High Quality Region

Observations

(1) There is little or no effect of the inlet subcooling on the heat transfer coefficient in the high quality region (i.e., $X > 0.10$).

The runs of Fig. 6.4.1 show essentially no change in the heat transfer coefficient with a variation in the inlet subcooling. There is some deviation at the lowest qualities, but this is due to axial heat conduction from the hot patch. Fig. 6.4.2 shows similar trends at higher qualities.

Discussion

This indicates that at higher qualities, the film boiling heat transfer coefficient is a function of local conditions and not inlet conditions.

6.4.2. Low Quality Region

Observations

(1) In the low quality and subcooled region, the inlet subcooling does affect the heat transfer coefficients; the higher the inlet subcooling, the greater the heat transfer coefficient.

(2) This effect is stronger at higher mass fluxes.

Higher mass flux runs tend to have data at lower qualities (for the same inlet temperature) simply because the hot patch heat flux does not increase the quality of the fluid as much at higher mass fluxes. Consequently Figs. 6.4.2 and 6.4.3 have data at progressively lower qualities.

The data of Fig. 6.4.2 do not show any particular inlet subcooling effect, but the data of Fig. 6.4.3 obtained at a somewhat higher mass flux do show a definite effect. It should be noted that the actual quality will be greater than zero in film boiling regardless of the equilibrium quality. Therefore in the subcooled region, the equilibrium quality is not an accurate representation of the actual quality, but it does serve as an indication of the subcooling of the liquid assuming that most of the heat is delivered to the liquid.

Discussion

As stated in the theoretical discussion (Section 2.2.3) the liquid temperature at the start of the film boiling length may affect the vapour film thickness. It is

possible that the higher the inlet subcooling, the thinner the initial vapour layer. If this is true and the vapour layer thickness does not increase significantly downstream, until the bulk of the liquid reaches saturation, then the inlet subcooling will affect the vapour film thickness and the heat transfer coefficient downstream. The higher the inlet subcooling the thinner the vapour film and the higher the heat transfer coefficient. This effect would produce trends similar to the trends of Fig. 6.4.3.

6.4.3. Pressure Effects

Observations

(1) The effects of inlet subcooling are not as pronounced at lower pressures.

Discussion

There are several contributing factors which tend to reduce the inlet subcooling effect at lower pressures. Firstly, since the void fraction is a much stronger function of quality at low pressure, the vapour film thickens more quickly with quality. Hence the inlet subcooling effect disappears more

quickly with quality. Secondly, at lower pressures, it was more difficult to maintain film boiling at higher inlet subcoolings, which in part accounts for the lack of data in this area. The latent heat is greater at lower pressures, consequently, at the same inlet subcooling, the inlet quality will be higher for the lower pressure data.

6.5. Mass Flux Effect

On Figs. 6.5.1 to 6.5.4 the heat transfer coefficient has been plotted against thermodynamic equilibrium quality. On each plot several runs were selected at the same pressure, heat flux and inlet subcooling, but different flow rates. Although the inlet subcoolings are normally the same, the hot patch heat flux and the portion of the heated length upstream of the hot patch tend to increase the quality more at lower flow rates. Therefore, the higher the mass flux the higher the subcooling at the start of the film boiling length.

6.5.1. Higher Mass Fluxes

Observations

(1) The heat transfer coefficient increases with mass flux.

Referring to Fig. 6.5.1, the higher mass flux data show higher values of the heat transfer coefficient at any quality.

Discussion

This observation is probably related to the higher vapour Reynolds number and consequent better mixing in the vapour layer that occurs at higher mass fluxes. This effect can be seen in Figs. 6.5.1 and 6.5.2.

6.5.2. Lower Mass Fluxes

Observations

(1) At lower mass fluxes the heat transfer coefficient does not appear to be a strong function of mass flux.

(2) The lowest mass flux heat transfer coefficient can be higher than the next higher mass flux heat transfer coefficient.

The data of Figs. 6.5.4 and 6.5.3 do not show a strong mass flux dependence although the overlap at low quality values is minimal in some cases. Moreover, the heat transfer coefficient appears to be a function of quality alone (and pressure).

The lowest mass flux heat transfer coefficients are greater than the next higher mass flux data at the same quality. This can be seen in Figs. 6.5.2, 6.5.3 and 6.5.4.

Discussion

Observation (1) suggests that the improvement in the heat transfer coefficient as a result of the higher mass flux is equally offset by the higher vapour superheat. This could occur since at the same quality, the higher mass flux data were obtained from locations downstream, where the vapour superheat is probably larger.

This mechanism also explains observation (2), except that in this case the vapour superheat more than offsets the improvement in the heat transfer coefficient due to the higher flow rate. The wall temperature curves (dotted lines) of Fig. 6.5.4b support the idea that the axial location affects the vapour temperature. If these curves were plotted as wall temperature against axial location, the two lowest mass flux curves would fall almost on top of one another. Therefore, the wall temperatures are essentially a function of axial location and not quality.

6.5.3. Quality Trends

Observations

(1) At higher mass fluxes the heat transfer coefficient begins to increase with quality in the high quality region.

The heat transfer coefficient decreases as the quality increases, up to a point. At this point the higher flow rate data will tend to show an increase in the heat transfer coefficient, while the lower flow rate data will continue the decreasing trend. Fig. 6.5.1b shows this effect clearly near 0.10 quality. Similar trends are visible in the other data plots. It can

be seen that the higher flow rate data tend to show larger increases in the heat transfer coefficient in this "up-turn" region.

Discussion

As discussed in Section 2.2.5 there are two competing mechanisms present:

(1) With constant vapour superheat, increasing the quality increases the overall heat transfer coefficient.

(2) With constant quality, increasing the vapour superheat decreases the overall heat transfer coefficient.

As the quality increases, both of the mechanisms occur, consequently the net change in the overall heat transfer coefficient depends on the relative strengths of the two mechanisms. The case of the "up-turns" as noted above is a situation where mechanism 1) exceeds mechanism 2). As noted in Section 2.2.5, this situation only results at higher mass fluxes since mechanism 1) increases in strength with increasing mass flux.

CHAPTER 7

COMPARISON WITH EMPRICAL CORRELATIONS

Four correlations are compared with the data over a wide range of pressure and mass flux. Only one set of data (one heat flux) was chosen for the comparisons to avoid overcrowding the plots. These comparisons are made graphically by plotting the heat transfer coefficient against quality in Fig. 7.1 to 7.4. On each plot the experimental data (at one heat flux) are indicated by the solid curve. The four correlations are shown by the dashed curves numbered as follows:

(1) Groeneveld-Delorme [13]

(2) Dougall-Rohsenow [10] (high quality correlation)

(3) Berenson [4]

(4) Sherman [29]

The vapour thermophysical properties of correlations 1, 3 and 4 were evaluated at the vapour temperature defined as $(T_{wall} + T_{sat})/2.0$. The Dougall-Rohsenow correlation used vapour properties evaluated at the saturation temperature.

It should be noted that Bromley's correlation is very similar to Berenson's correlation [5], and hence the trends of two correlations will be similar.

7.1. Highest Flow Results (2750 $kg \cdot m^{-2} \cdot s^{-1}$ - Fig. 7.1)

Fig. 7.1 shows two sets of data obtained at 2750 $kg \cdot m^{-2} \cdot s^{-1}$. The Groeneveld-Delorme correlation appears to be closest to the data in the subcooled region. In the positive quality region, this correlation increases more quickly than the data resulting in a progressively increasing overprediction of the heat transfer coefficient.

Sherman's correlation appears to be reasonably close to the data as well, although it does not show as strong an increasing trend at higher qualities.

The Dougall-Rohsenow correlation (appearing off the top of the plots) significantly overestimates the heat transfer coefficient. Berenson's correlation significantly understimates the heat transfer coefficient.

7.2. Moderate Flow (923 $kg \cdot m^{-2} \cdot s^{-1}$ - Fig. 7.2)

Berenson's correlation appears quite close to the data especially in the low quality and subcooled region. It fails, however, to predict the increasing trend in the heat transfer coefficient at higher qualities.

Both the Dougall-Rohsenow and Groeneveld-Delorme correlations show sharply increasing trends with quality. This is contrary to the relatively flat trend of the data. To some extent the Groeneveld-Delorme correlation appears to approach data in the higher quality region (i.e., 6 MPa data). This trend is present to a larger extent on the lower flow data of Figs. 7.3 and 7.4.

Sherman's correlation consistently overestimates the heat transfer coefficient by about 35%.

7.3. Lower Flows (359 $kg \cdot m^{-2} \cdot s^{-1}$ - Fig. 7.3)

These plots show similar trends to Fig. 7.2. Berenson's correlation appears reasonably close to the data over the range of pressures in the low quality region. As the quality increases the experimental data show a decrease, possibly due to vapour superheat. None of the correlations display this trend, except possibly Sherman's to some extent.

The Dougall-Rohsenow correlation shows much too strong an increasing trend with quality. This is primarily due to the two-phase Reynolds number in the correlation (Section 2.3). The Groeneveld-Delorme correlation also shows a strong increasing

trend with quality, for the same reason. However, it does appear to approach the experimental results at higher qualities. This indicates that the correlation may be valid for prediction of high quality film boiling data. This seems reasonable since high quality film boiling data were used to optimize the coefficients of this correlation.

Sherman's correlation overestimates the heat transfer coefficient at all pressures. However, it does predict a decrease in the heat transfer coefficient with decreasing pressure, which is the correct trend.

7.4. Lowest Flow Data (120 $kg \cdot m^{-2} \cdot s^{-1}$ - Fig. 7.4)

In the low quality region, Berenson's correlation is the only one near the data over the pressure range of 2 to 6 MPa. Both the Groeneveld-Delorme correlation and the Dougall-Rohsenow correlation fail to account for the decreasing trend in the heat transfer coefficient with quality. However, the Groeneveld-Delorme correlation does agree favourably with the data in the higher quality region.

7.5. Summary

The empirical correlations chosen for comparison with the data were all derived from high quality film boiling data ($X > 40\%$ approximately). Therefore, it is not surprising that the trends of the correlation do not match the trends of the data over all flow conditions. However, selected correlations appear to be better than the others within certain bounds.

In the low quality and subcooled region, Berenson's correlation appears to most accurately predict the data. The correlation agrees most closely with the data of a mass flux of 923 $kg \cdot m^{-2} \cdot s^{-1}$ and since it contains no mass flux dependence, the agreement deteriorates with higher or lower mass fluxes.

The Groeneveld-Delorme correlation appears to be the most accurate at higher qualities, especially at lower mass fluxes (Fig. 7.4).

At very high flow rates (2750 $kg \cdot m^{-2} \cdot s^{-1}$) Sherman's correlation appears to most accurately estimate the data.

CHAPTER 8

SUMMARY OF RESULTS AND CONCLUSIONS

(1) The minimum film boiling temperature has been measured over a wide range of pressures and mass fluxes. These data are believed to be the world's first stable minimum film boiling temperatures and they fill a large gap in the previously existing data base.

(2) A correlation developed from the minimum film boiling temperature data predicts the major pressure and quality trends of the data. This correlation is expected to be useful for inclusion in reactor safety codes.

(3) A large data base of stable low quality and subcooled film boiling data has been obtained. This data base covers a range of 2 MPa to 9 MPa and 120 to 2750 $kg \cdot m^{-2} \cdot s^{-1}$. The range of the data is summarized in Table 8.1 These data are believed to be the first low quality and subcooled and film boiling data obtained at elevated pressures. A large gap in the previous existing data base has been filled with these data.

(4) From the discussion of Chapter 6, it is clear that film boiling is a very complicated phenomenon incorporating many different effects which occur over limited ranges of the flow conditions. These effects change as the system parameters change (flow, pressure, ΔH_{in}) and it is difficult to specify exact ranges of applicability for each effect. For this reason the major effects will be stated here with the proviso that the ranges are limited as shown by the actual data plots and discussed qualitatively in Chapter 6.

(i) Vapour superheat or thermodynamic non-equilibrium plays an important role in determining the overall heat transfer coefficient. This role increases as the mass flux decreases.

(ii) Heat flux affects the heat transfer coefficient, especially in the low quality and subcooled region: the lower the heat flux the higher the heat transfer coefficient. This effect does have some exceptions as discussed in Chapter 6.

(iii) Inlet subcooling affects the heat transfer coefficient in the low quality and subcooled region: the higher the inlet subcooling, the higher the heat transfer coeficient. This effect is stronger at higher mass fluxes and higher inlet subcoolings.

(iv) The heat transfer coefficient varies directly with pressure.

(v) The heat transfer coefficient increases with mass flux. This effect is stronger at higher mass fluxes and higher inlet subcoolings.

(vi) The heat transfer coefficient increases sharply in the subcooled region as the quality is reduced.

(5) No single empirical heat transfer correlation accurately predicts the film boiling heat transfer coefficient of this study, although several correlations do appear better in certain areas: Berenson's correlation [4] at low qualities and Groeneveld-Delorme [13] at high qualities. Sherman's correlation [29] appears to most accurately predict the highest mass flux data (2750 $kg \cdot m^{-2} \cdot s^{-1}$).

None of the correlations account for the sharp increase in the heat transfer coefficient with decreasing quality seen in the subcooled region, nor, the gradual decrease in the heat transfer coefficient with increasing quality at low to moderate flows.

APPENDIX A

RADIATION

A.1. Radiative Heat Transfer

The net radiant heat flux from the tube wall to the vapour and liquid core was calculated by means of Hottel's method [25]. The method involves the evaluation of various "view factors" and "pseudo view factors".

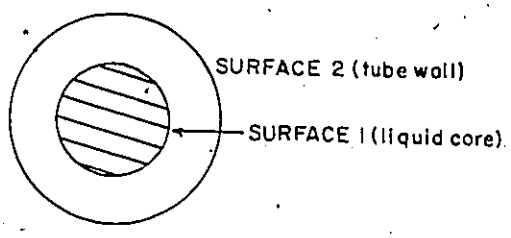


FIGURE A.0

Surface 1 is assumed to be at absolute zero, and Surface 2 is assumed to be at a temperature such that if it was black its emissive power would be 1.0. Surface 1 will have a heat flux away from it due to incident radiation from Surface 2 that is reflected. Similarly Surface 2 will have a heat flux away from it due to reflected radiation and due to original emission as a result of its temperature.

These reflected heat fluxes are termed R_{21} and R_{22}. The first subscript indicates the surface from which the radiation originated and the second subscript indicates the surface from which it is reflected. The reflected heat fluxes are scaled down by choosing Surface 2 to have an emissive power of 1.

The radiation away from Surface 1 is A_1R_{21}. Since this is due to reflection of the incident beam, then the incident beam has an intensity of $\frac{A_1R_{21}}{1-\epsilon_1}$. (All surfaces are assumed to be gray, meaning that the absorptivity (γ) = emissivity (ϵ) and neither is a function of wavelength). Knowing the incident intensity, the absorbed radiation, as a result of emission at Surface 2 is:

$$\frac{A_1R_{21}\epsilon_1}{1-\epsilon_2} \qquad (\text{i.e., } \epsilon_1 = \gamma_1)$$

The above relation is set equal to A_2F_{21}, where F_{21} is the "pseudo view factor" with which Surface 2 sees Surface 1.

In general

$$A_2F_{2N} = R_{2N}A_N\left(\frac{\epsilon_N}{1-\epsilon_N}\right) \qquad (A.1)$$

The values of the R's are found by calculating energy balances on the surfaces (two in this case).

The following discussion makes use of view factors (F) which are defined purely on a geometry basis. These factors represent the fraction of radiation leaving one black surface that is intercepted by the other. These are distinct and separate from the "pseudo view factors" (F) which include the effects of surface emissivity and vapour transmissivity.

Any radiant energy passing between surfaces must pass through the intervening vapour layer, and as a result a portion of the energy is absorbed and a portion is transmitted. As an example, τ_{12} indicates the fraction of the radiant energy transmitted between Surfaces 1 and 2.

A.2. Energy Balances

The energy reaching Surface 2 comes from Surface 1 and other areas of Surface 2. This can be written as follows:

$$A_2F_{22}\tau_{22}\epsilon_2 + A_2F_{22}R_{22}\tau_{22} + A_2F_{12}R_{21}\tau_{12}$$

Part of the energy incident upon Surface 2 is reflected:

$$\text{REFLECTED ENERGY} = (1 - \varepsilon_2)\left(A_2F_{22}\tau_{22}(\varepsilon_2 + R_{22}) + A_1F_{12}R_{21}\tau_{12}\right)$$

This reflected energy is equal to A_2R_{22}, by the definition of "R". Rearranging the equation yields the following result:

$$A_1F_{12}R_{21}\tau_{12} + A_2F_{22}\tau_{22}R_{22} - A_2R_{22}/\rho_2 = -A_2F_{22}\tau_{22}\varepsilon_2$$

$$R_{21}(A_1F_{12}\tau_{12}) + R_{22}(A_2F_{22}\tau_{22} - A_2/\rho_2) = -A_2F_{22}\tau_{22}\varepsilon_2 \qquad (A.2)$$

where $(1 - \varepsilon_2) = \rho_2$

In a similar fashion, an equation can be developed for Surface 1.

REFLECTED ENERGY FROM SURFACE 1

$$= (1 - \varepsilon_1)(A_2F_{21}\varepsilon_2\tau_{21} + A_2F_{21}R_{22}\tau_{21} + A_1F_{11}R_{21}\tau_{11} = A_1R_{21}$$

$$R_{21}(A_1F_{11}\tau_{11} - A_1/\rho_1) + R_{22}(A_2F_{21}\tau_{21}) = -A_2F_{21}\varepsilon_2\tau_{21} \qquad (A.3)$$

The values of R_{22} and R_{21} can be found using Cramer's Rule to solve the two equations (A.2) and (A.3). The determinant of the following matrix must be evaluated:

$$\begin{vmatrix} A_1F_{11}\tau_{11} - \frac{A_1}{\rho_1} & A_2F_{21}\tau_{21} \\ A_1F_{12}\tau_{12} & A_2F_{22}\tau_{22} - \frac{A_2}{\rho_2} \end{vmatrix} \qquad (A.4)$$

In order to simplify the algebra, all of the vapour transmissivities are assumed equal. Although this assumption is not entirely true, the retention of different transmissivities is not warranted since there is no reliable way of evaluating these values individually. An average, approximate value is used instead (τ).

Therefore the determinant becomes:

$$DET = \left(A_1 F_{11}\tau - \frac{A_1}{\rho_1}\right)\left(A_2F_{22}\tau - \frac{A_2}{\rho_2}\right) - A_1F_{12}A_2F_{21}\tau^2$$

Consideration of the geometry (Fig. A.0) allows the evaluation of the view factors as follows:

$F_{11} = 0$ (since Surface 1 cannot "see" itself)

$F_{12} = 1$ (since all radiation from Surface 1 must reach Surface 2, in the absence of an absorbing medium between the two surfaces)

However $A_1F_{12} = A_2F_{21}$

therefore $$F_{21} = \frac{A_1}{A_2} F_{12} = \frac{A_1}{A_2} \qquad (A.5)$$

Also: $$F_{22} + F_{21} = 1$$

therefore $$F_{22} = 1 - F_{21} = 1 - \frac{A_1}{A_2}$$

From the above relations the determinant is simplified:

$$DET = -\frac{A_1A_2\tau}{\rho_1}\left(1 - \frac{A_1}{A_2}\right) + \frac{A_1A_2}{\rho_1\rho_2} - A_1^2\tau^2 \qquad (A.6)$$

R_{12} can be found from the determinant formed by replacing the first column of the matrix with the right hand side of equations (A.2) and (A.3):

$$\begin{vmatrix} -A_2F_{21}\tau\epsilon_2 & A_2F_{21}\tau \\ -A_2F_{22}\tau\epsilon_2 & A_2F_{22}\tau - \frac{A_2}{\rho_2} \end{vmatrix}$$

$$DET = -A_2F_{21}\tau\epsilon_2\left(A_2F_{22}\tau - \frac{A_2}{\rho_2}\right) + A_2F_{21}A_2F_{22}\tau^2\epsilon_2$$

Substituting in the view factor values:

$$DET = -A_1\tau\varepsilon_2\left[(A_2 - A_1)\tau - \frac{A_2}{\rho_2}\right] + A_1(A_2 - A_1)\tau^2\varepsilon_2$$

$$= \frac{A_1A_2\tau\varepsilon_2}{\rho_2}$$

Therefore:

$$R_{21} = \frac{A_1A_2\tau\varepsilon_2/\rho_2}{-\frac{A_1A_2\tau}{\rho_1}\left(1 - \frac{A_1}{A_2}\right) + \frac{A_1A_2}{\rho_1\rho_2} - A_1^2\tau^2}$$

$$= \frac{A_1A_2\tau\varepsilon_2}{-\frac{A_1\tau\rho_2}{\rho_1}(A_2 - A_1) + \frac{A_1A_2}{\rho_1} - A_1^2\tau^2\rho_2}$$

Referring to equation (A.1), A_2F_{21} can be evaluated:

$$A_2F_{21} = R_{21}A_1\frac{\varepsilon_1}{(1-\varepsilon_1)}$$

$$= \frac{A_1\varepsilon_1\varepsilon_2\tau}{1 - \rho_2\tau + \tau\frac{A_1\rho_2}{A_2}(1 - \rho_1\tau)} \qquad (A.7)$$

In order to evaluate A_2F_{22}, R_{22} must be found. The second column of determinant (A.4) is replaced by the right side of equations (A.2) and (A.3), and the determinant so formed becomes:

$$\begin{aligned} DET &= A_2F_{22}\varepsilon_2\tau\,\frac{A_1}{\rho_1} + A_1^2F_{12}^2\varepsilon_2\tau^2 \\ &= (A_2 - A_1)\,\varepsilon_2\tau\,\frac{A_1}{\rho_1} + A_1^2\varepsilon_2\tau^2 \end{aligned}$$

$$R_{22} = \frac{(A_2 - A_1)\varepsilon_2\tau\,\dfrac{A_1}{\rho_1} + A_1^2\varepsilon_2\tau^2}{-\dfrac{A_1A_2\tau}{\rho_1}\left(1 - \dfrac{A_1}{A_2}\right) + \dfrac{A_1A_2}{\rho_1\rho_2} - A_2^2\tau^2}$$

$$A_2F_{22} = \frac{A_2\varepsilon_2}{1-\varepsilon_2}\,R_{22}$$

$$\frac{\varepsilon_2^2[\tau(A_2 - A_1) + A_1\tau^2\rho_1]}{1 - \rho_2\tau + \tau\,\dfrac{A_1}{A_2}\,\rho_2(1 - \rho_1\tau)} \qquad (A.8)$$

The above discussion indicates that out of the original emission from Surface 2, an amount (A_2F_{22}) is absorbed by Surface 2, and an amount (A_2F_{21}) is absorbed by Surface 1. Therefore the difference between these two amounts and the original emission must have been absorbed by the vapour layer:

i.e. $$A_2F_{2v} = A_2 (\varepsilon_2 - F_{22} - F_{21})$$

With this result, the net radiant heat flux away from Surface 2 can be evaluated, since it is the sum of the heat fluxes to the vapour and to the liquid core.

$$q_{2-v} = A_2F_{2v}\sigma(T_2^4 - T_v^4) \qquad (A.9)$$

$$q_{21} = A_2F_{21}\sigma(T_2^4 - T_1^4) \qquad (A.10)$$

where σ = Stefan-Boltzman constant

$= 5.669 \times 10^{-11}$ $kW \cdot m^{-2} \cdot K^{-4}$

A.3. Simplified Equations

Equations (A.7) and (A.8) are simplified when the emissivity of the liquid is unity (which is a reasonable approximation in this case). The void fraction can be used to relate the areas of Surfaces 1 and 2:

$$A_1 = A_2(1 - \alpha)^{\frac{1}{2}}$$

$$\frac{A_1}{A_2} = (1 - \alpha)^{\frac{1}{2}}$$

Therefore, equation (A.8) becomes:

$$A_2F_{22} = \frac{\varepsilon_2^2 \tau (A_2 - A_1)}{1 - \rho_2\tau + \tau\frac{A_1}{A_2}\rho_2}$$

$$= \frac{\varepsilon_2^2 \tau A_2 \left[1 - (1-\alpha)^{\frac{1}{2}}\right]}{1 + \rho_2\tau \left[(1-\alpha)^{\frac{1}{2}} - 1\right]} \qquad (A.11)$$

and equation (A.7) becomes:

$$A_2F_{21} = \frac{A_2(1-\alpha)^{\frac{1}{2}} \varepsilon_2\tau}{1+\rho_2\tau \left[(1-\alpha)^{\frac{1}{2}} - 1\right]} \qquad (A.12)$$

The net radiant heat flux from Surface 2 is then calculated from equations (A.9) and (A.10)

i.e. $$\frac{q}{A_2} = F_{2v}\, \sigma(T_2^4 - T_v^4) + F_{21}\, \sigma(T_2^4 - T_1^4) \qquad (A.13)$$

Fig. A.1 is a plot of this relation against quality at several wall temperatures. The gas temperature was arbitrarily set to the average value of the wall and saturation temperatures. The emissivity of the Inconel and the transmissivity of the water vapour (evaluated from the emissivity of the water vapour) were

calculated from empirical fits to existing data, as outlined in Sections A.4 and A.5. The void fraction was calculated as described under Section A.7.

A.4. Emissivity of Inconel

The emissivity of Inconel 600 (Surface 2) was obtained from general information published by the manufacturer. A line was fitted to the data as follows:

$$\varepsilon = 0.6275 + 0.000198*T$$

where T is °C

A.5. Emissivity of Water Vapour

The emissivity of the liquid core is close to unity and was assumed as such throughout the calculations. The emissivity of the vapour layer is a complex function of pressure, temperature and vapour volume size and shape. Since, the vapour layer cannot be considered optically thin in this experiment the vapour emissivity cannot be related simply to the Planck mean absorption coefficient, as other experimenters have done.

Instead, the gas emissivity must be obtained by interpolation from charts (Fig. A.2) which show the emissivity as a function of temperature, pressure and mean beam length.

The mean beam length is related to the thickness of the vapour layer but includes, to some extent, the fact that all of the radiation does not traverse exactly the same distance. A value recommended by Holman [19] is

$$L = 3.6 \frac{V}{A}$$

where L = mean beam length

V = volume of the gas

A = total surface area

This equation can be expressed in terms of vapour film thickness (δ) or void fraction (α)

$$L = 1.8\delta$$

$$L = 1.8R\,(1 - (1 - \alpha)^{\frac{1}{2}})$$

where R = tube radius

Given the void fraction (hence the mean beam length), pressure and gas temperature, the gas emissivity can be evaluated graphically from Fig. A.2.

The absorptivity of the gas can be evaluated from the emissivity using the following equation [19]:

$$\gamma(T_v, T_s PL) = \left(\frac{T_v}{T_s}\right)^{0.45} \varepsilon_v\left(T_s, PL\,\frac{T_s}{T_v}\right) \qquad (A.14)$$

where T_s is the surface temperature, and

T_v is the gas temperature

This equation states that if the absorptivity of the gas is to be evaluated (and hence the transmissivity) from the emissivity data, then the partial pressure beam length product (PL) must be multiplied by T_s/T_v and the resulting emissivity multiplied by $(T_v/T_s)^{0.45}$. The approximate reasoning behind this equation is that the gas emissivity depends upon the temperature of the gas, since it <u>is</u> the gas that is emitting. However, the gas absorptivity depends upon the radiation incident upon it and hence the wall temperature. These two interrelations can be combined theoretically to produce equation (A.14).

One further effect to be included in Eqn. (A.14) is the pressure broadening of spectral lines which tends to increase the gas absorptivity as the pressure is increased. An empirical correction factor C_w has been evaluated as a function of pressure and the pressure-beam length product $(PL)_s$. This value was determined by extrapolating from a graph in reference [19].

The absorptivity of the water vapour can now be evaluated by determining the vapour emissivity (ε_v) at T_s and $PL(T_s/T_v)$ and then multiplying the result by $(T_v/T_s)^{0.45}$. A further multiplication of this result by C_w evaluated at PL results in the gas absorptivity. The transmissivity of the vapour is simply: $\tau = 1 - \gamma$.

A.6. Empirical Correlation of Emissivity

To facilitate computer calculations, the graphical form of gas emissivity as a function of temperature and pressure-beam length, was converted into an empirical correlation. Hottel [20] outlines a method to obtain a "fit" to the emissivity data. The general approach of his method was applied using a "one-clear, two-gray gas model".

An equation of the following form was fitted to the data:

$$\varepsilon_v = \underbrace{A_1(1-e^{-0PL})}_{\text{clear gas}} + \underbrace{A_2(1-e^{-K_1PL})}_{\text{gray gas}} + \underbrace{A_3(1-e^{-K_2PL})}_{\text{gray gas}}$$

After considerable effort the following equation resulted:

$$\varepsilon_v = 2.1139e^{-0.7189T}(0.3270 - 0.2749e^{-0.8494PL}) - 0.0521e^{0.001831T}e^{-.8949PL} \qquad (A.15)$$

where T is in °Rankine/1000

PL is pressure-beam length product in ATM-FT

Fig. A.3 shows a comparison between the empirical correlation above and data interpolated from Fig. A.2.

The pressure broadening correction factor C_w was also fitted as a function of PL:

$$C_w = 1.443 - 0.098C_1 = 0.0386C_1^2$$

where $C_1 = 1.603PL - 2.01.$

A.7. Void Fraction

The void fraction was calculated from the following:

$$\alpha = \frac{X}{\left(X + \frac{\rho_g}{\rho_\ell}(1-X)K\right)} \qquad (A.16)$$

The slip ratio (K) was determined by comparing the prediction of the equation to that of Fung's equation [12], at atmospheric pressure, which suggested that a value of 8.0 most closely matched his data. The slip ratio was then allowed to vary with pressure, as follows, which approximately accounts for the pressure dependence in adiabatic flow [2]:

$$K = \frac{8.0}{4.36}\left(\frac{\rho_\ell}{\rho_g}\right)^{0.2} \qquad (A.17)$$

All of the void fraction calculations in this report used the saturation value for ρ_g. It could be argued that the ρ_g in the denominator of the void fraction equation should be evaluated at the vapour film temperature.

APPENDIX B

HEAT BALANCE AND ZERO POWER DATA

B.1. Zero Power Runs

The heat loss from the test section was evaluated from the inlet and the outlet temperatures as follows:

$$\text{HEAT LOSS} = (h(TIN) - h(TOUT))*W$$

where h is the liquid enthalpy evaluated at the outlet pressure and the inlet or outlet temperature.

W is the mass flow rate in kg/s

Fig. B.1 shows the results of two such zero power runs plotted as heat loss versus temperature difference between the test section and the surroundings. The data show a distinct curvature, which is a result of the rather rapid increase in the test section temperature, without allowing sufficient time for the heat loss paths to come to equilibrium. At the highest temperatures the data "turnaround" and the heat loss appear to decrease. These data were taken when the test section temperature

was decreasing, consequently they show less heat loss because, again, insufficient time was allowed for the heat loss paths to equilibrate. It is therefore reasonable to draw a straight line between these high and low heat losses to indicate the equilibrium heat loss, i.e., the heat loss that would have been measured if the test section temperature had been increased very slowly. The equation of this line gives the heat loss as a function of the temperature difference between the test section and the surroundings:

HEAT LOSS = 4.66E-03*(TEST SECTION AVERAGE TEMPERATURE - AMBIENT TEMPERATURE) (B.1)

This heat loss can be attributed principally to losses from the test section power cables. Since the loss will be divided approximately equally between the two power cables, the inlet quality (subcooling) can be corrected for the loss at the lower power clamp. This assumes that the heat loss from the remainder of the test section through the insulation is negligible. The actual liquid enthalpy downstream of the lower power clamp is less than that calculated from the inlet temperature and heat addition from the test section power, by an amount equal to

half of the loss calculated above. This can be effectively included in the calculations by redefining the inlet enthalpy to include this loss:

$$\text{i.e., } h(IN) = h(TIN) - (\text{HEAT LOSS})/2 \qquad (B.2)$$

where HEAT LOSS is evaluated using the test section inlet temperature in equation (B.1).

B.2. Heat Balance Runs

Fig. B.2 shows the heat loss plotted as a function of test section power. Fig. B.3 shows the same data corrected for the heat losses at the lower and upper power clamps. Equation (B.2) was evaluated both at the inlet and the outlet temperatures and the heat loss so evaluated was subtracted from the electrical power. From Fig. B.3 it can be seen that this correction effectively accounts for the heat balance loss.

APPENDIX C

EVALUATION OF THE INSIDE WALL TEMPERATURE

The inside wall temperature was evaluated from the measured outside wall temperature by calculating the temperature drop across the tube wall. The general equation for the inside wall temperature, assuming no heat-loss outwards through the insulation (perfect insulation), is given below [25]:

$$T_{inside} = T_{outside} - \frac{Q}{2\pi \cdot L \cdot k}\left[\frac{r_o^2 \log \frac{r_o}{r_i}}{r_o^2 - r_i^2} - 1/2\right]$$

where Q = total power generated (kW)

r_o = outside radius of the tube (m)

$= 5.5626 \times 10^{-3}$

r_i = inside radius of the tube (m)

$= 4.464 \times 10^{-3}$

k = thermal conductivity of the tube evaluated at the wall temperature ($kW.m^{-1}.°C^{-1}$)

L = heated length = 1.97 m.

The thermal conductivity of Inconel 600 as a function of temperature was evaluated from the manufacturer's data. A fit to this data is given below.

$$X = 2.614 \times 10^{-3} \times T_{wall} - 2.183$$

$$k = 2.127 \times 10^{-2} + 3.524 \times 10^{-3} X + 1.428 \times 10^{-4} X^2$$

k is in $kW \cdot m^{-1} \cdot {}^{\circ}C^{-1}$.

APPENDIX D

DATA TABLES

D.1. Wall Temperature

Table D.1 contains a complete list of all of the data obtained in this study. Each line in the table represents one computer scan of the instrument signals. Associated with each computer scan is a run number which specifies the nominal conditions of each run. The digits in the run number have the following meanings:

Run number = IJKL

I	Pressure	J	Flow Rate	K	Inlet Subcooling
		1	27 kg/h	1	50 kJ/kg
2	2 MPa	2	48.5	2	100
3	3	3	81.0	3	182
4	4	4	118.0	4	255
5	5	5	208.8		
6	6	6	---		
7	7	7	620.0		
8	8				
9	9				

L	Run Type
1	film boiling
7	zero power runs
9	heat balance runs

The temperatures (1 to 20) listed in the table are the measured outside wall temperatures. The inside wall temperatures can be calculated from the formula of Appendix C. The location of each thermocouple reading can be determined from Fig. 3.2 where the thermocouple numbers listed up the centre of the figure correspond to the column headings of Table D.1.

It should be noted that the test section power does not include the hot patch power. Therefore the total enthalpy rise of the fluid from the inlet to the outlet must be calculated from the sum of these two powers.

Thermocouples 3 and 14 were connected to test section power trip instruments. As a result of this additional loading, these temperature measurements may be somewhat in error. Thermocouple number 5 failed before the experiment began, consequently it does not appear in the table.

Since pairs of thermocouples read essentially the same temperature, the plots of Section 6 were generated from only nine of the thermocouples (2, 4, 6, 8, 10, 11, 13, 16, 18). Neither thermocouple 19 or 20 were included in the plots since these temperatures were strongly affected by axial conduction from the hot patch.

D.2. Minimum Film Boiling Data

Table D.2 lists the minimum film boiling results. Each line shows the last computer scan taken before the test section quenched. The last four columns of the table indicate the conditions at the point when the test section quenched, since a computer scan was not in general taken immediately before the test section quenched. These columns have the following meanings:

MINF TEMP — This is the temperature of the test section at the quench point, immediately before it quenched. This value was interpolated from the analogue temperature-time charts.

MINF POWER — This value is the test section power when the quench occurred. This value may differ from the T/S power (Column 7) since in some cases the power was reduced and the test quenched before another computer scan was taken.

MINF QUAL — This value is the local quality at the quench point.

T/C # — This value is the number of the thermocouple which quenched first. From this number the location of the quench can be determined by referring to the thermocouple numbers shown on Fig. 3.2.

BIBLIOGRAPHY

1. M.M. Abu-Romia and C.L. Tien, "Appropriate Mean Absorption Coefficients for Infrared Radiation of Gases," Journal of Heat Transfer, 321-327, 1967.

2. S.Y. Ahmad, "Axial Distribution of Bulk Temperature and Void Fraction in a Heated Channel with Inlet Subcooling," Journal of Heat Transfer, 595-609, Nov. 1970.

3. R.L. Anderson and T.G. Kollie, "Accuracy of Small Diameter Sheathed Thermocouples for the Core Flow Test Loop," ORNL-5401.

4. P.J. Berenson, "Film Boiling Heat Transfer from a Horizontal Surface," Journal of Heat Transfer, 351-358, Aug. 1961.

5. L.A. Bromley, "Heat Transfer in Stable Film Boiling," Chemical Engineering Progress, Vol. 46, 221-227, 1950.

6. J.J. Carbajo, "A Study on the Rewetting Temperature," submitted for publication to the International Journal of Heat Transfer, Mar. 1980.

7. K.C. Chan and G. Yadigaroglu, "Calculations of Film Boiling Heat Transfer Above the Quench Front During Reflooding," from ASME publication "Experimental and Analytical Modelling of LWR Safety Experiment," HTD-Vol. 7, 1980.

8. J.G. Collier, Convective Boiling and Condensation, McGraw-Hill Book Company, Oxford, 1972.

9. J.T. Davies, Turbulent Phenomena, Academic Press, New York, 1972.

10. R.S. Dougall and W.M. Rohsenow, "Film Boiling on the Inside of Vertical Tubes with Upward Flow of the Fluid at Low Qualities," Massachusetts Institute of Technology Report No. 9079-26, 1963.

11. E.R.G. Eckert and R.M. Drake, Heat and Mass Transfer, McGraw-Hill Book Company, New York, 1959.

12. K.K. Fung and D.C. Groeneveld, "Empirical Correlation of Film Boiling Data," Quarterly report to the United States Nuclear Regulatory Commission, Oct. 1979.

13. D.C. Groeneveld and G.G.J. Delorme, "Prediction of Thermal Non-Equilibrium in the Post-Dryout Regime," Nuclear Engineering and Design, Vol. 36, 17-26, 1976.

14. D.C. Groeneveld and S.R.M. Gardiner, "Post-CHF Heat Transfer Under Forced Convective Conditions," AECL-5883, 1977.

15. D.C. Groeneveld, "The Thermal Behaviour of a Heated Surface at and Beyond Dryout," AECL-4309, 1972.

16. D.C. Groeneveld and S.R.M. Gardiner, "A Method of Obtaining Flow Film Boiling Data for Subcooled Water," International Journal of Heat and Mass Transfer, Vol. 21, 664-665, 1978.

17. D.C. Groeneveld, S.C. Cheng and K.K. Fung, "Progress in Low Quality and Subcooled Post-CHF Studies," paper presented at the USNRC's Seventh Water Reactor Safety Research Information Meeting, Gaithersburg, Nov. 5-9, 1979.

18. R.E. Henry, "A Correlation for the Minimum Film Boiling Temperature," Heat Transfer - Research and Design, AIChE Symposium Series, Vol. 70, No. 138, 82-90, 1974.

19. J.P. Holman, Heat Transfer, McGraw-Hill Book Company, New York, 1976.

20. H.C. Hottel and A.F. Sarofim, Radiative Transfer, McGraw-Hill Book Company, New York, 1967.

21. Y.Y. Hsu and R.W. Graham, Transport Processes in Boiling and Two Phase Systems, Hemisphere Publishing Corporation, Washington, 1976.

22. Y.Y. Hsu and J.W. Westwater, "Approximate Theory for Film Boiling on Vertical Surfaces," Heat Transfer-Storrs, Chemical Engineering Progress Symposium Series No. 30, Vol. 56, 1958.

23. J.M. Kay, An Introduction to Fluid Mechanics and Heat Transfer, Cambridge University Press, 1963.

24. L. Manson, "A Periodic Nonuniform Heat Transfer Mechanism in Film Boiling," Journal of Heat Transfer, 111-112, Feb. 1967.

25. W.H. McAdams, Heat Transmission, McGraw-Hill Book Company, New York, 1954.

26. S.M. Nijhawan, J.C. Chen and R.K. Sunderham, "Parametric Effects on Vapour Non-Equilibrium in Post Dryout Heat Transfer," ASME 80-WA/HT-50, 1981.

27. D.D. Pollock, "The Theory and Properties of Thermocouple Elements," ASTM Special Technical Publication 492, 1971.

28. H. Rouse, Fluid Mechanics for Hydraulic Engineers, McGraw-Hill Book Company, New York, 1938.

29. D.C. Sherman "Natural Convection Film Boiling on a Vertical Surface," California Institute of Technology, Pasadena, California, Report No. E200.2, 1980.

30. E.M. Sparrow and R.D. Cess, Radiation Heat Transfer, Brooks/Cole Publishing Company, Belmont, California, 1970.

31. S.W. Yuan, Foundations in Fluid Mechanics, Prentice-Hall Inc., New Jersey, 1967.

32. P.J. Schneider, Conduction Heat Transfer, Addison-Wesley Publishing Company, London, 1979.

33. K.K. Fung, private communication.

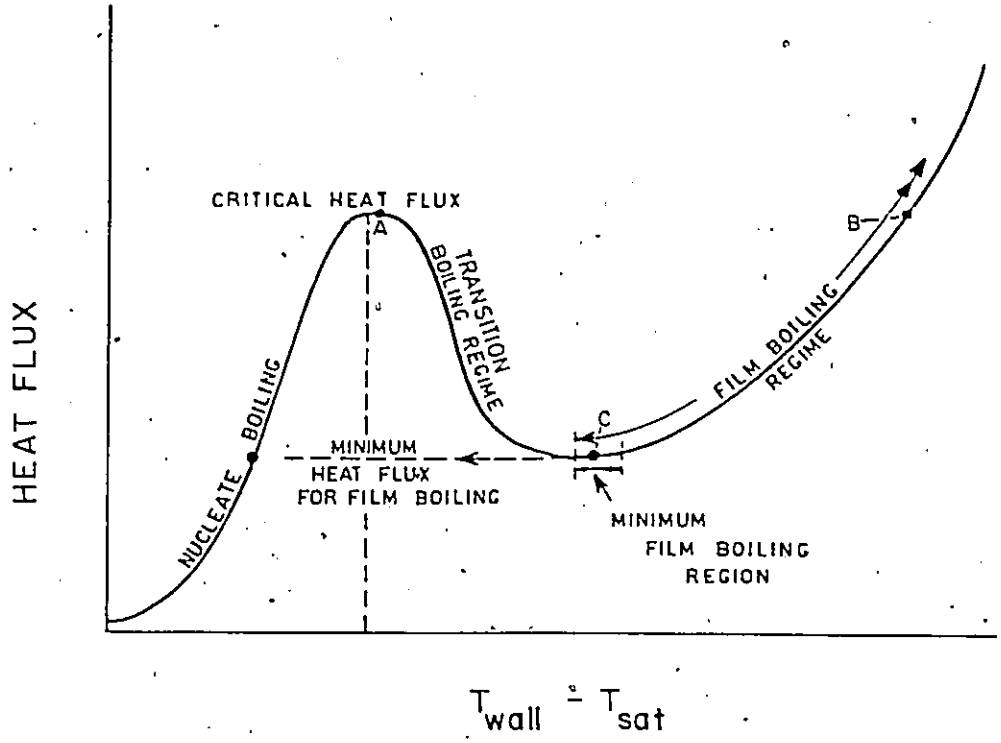


FIGURE 1.1: BOILING CURVE.

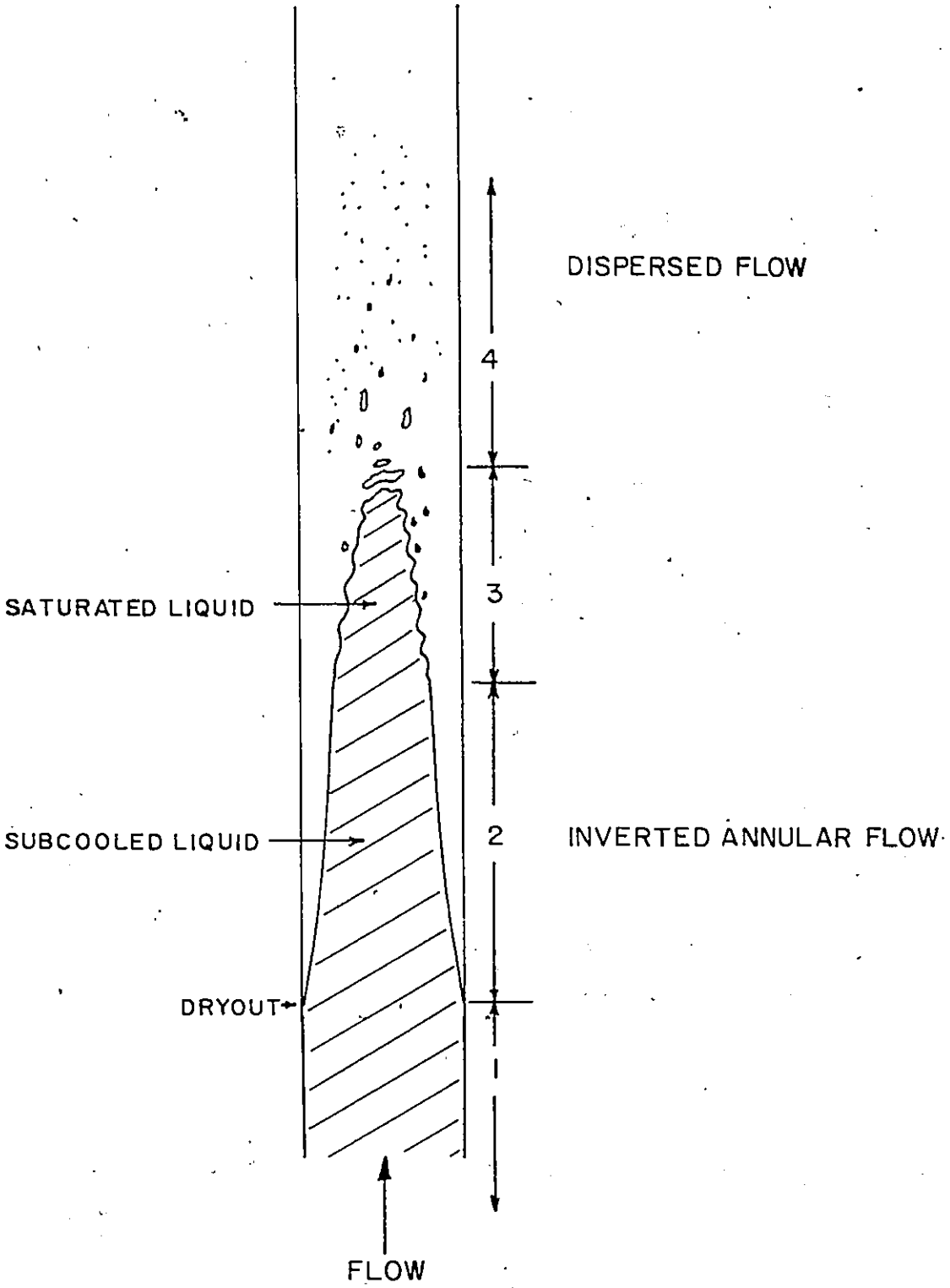


FIGURE 2.1.0: FILM BOILING FLOW REGIMES

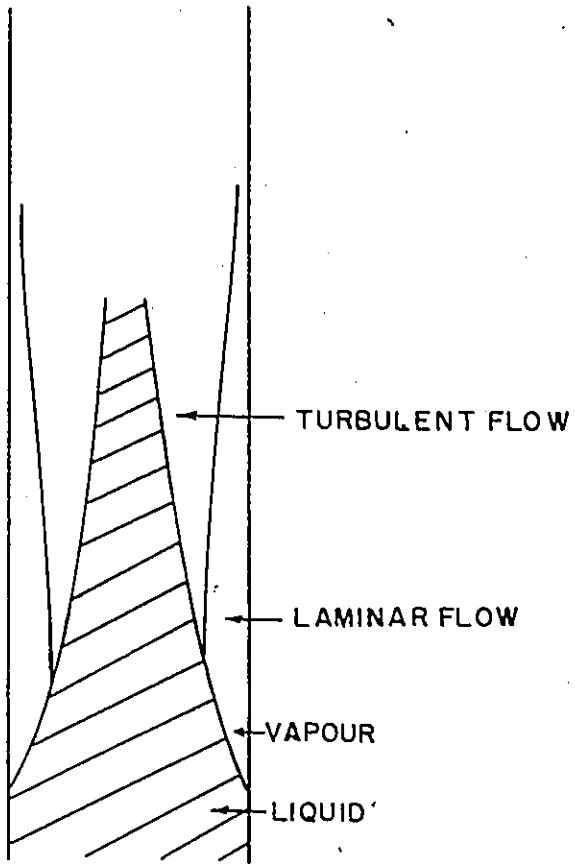


FIGURE 2.1.1: LAMINAR AND TURBULENT REGIONS IN INVERTED ANNULAR FLOW FILM BOILING.

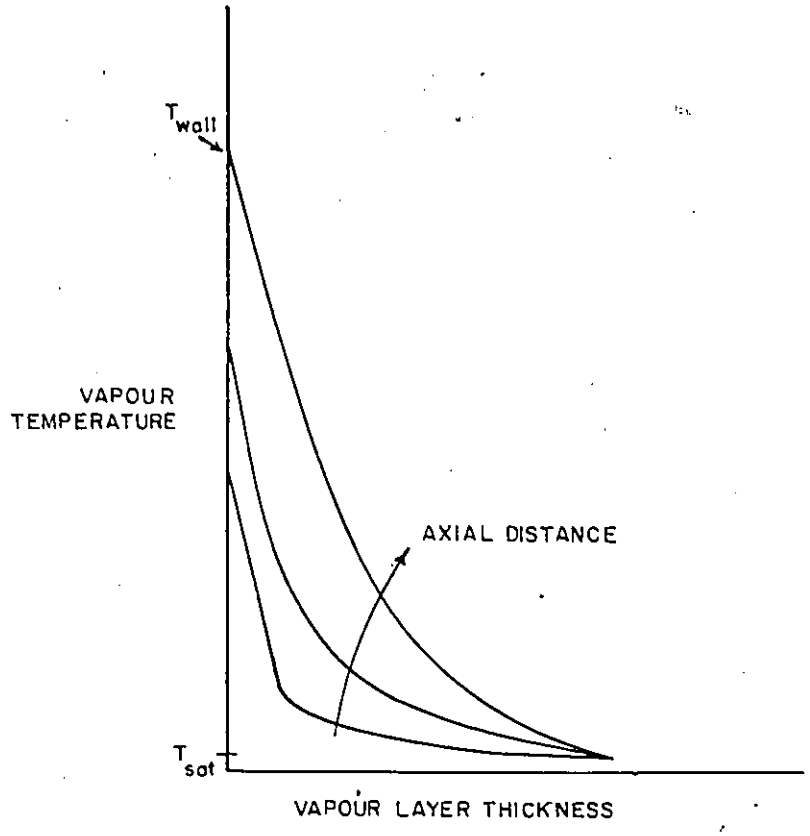


FIGURE 2.1.2: VAPOUR TEMPERATURE PROFILE IN LAMINAR, INVERTED ANNULAR FLOW FILM BOILING.

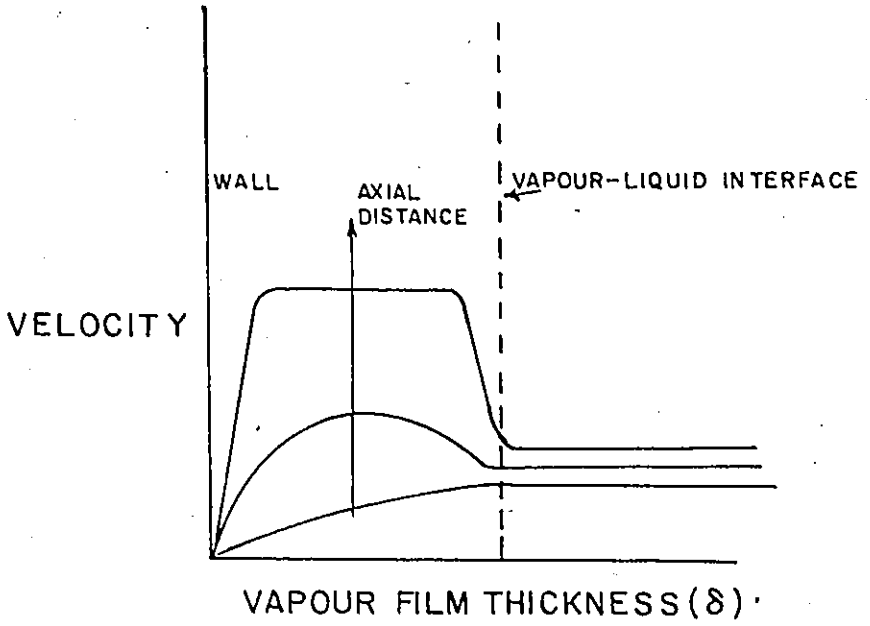


FIGURE2.1.3: DEVELOPING VELOCITY PROFILES IN INVERTED ANNULAR FLOW FILM BOILING.

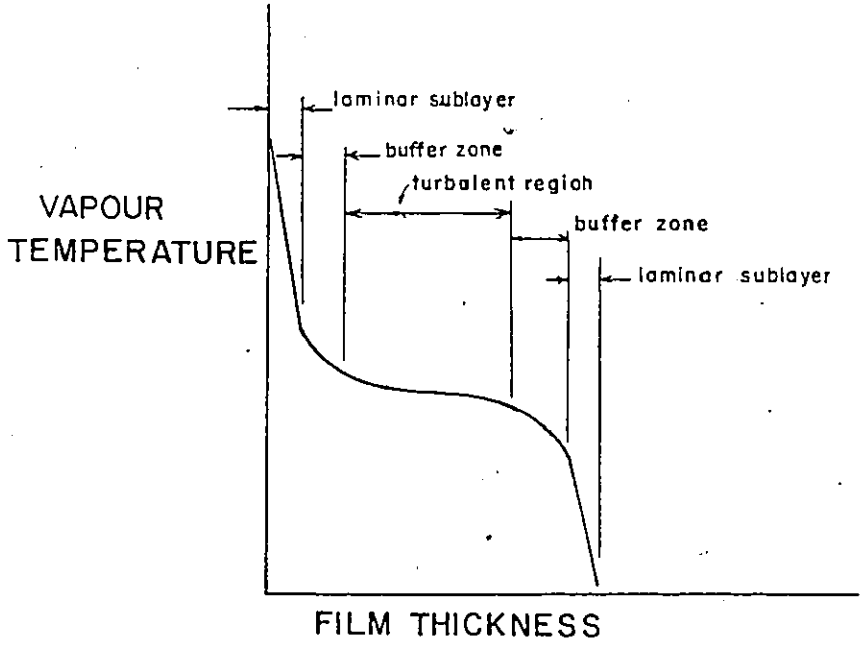


FIGURE 2.1.4: TEMPERATURE PROFILE ACROSS THE VAPOUR LAYER WHEN THE BULK OF THE VAPOUR FLOW IS TURBULENT.

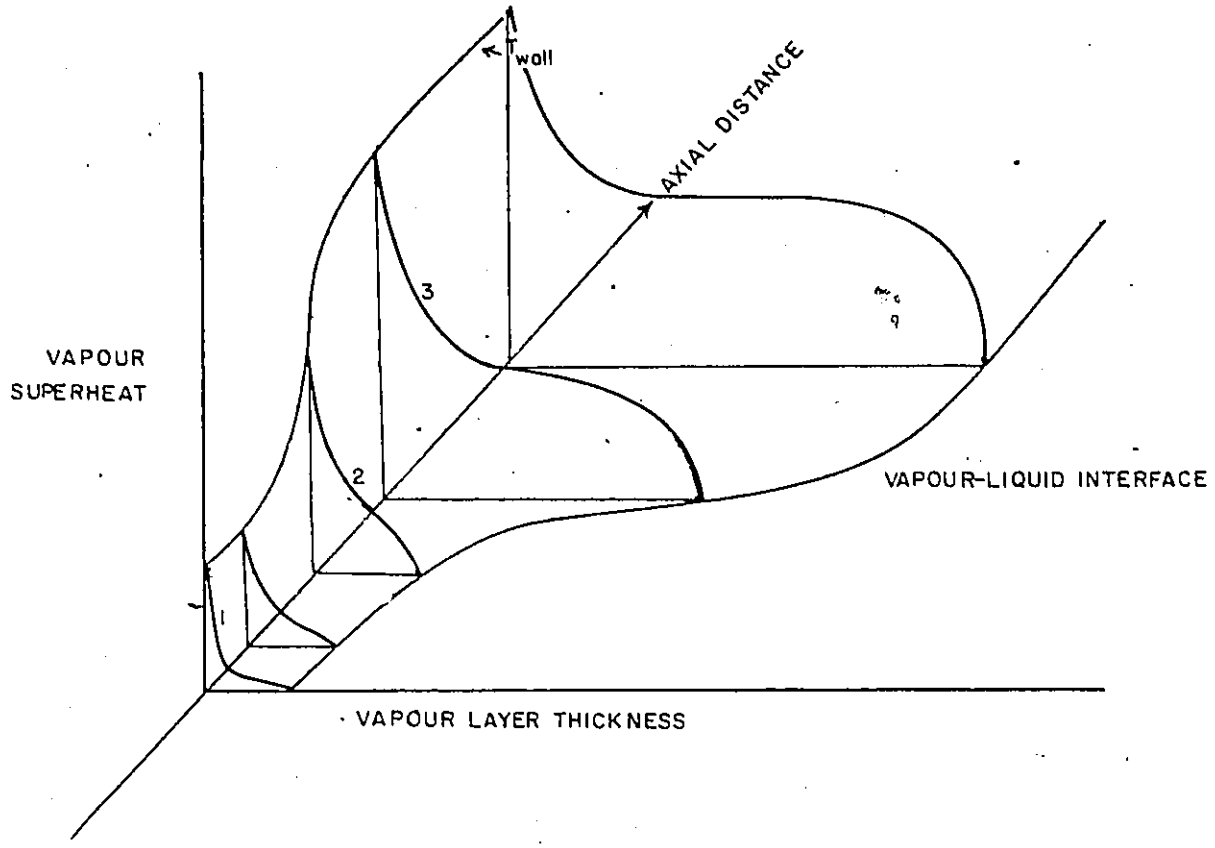


FIGURE 2.1.5: VAPOUR TEMPERATURE AND VAPOUR LAYER THICKNESS AS A FUNCTION OF AXIAL DISTANCE (QUALITY).

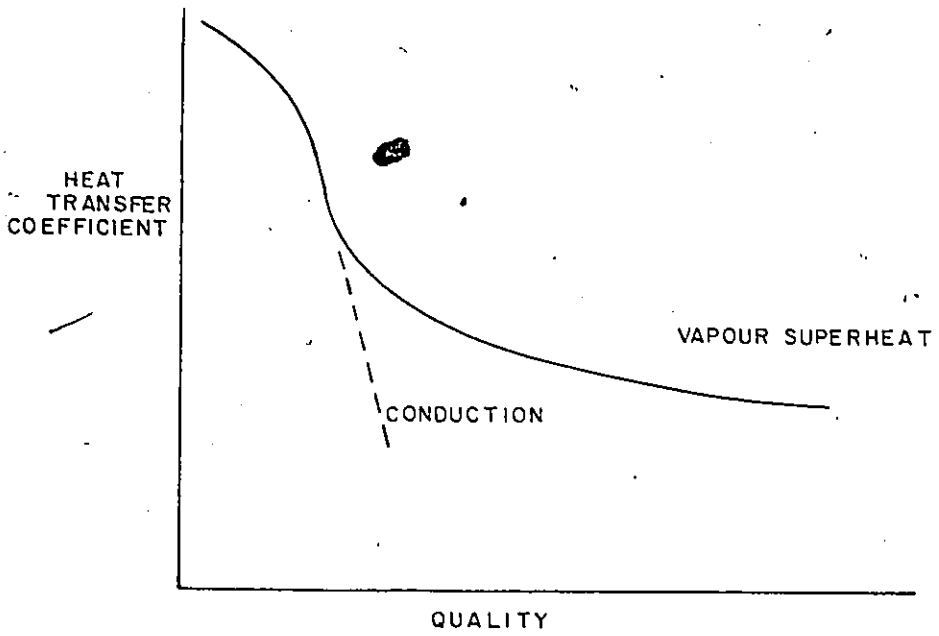


FIGURE 2.1.6: THE HEAT TRANSFER COEFFICIENT BASED ON THE WALL TEMPERATURES SHOWN IN FIGURE 2.1.5.

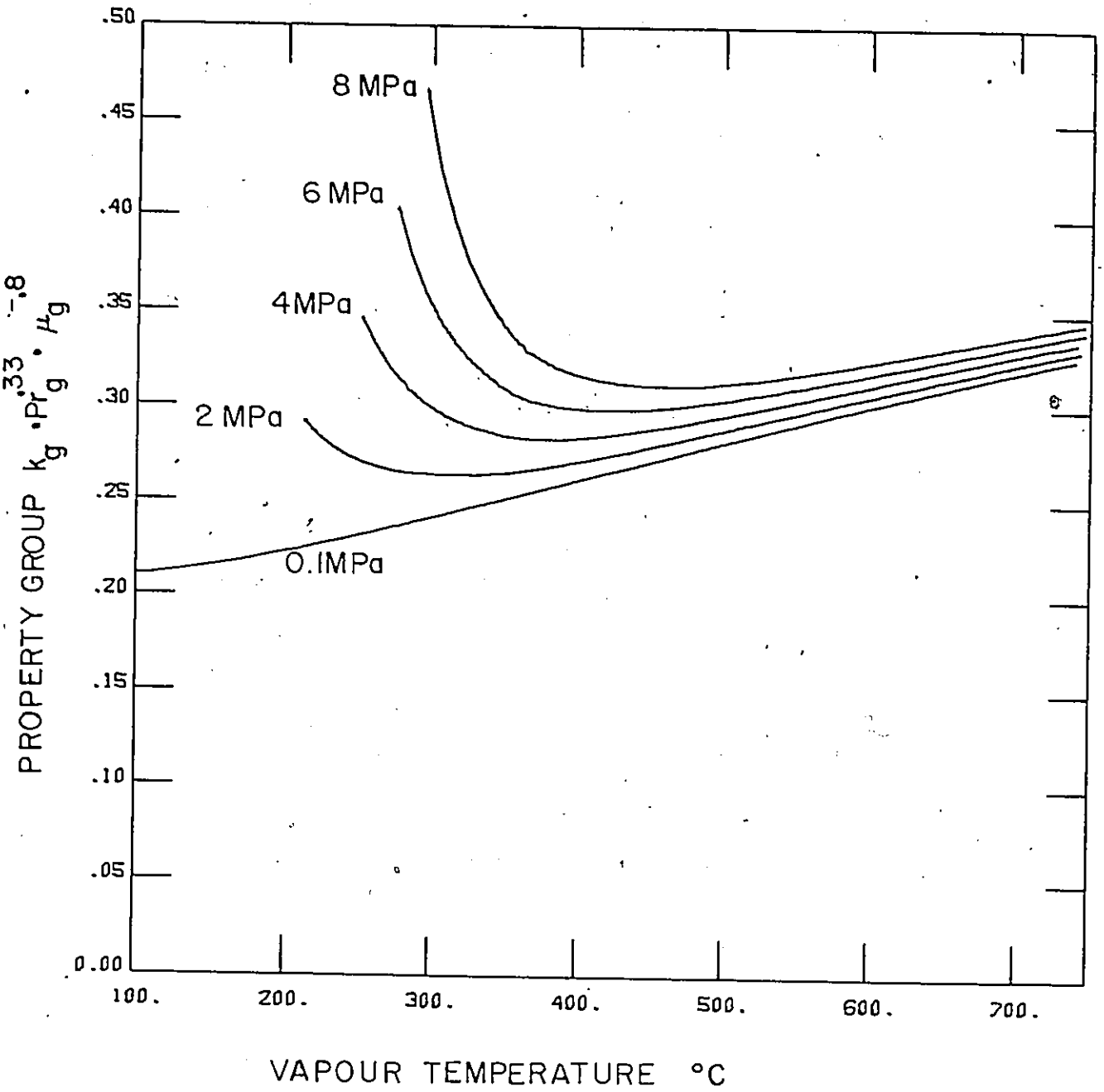


FIGURE 2.2.1: THE PROPERTY GROUP AS A FUNCTION OF TEMPERATURE AT DIFFERENT PRESSURES.

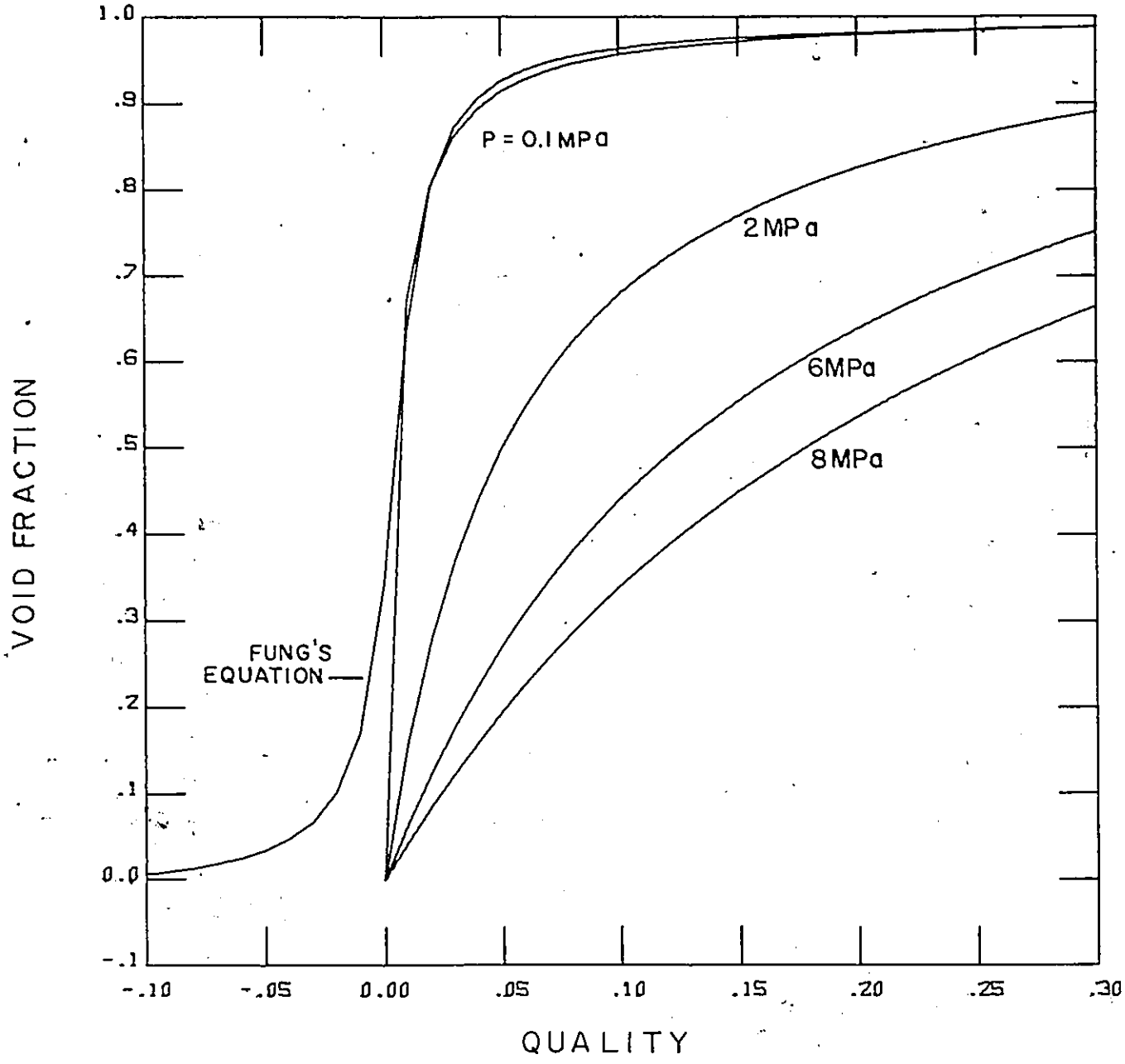


FIGURE 2.2.2: VOID FRACTION EQUATION 2.4 AS A FUNCTION OF QUALITY FOR DIFFERENT PRESSURES.

Fung's equation:

$$\alpha = 0.4871 + \frac{2}{\pi}(1 - 0.4871)\tan^{-1}\left(96.776\ (X - 0.004899)\right)$$

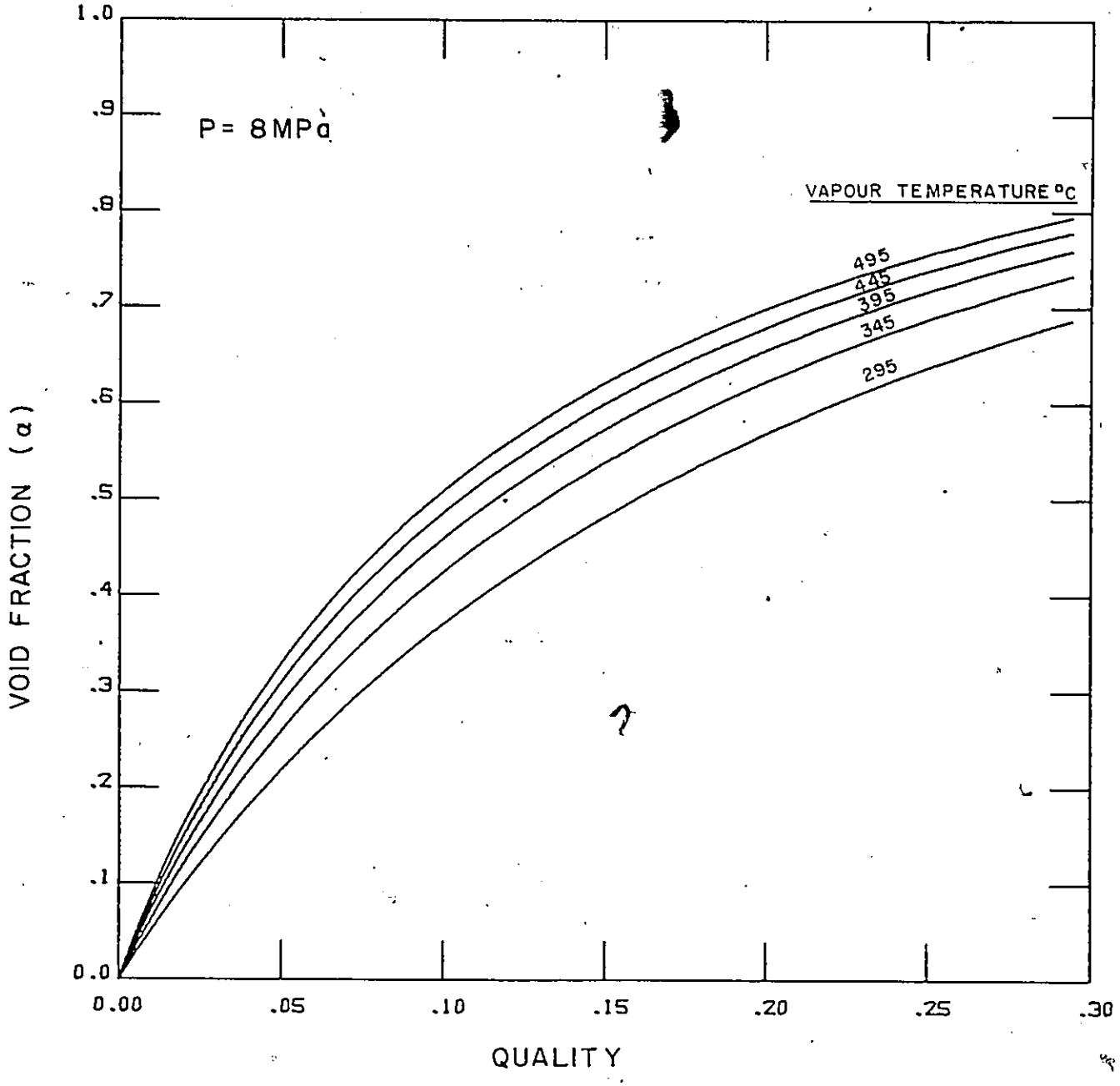


FIGURE 2.2.3 VOID FRACTION EQUATION 2.4 EVALUATED AT 8 MPA AS A FUNCTION OF QUALITY FOR DIFFERENT VAPOUR TEMPERATURES.

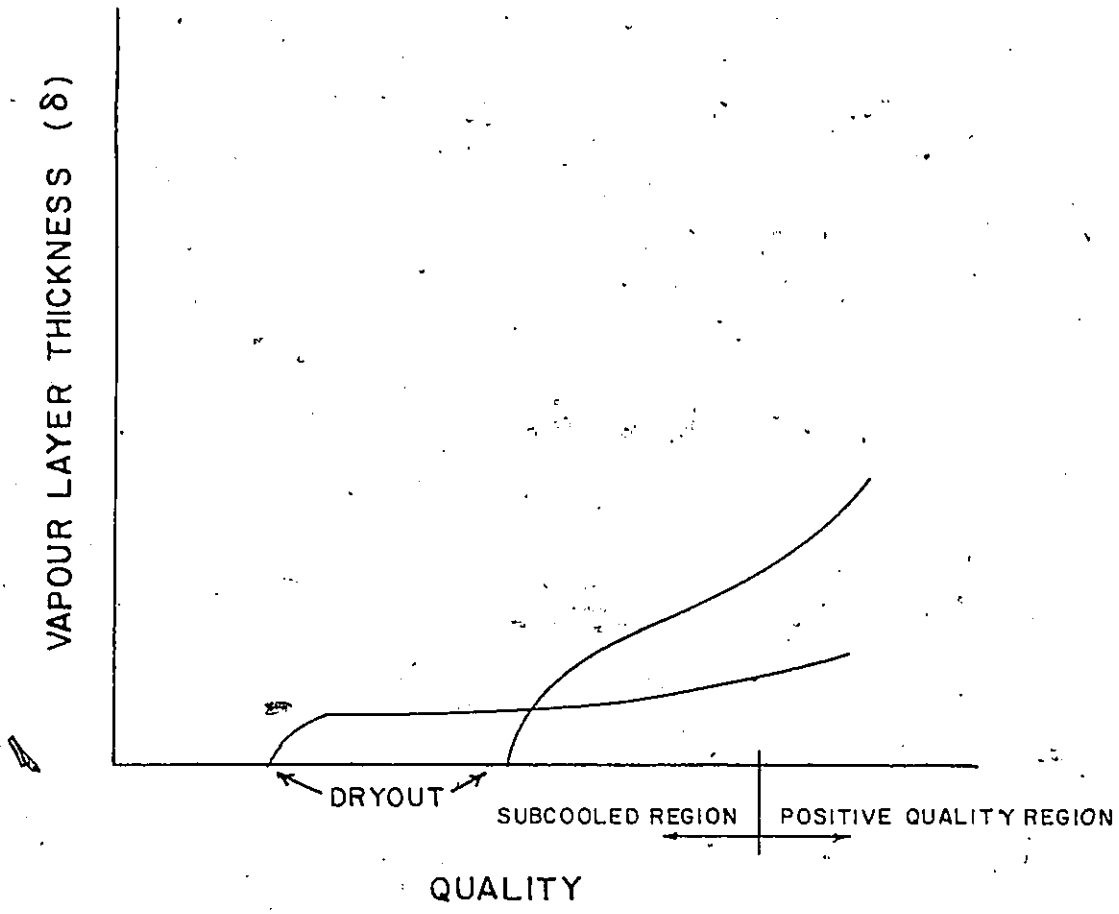


FIGURE 2.2.4: THE EXPECTED VARIATION IN THE VAPOUR LAYER THICKNESS WITH QUALITY (AXIAL POSITION) FOR DIFFERENT QUALITIES (SUBCOOLINGS) AT THE DRYOUT POINT.

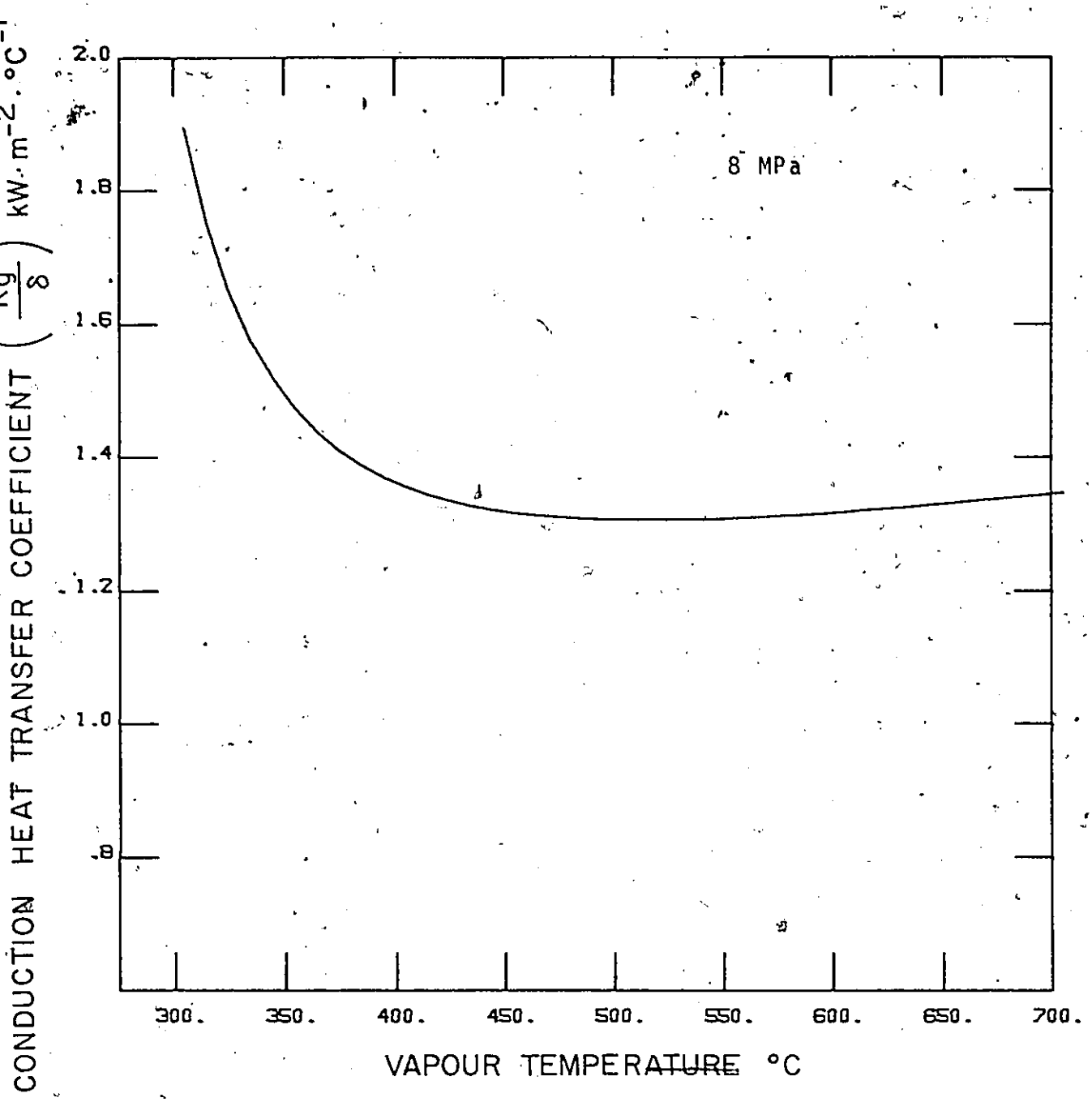


FIGURE 2.2.5: CONDUCTION HEAT TRANSFER COEFFICIENT (EQUATION 2.6) AS A FUNCTION OF VAPOUR TEMPERATURE AT 8 MPA.

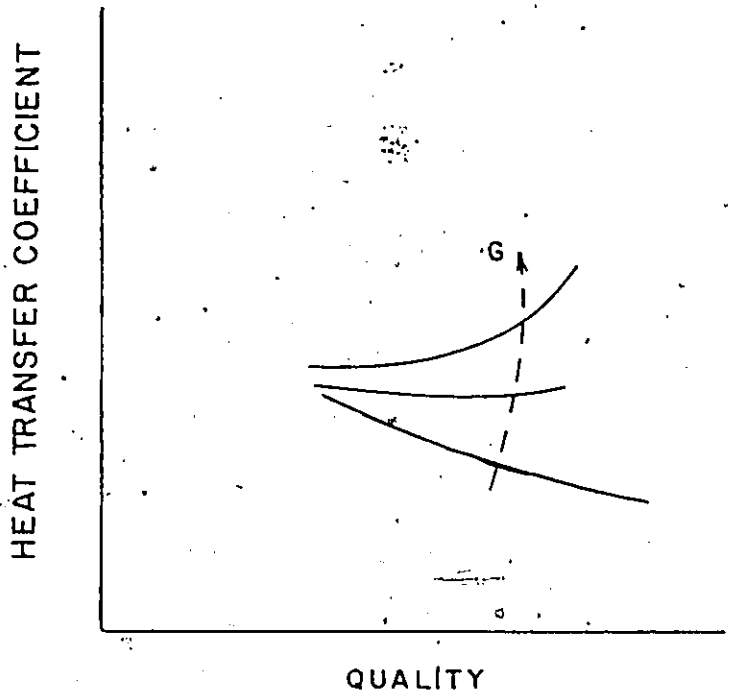


figure 2.2.6

FIGURE 2.2.6: THE EFFECT OF MASS FLUX ON THE HEAT TRANSFER COEFFICIENT.

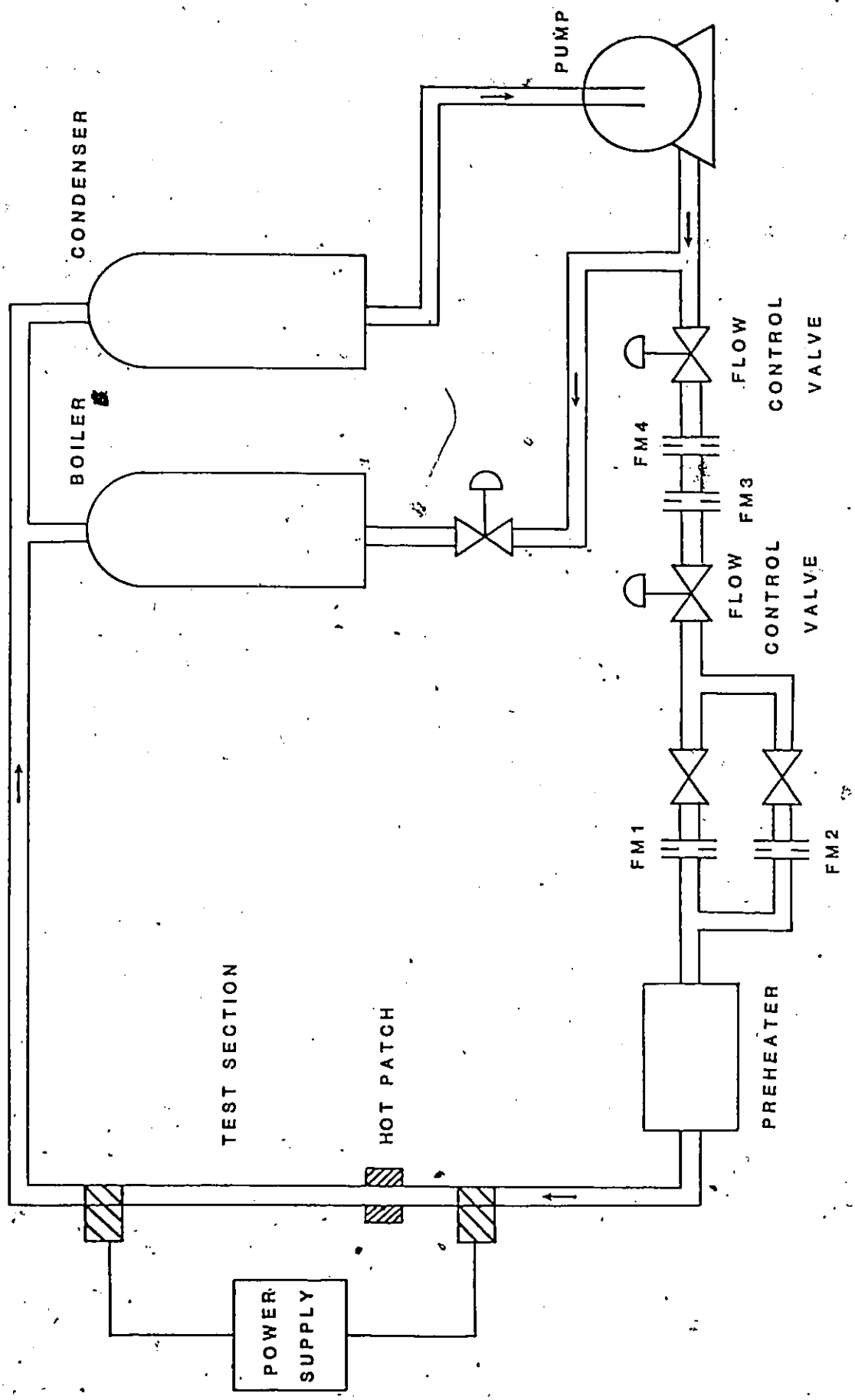


FIGURE 3.1: MR-1 FLARE LOOP FLOW DIAGRAM.

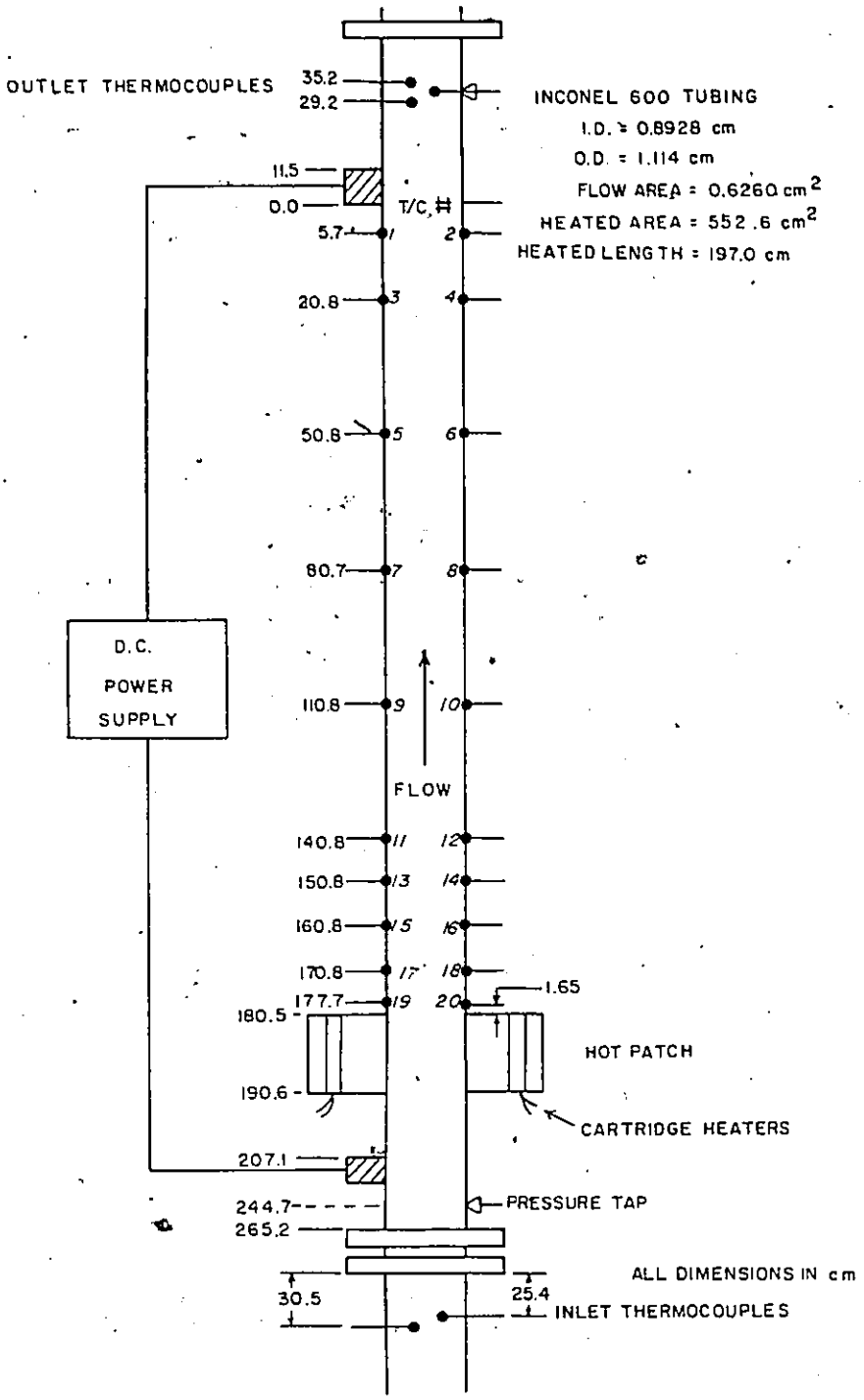


FIGURE 3.2: TEST SECTION INSTRUMENTATION.

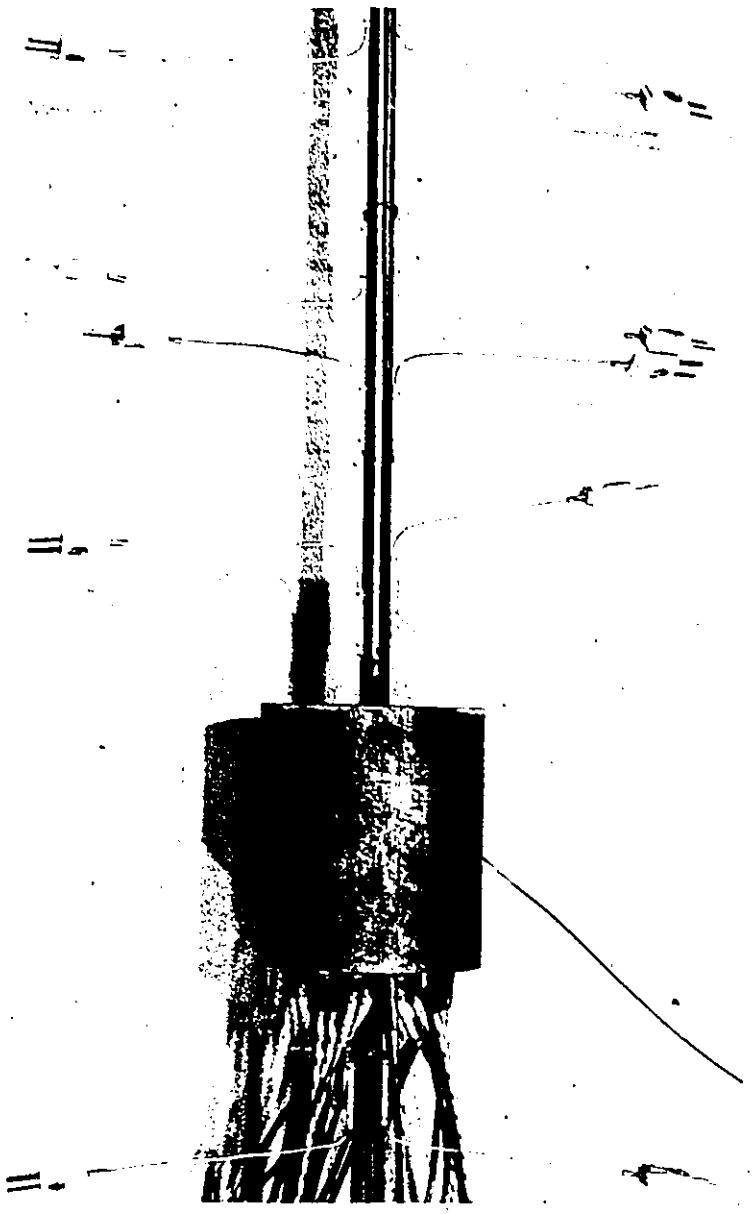


FIGURE 3.3: HOT PATCH AND TEST SECTION SHOWING THE DETAILS OF THE THERMOCOUPLE CONNECTIONS TO THE TEST SECTION.

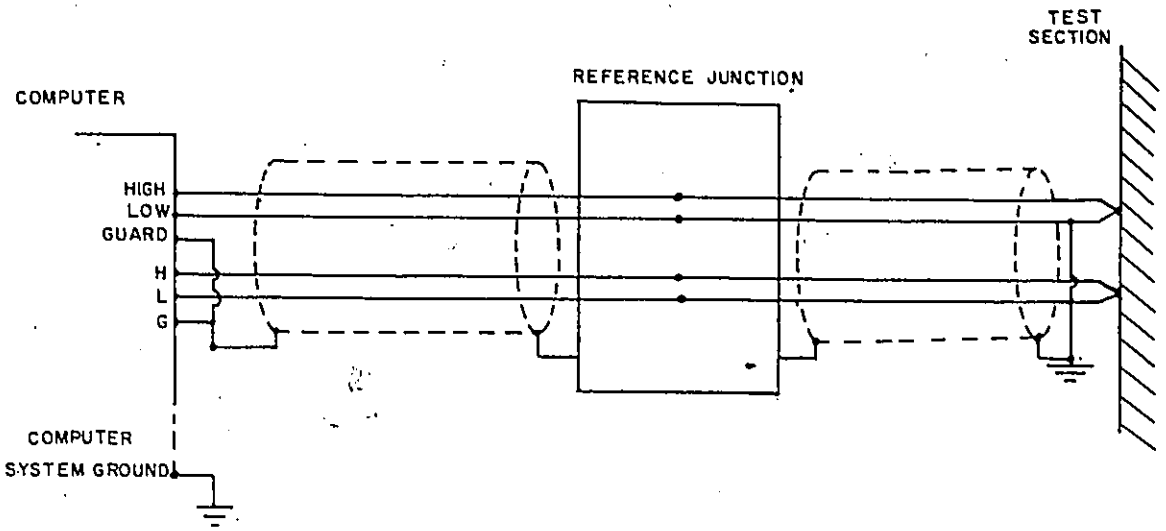


FIGURE 3.4: THERMOCOUPLE WIRING SCHEMATIC

FIGURE 3.5: INSULATED TEST SECTION SHOWING THE THERMOCOUPLE WIRING AND THE TEST SECTION POWER SUPPLY CABLES (TOP AND BOTTOM)

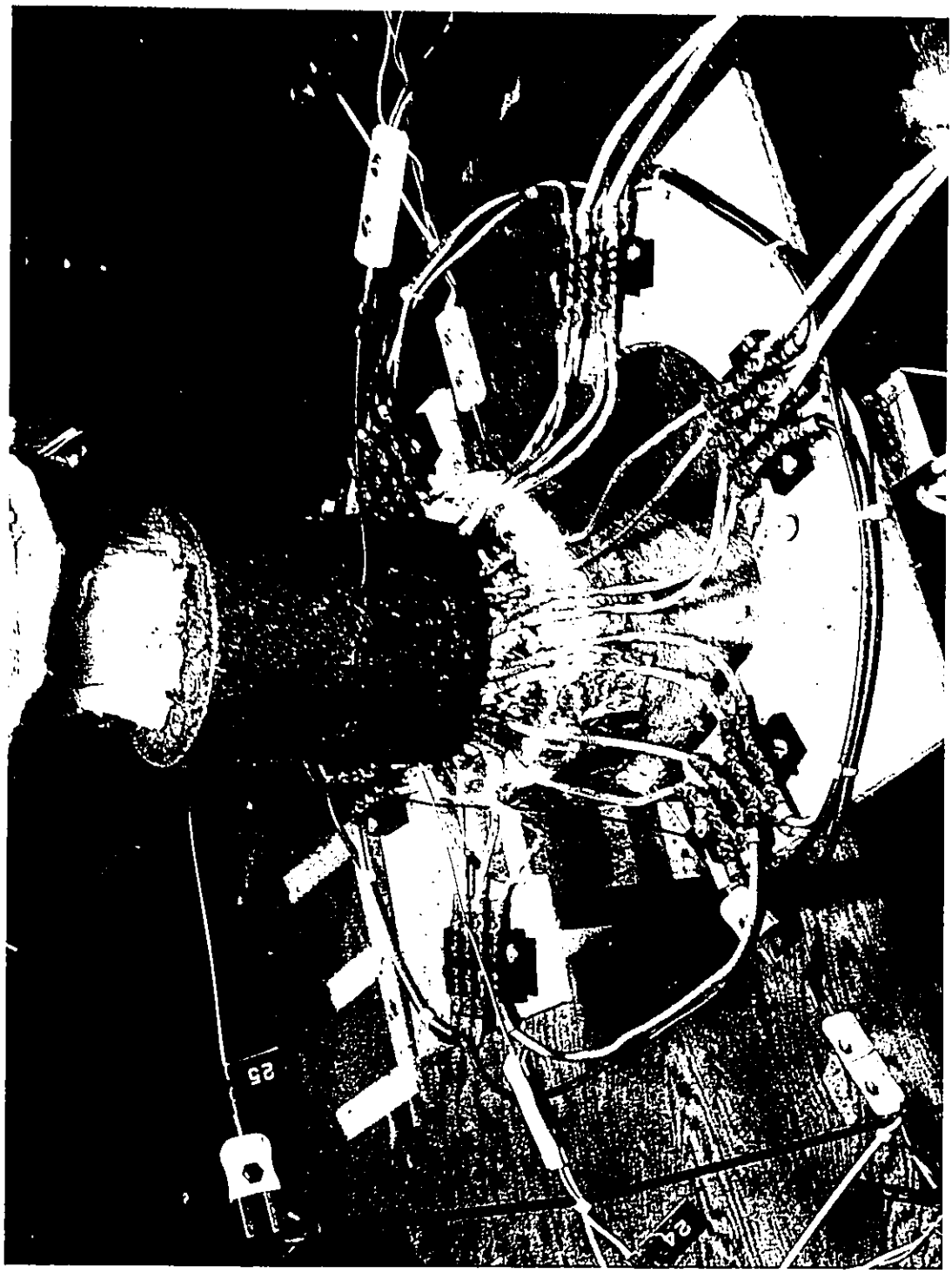


FIGURE 3.6: HOT PATCH WITH THE INSULATION REMOVED SHOWING THE POWER CONNECTIONS TO THE CARTRIDGE HEATERS.

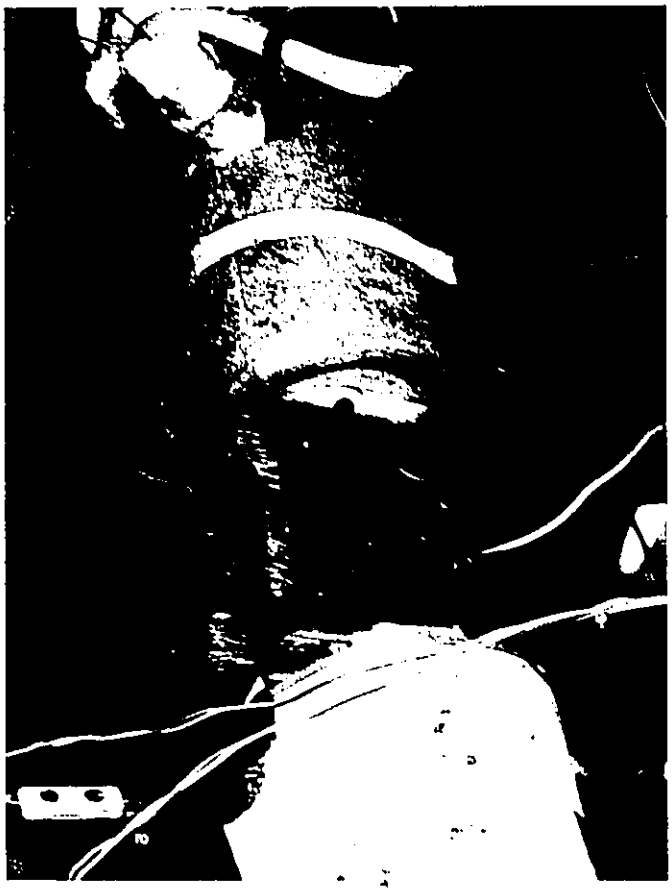


FIGURE 3.7: TEST SECTION POWER SUPPLY CONNECTION. THE TWO NICKEL PLATED COPPER PLATES CAN BE SEEN SANDWICHED BETWEEN THE POWER SUPPLY CABLE TERMINATION PLATES.

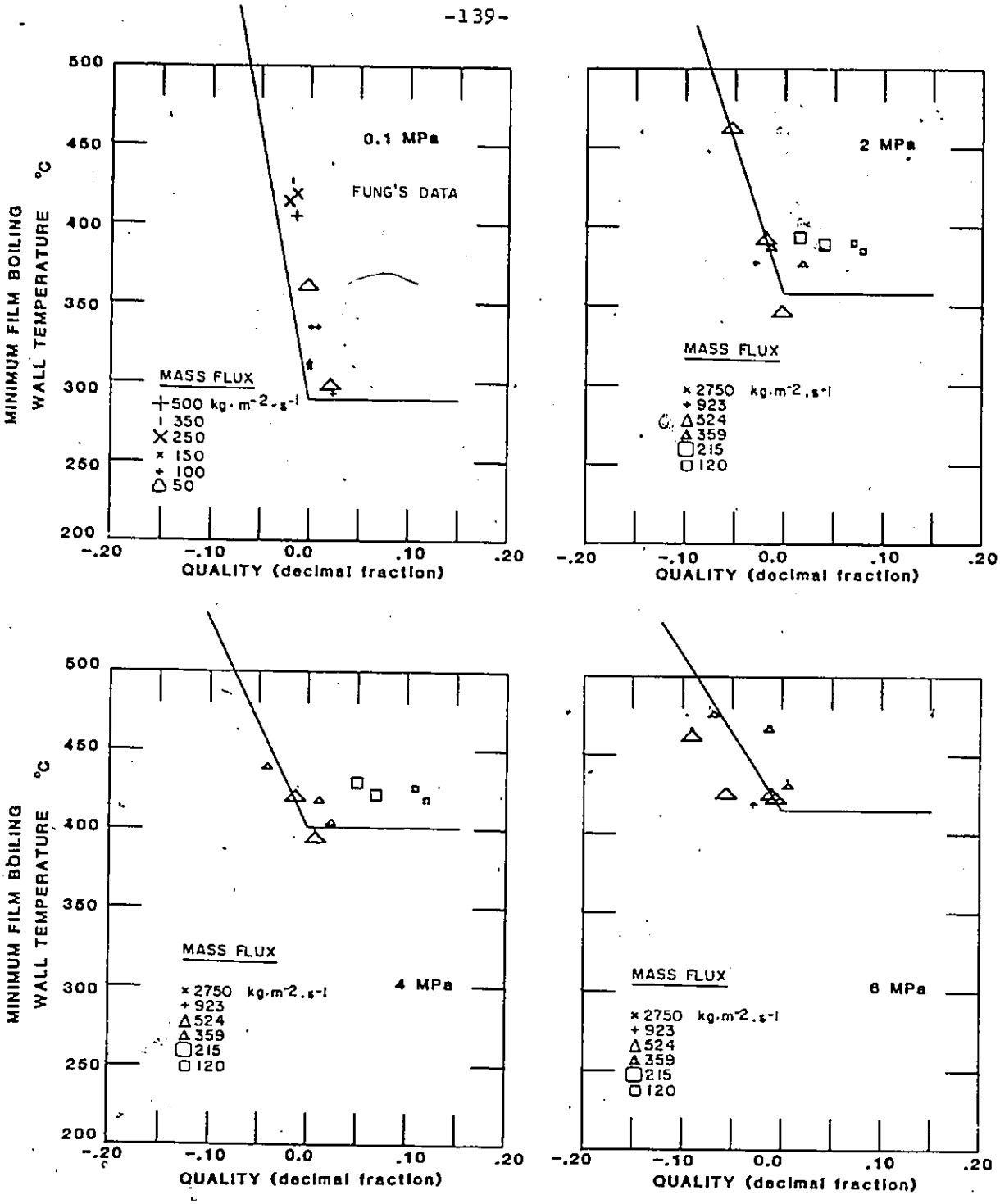


FIGURE 5.1: THE EFFECT OF QUALITY ON THE MINIMUM FILM BOILING TEMPERATURE DATA, TOGETHER WITH THE CORRELATION EQUATION 5.1.

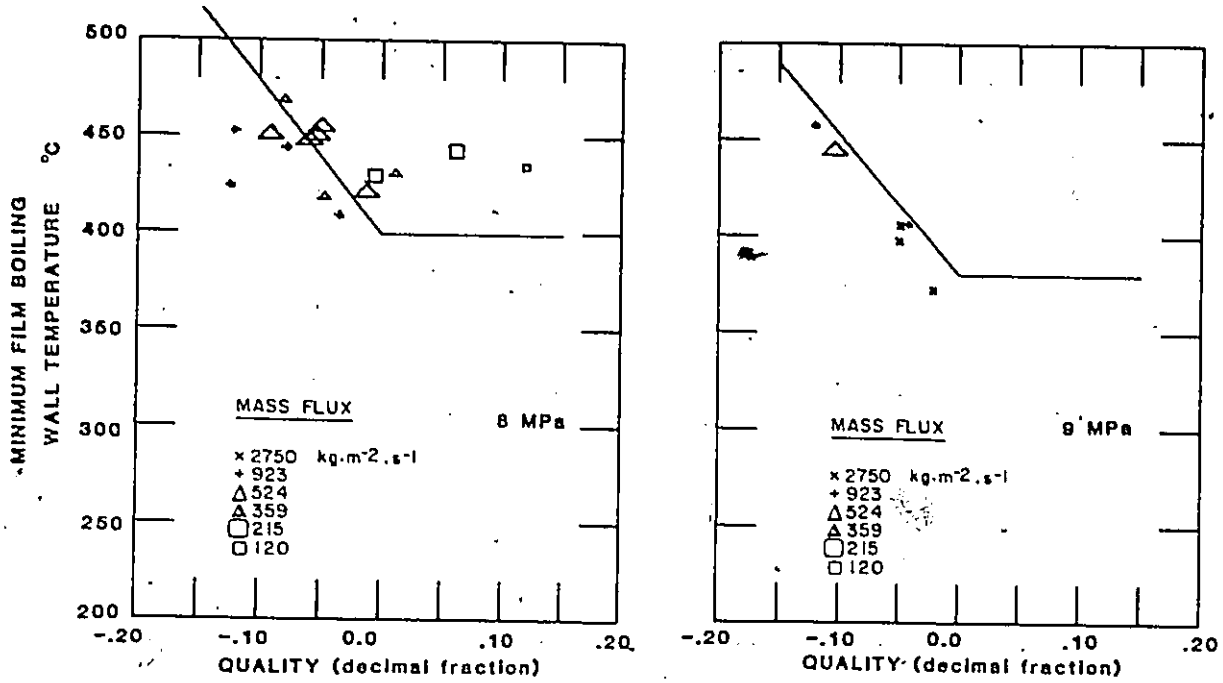


FIGURE 5.2: THE EFFECT OF QUALITY ON THE MINIMUM FILM BOILING TEMPERATURE DATA, TOGETHER WITH THE CORRELATION EQUATION 5.1.

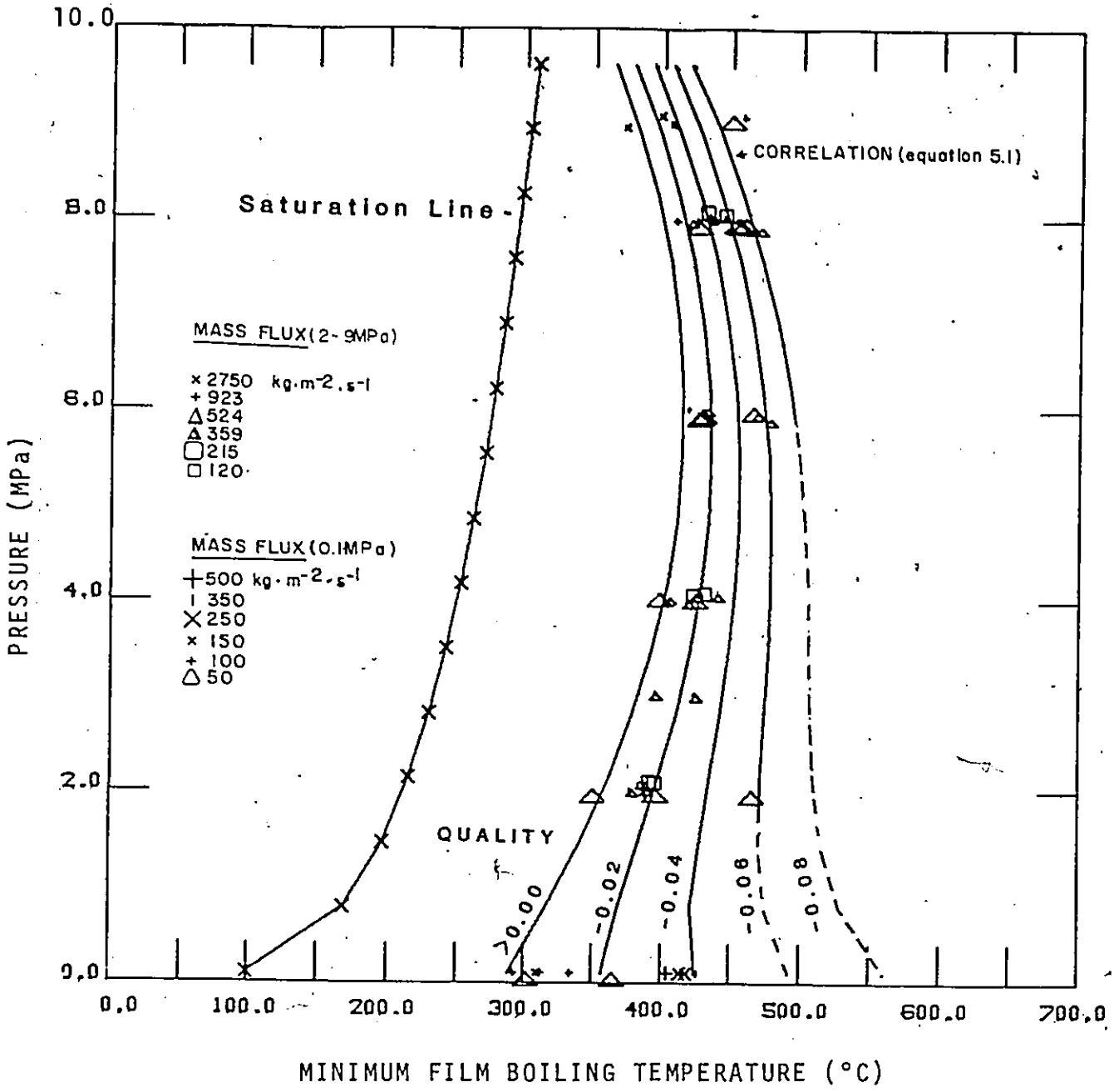


FIGURE 5.3: THE MINIMUM FILM BOILING DATA AND CORRELATION EQUATION 5.1.

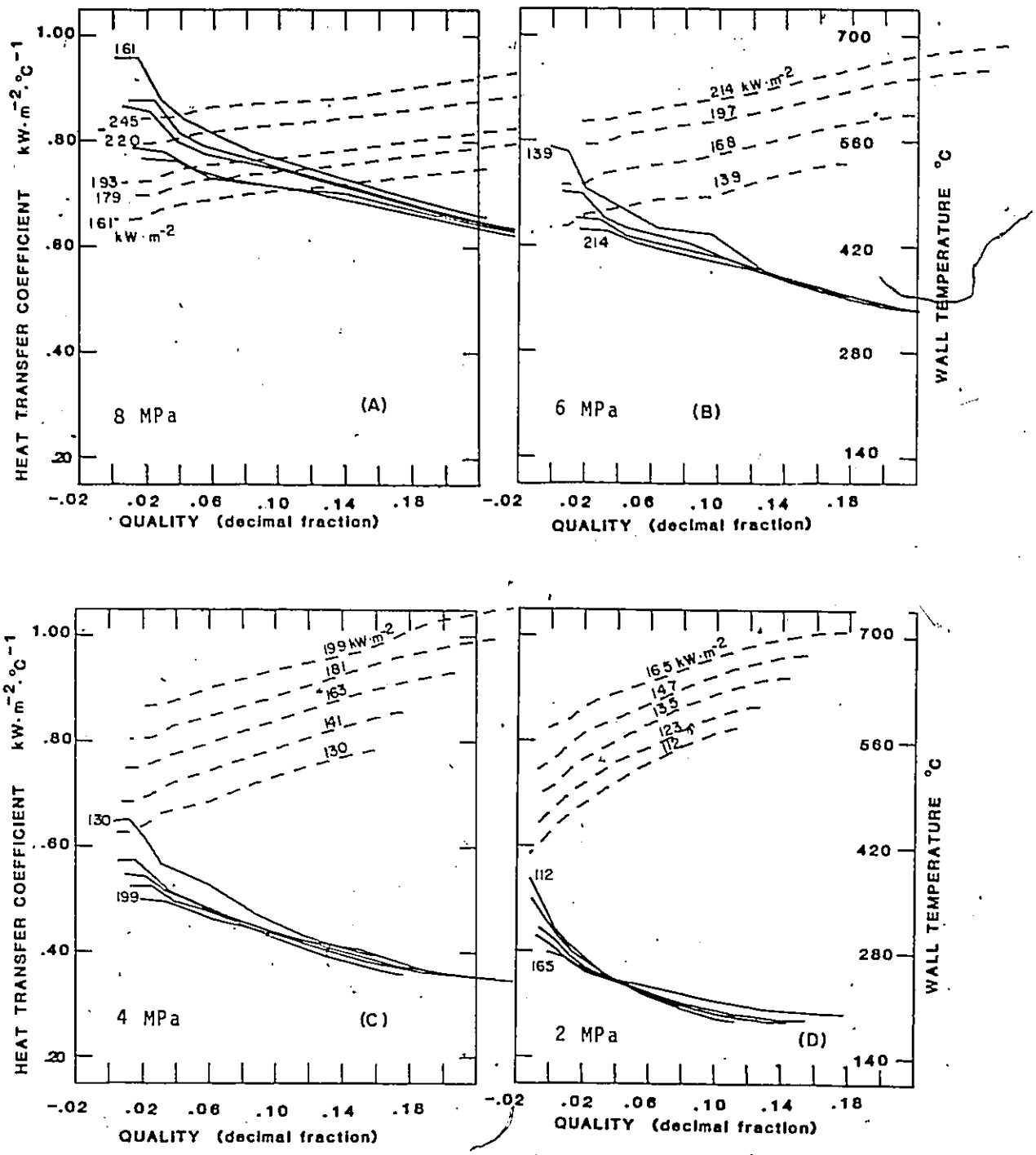


FIGURE 6.2.1: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 359\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 100\ kJ \cdot kg^{-1}$

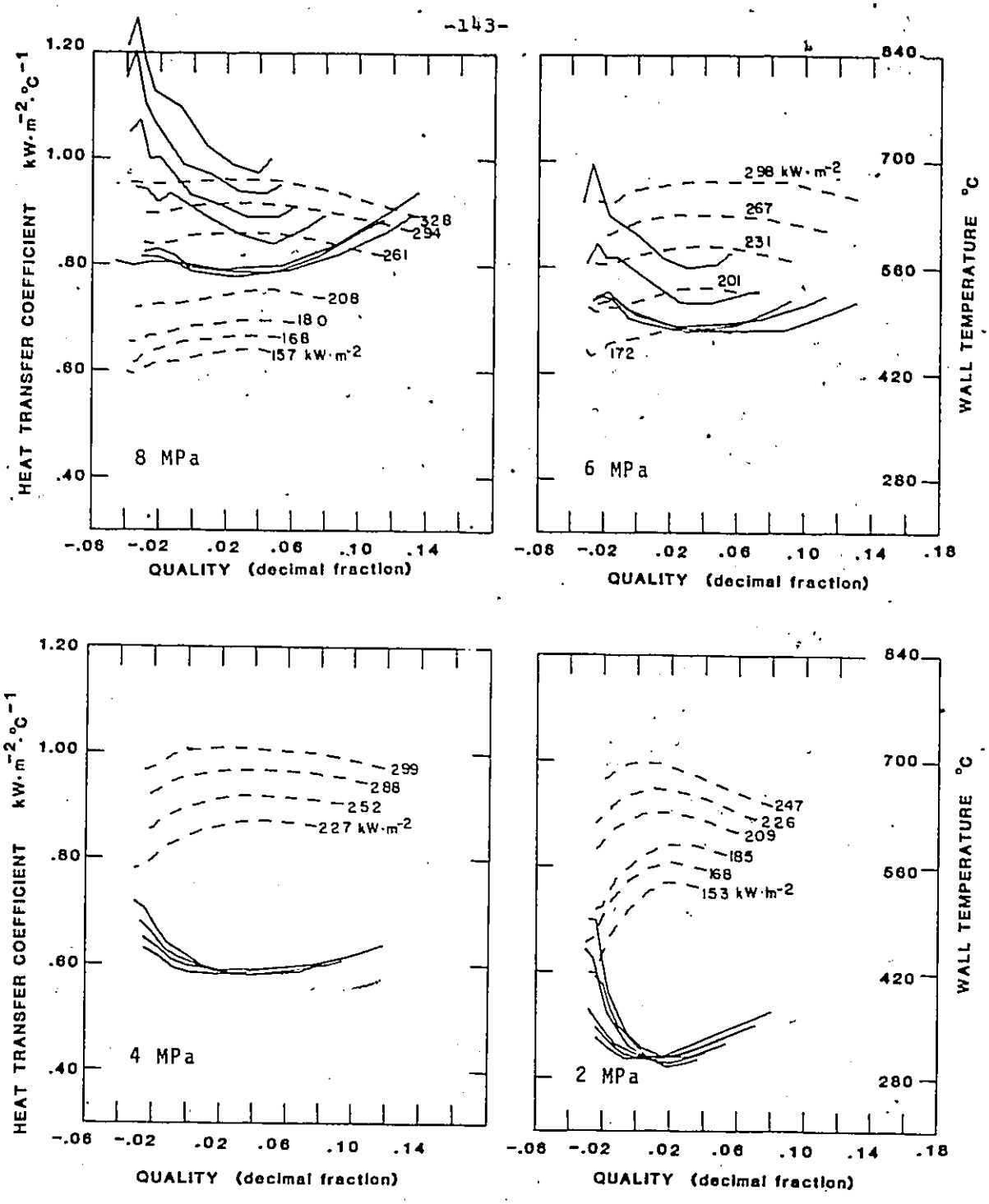


FIGURE 6.2.2: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 923\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 100\ kJ \cdot kg^{-1}$

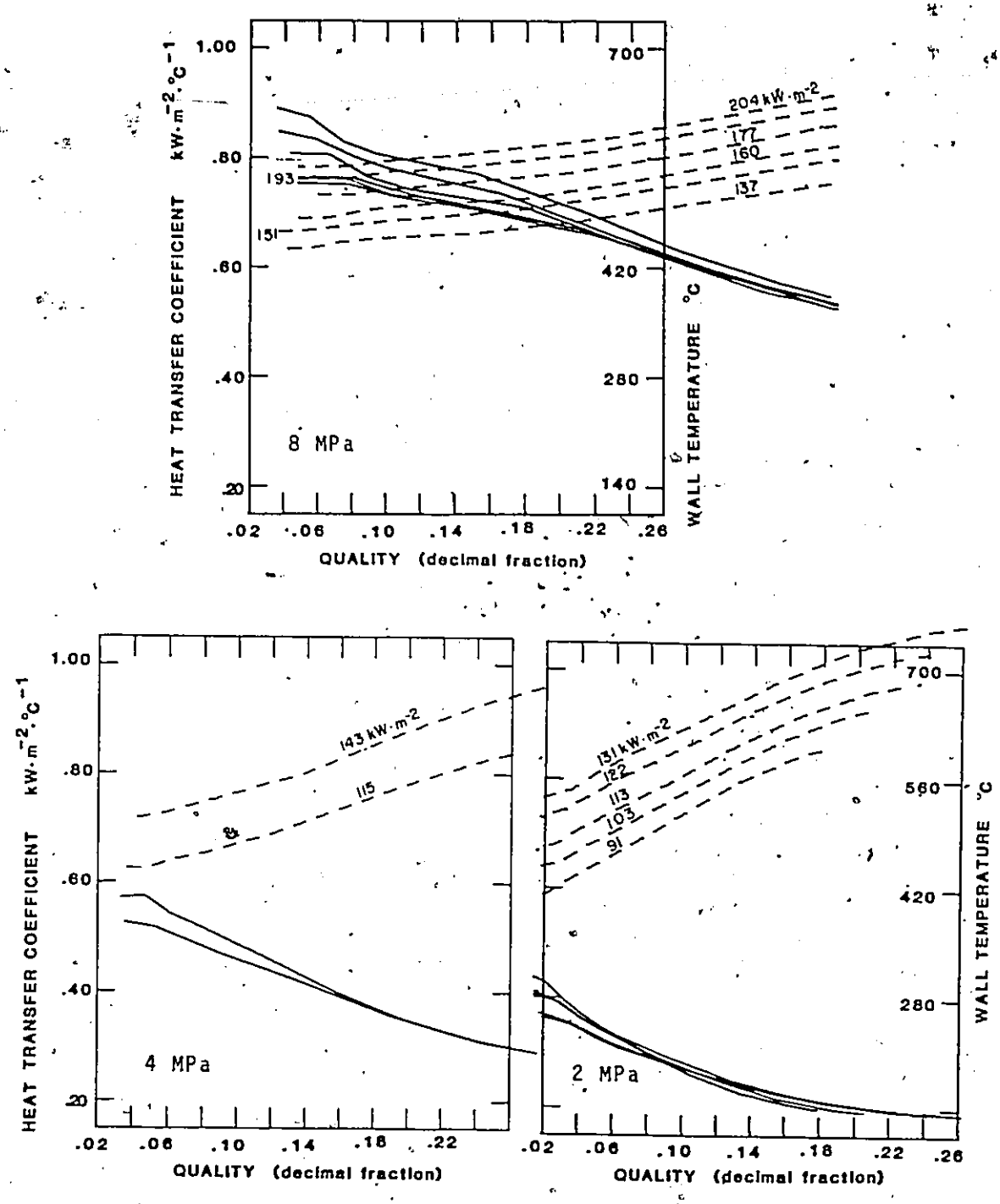
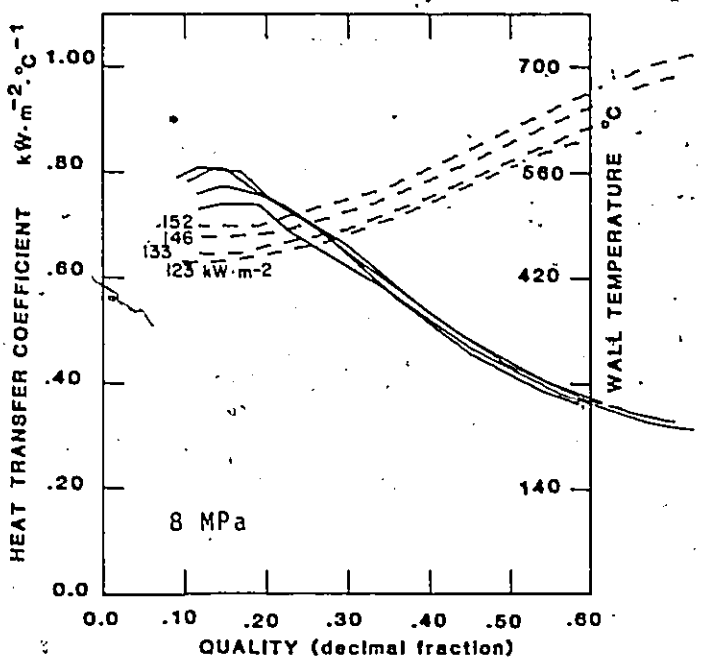


FIGURE 6.2.3: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 215\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 100\ kJ \cdot kg^{-1}$



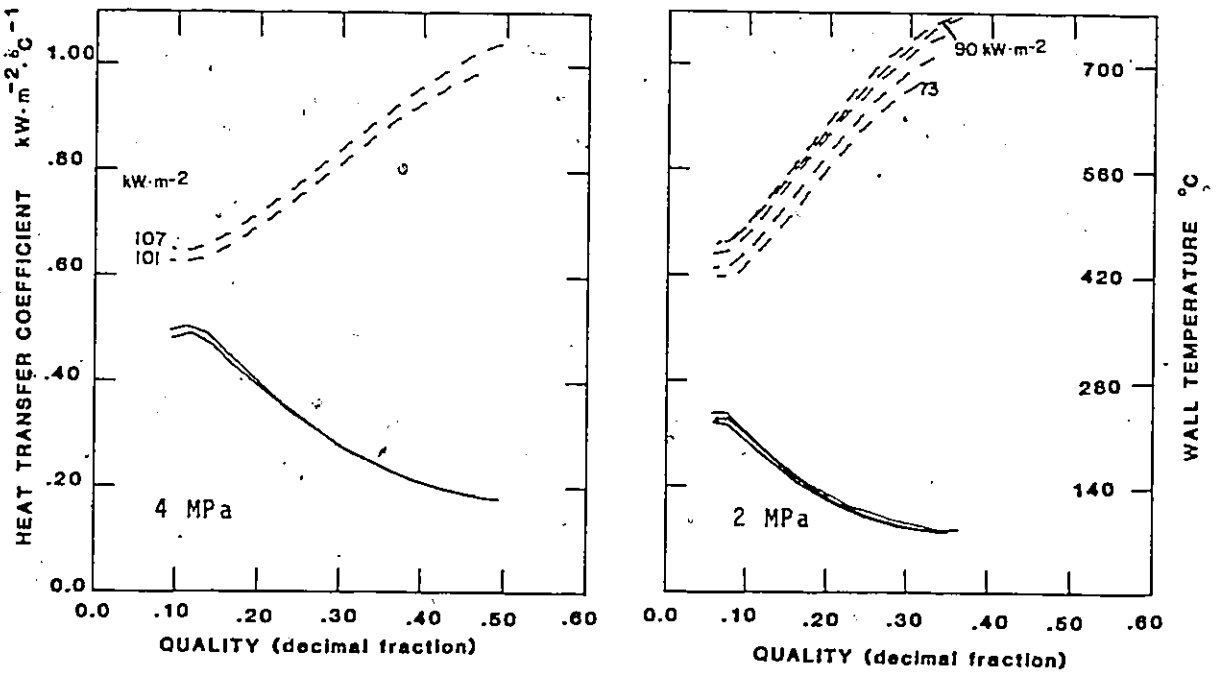


FIGURE 6.2.4: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 120\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 100\ kJ \cdot kg^{-1}$

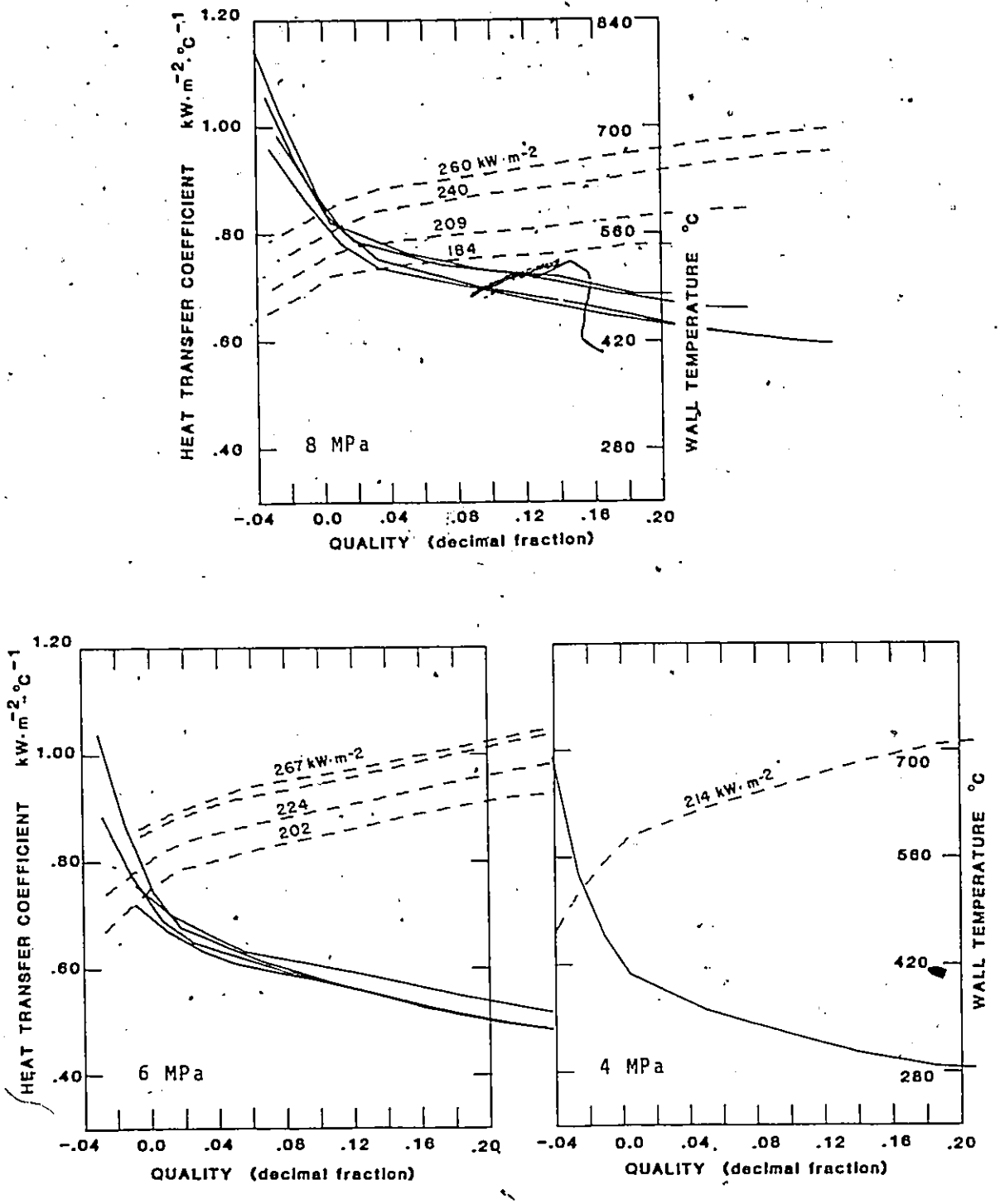


FIGURE 6.2.5: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 359\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 180\ kJ \cdot kg^{-1}$

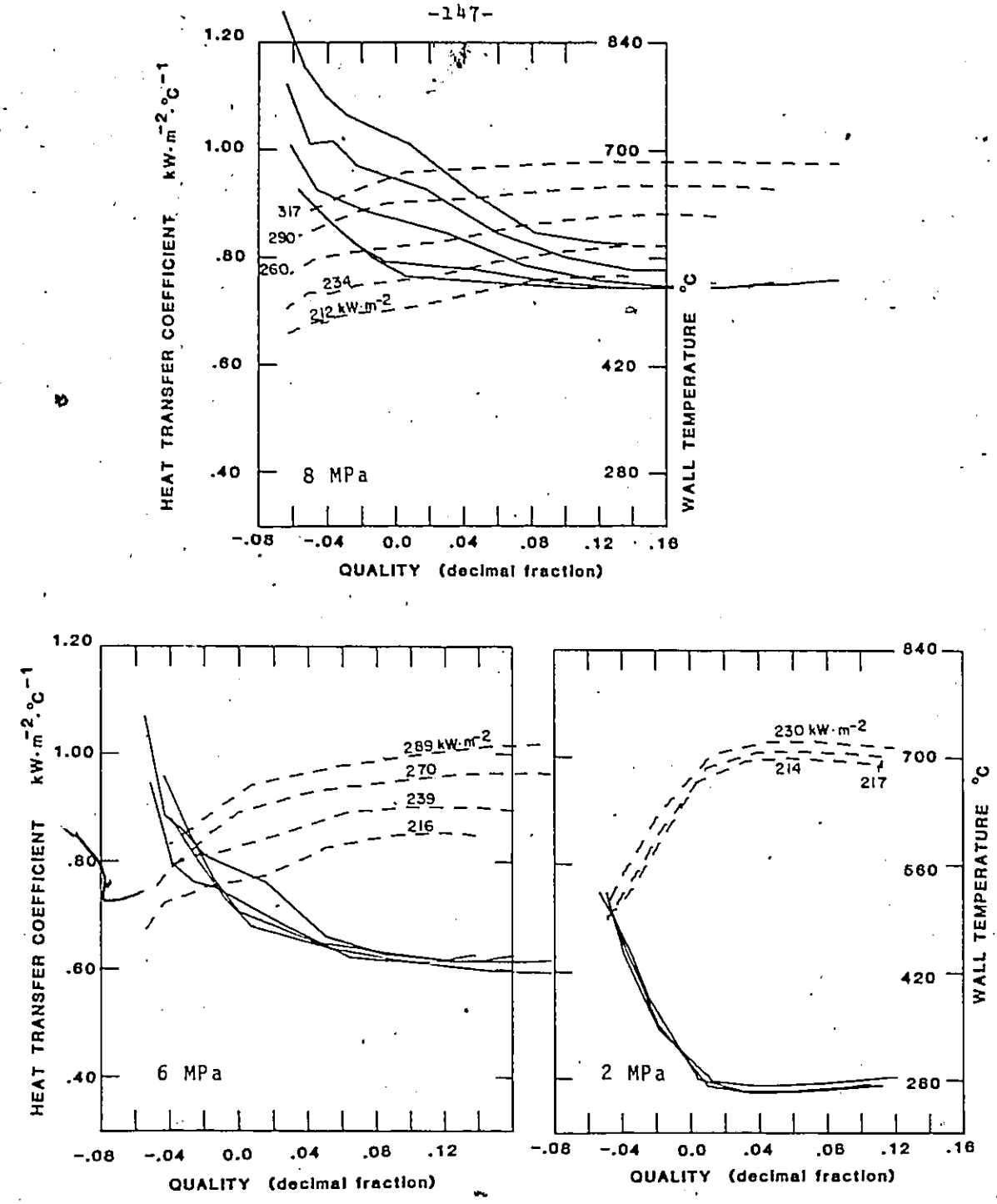


FIGURE 6.2.6: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 524\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 182\ kJ \cdot kg^{-1}$

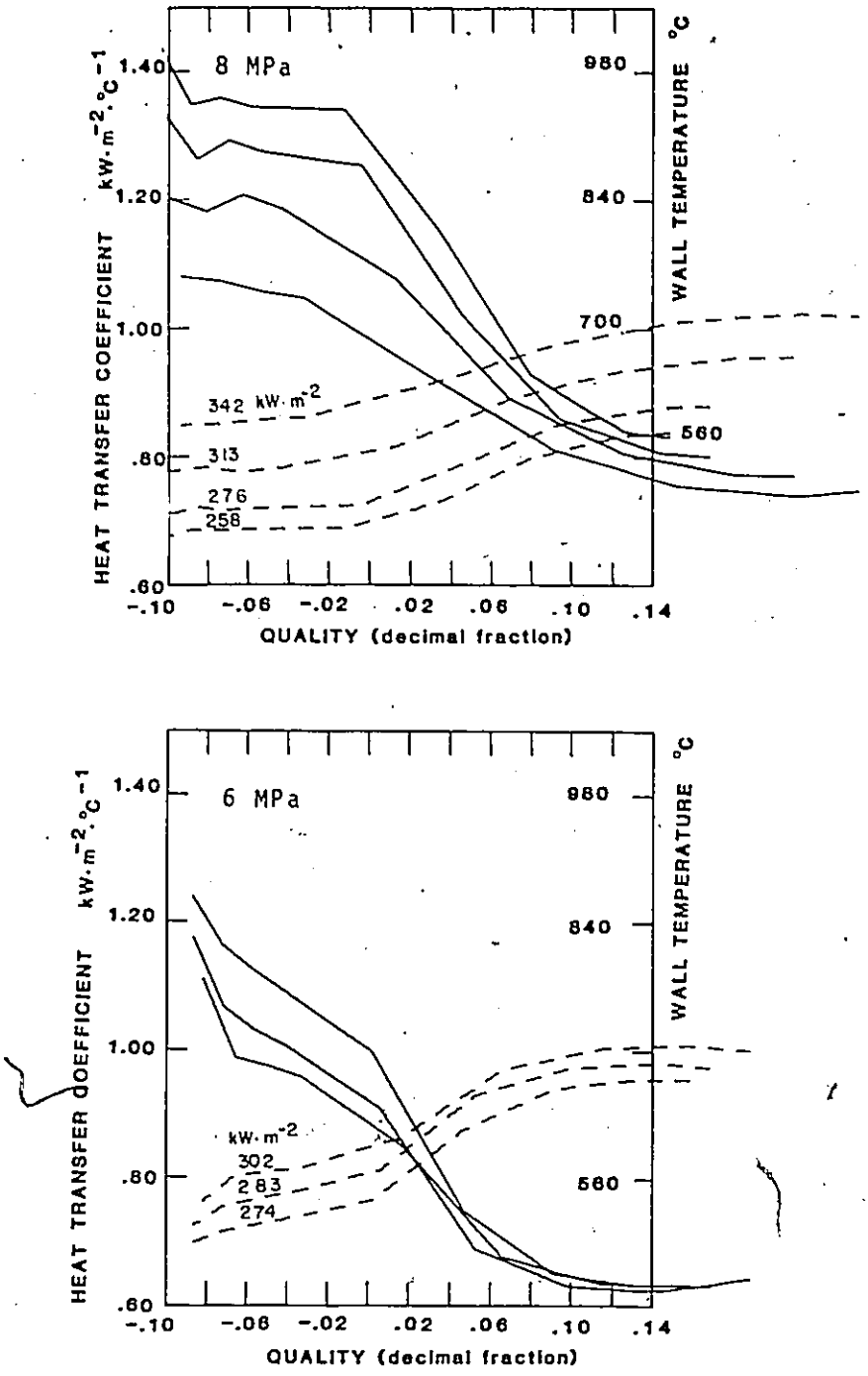


FIGURE 6.2.7: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 524\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 255\ kJ \cdot kg^{-1}$

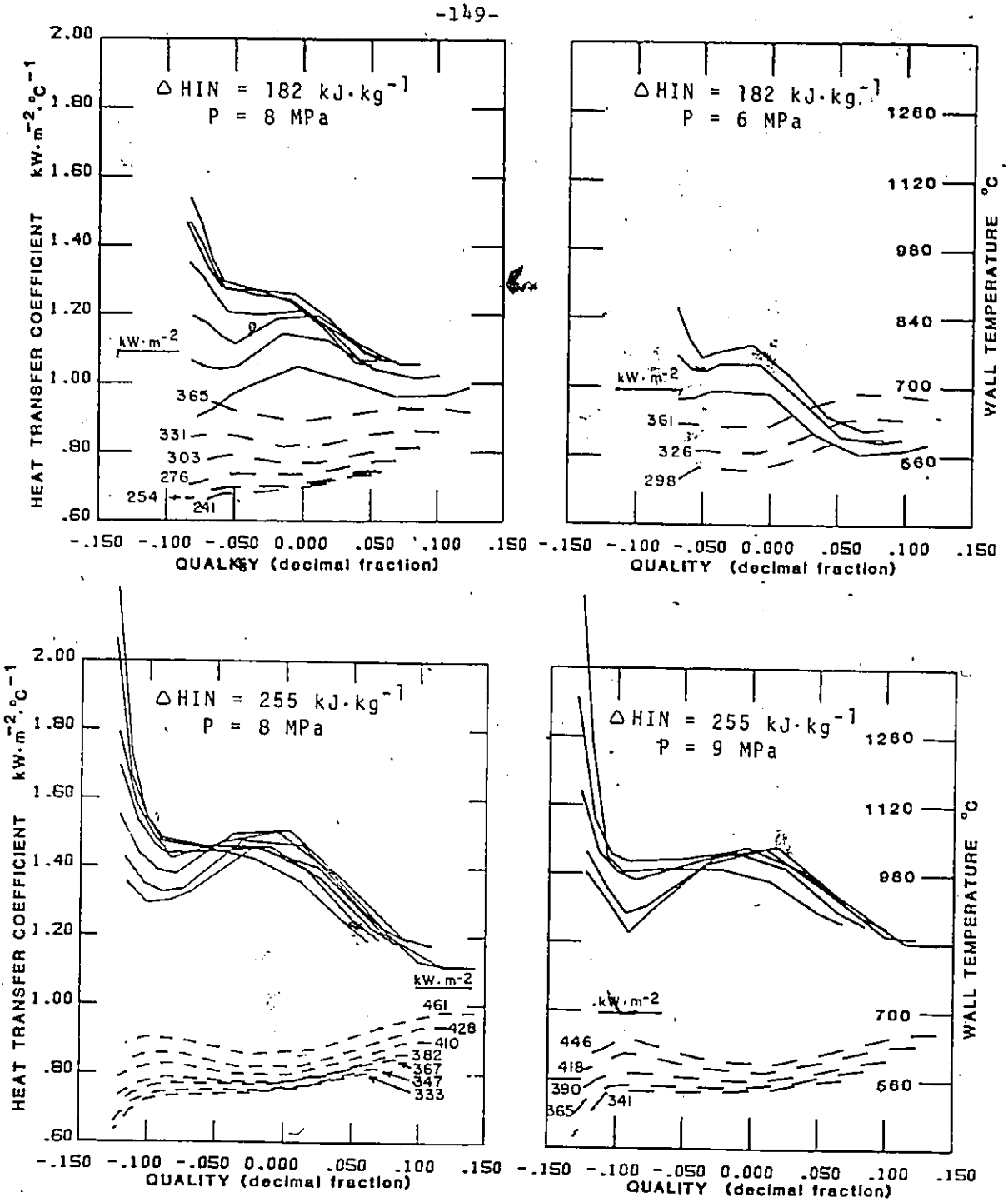


FIGURE 6.2.8: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 923\ kg \cdot m^{-2} \cdot s^{-1}$

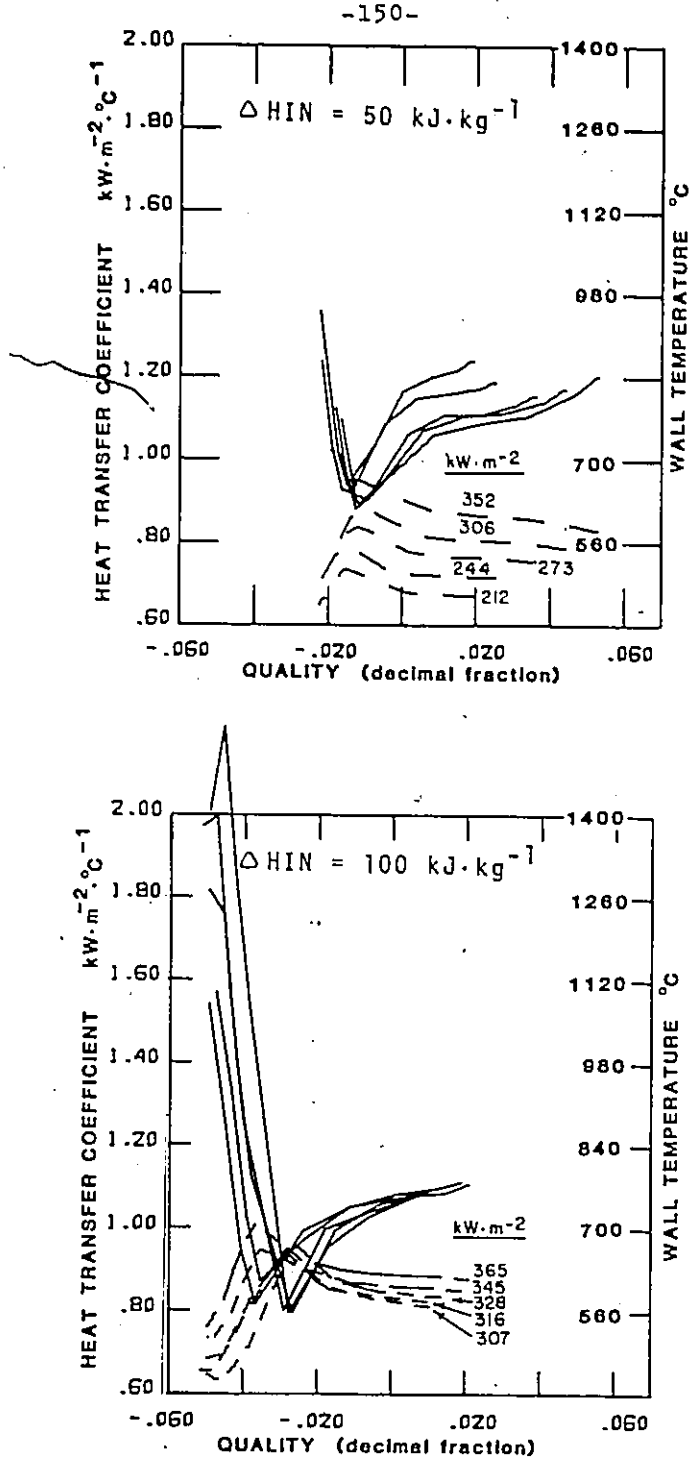
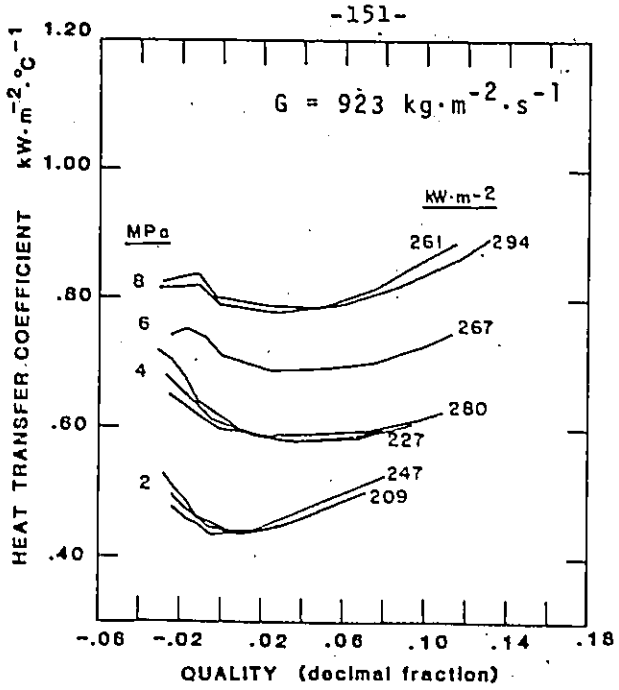


FIGURE 6.2.9: THE EFFECT OF HEAT FLUX ON THE HEAT TRANSFER COEFFICIENT.

$G = 2750\ kg \cdot m^{-2} \cdot s^{-1}$
$P = 9\ MPa$



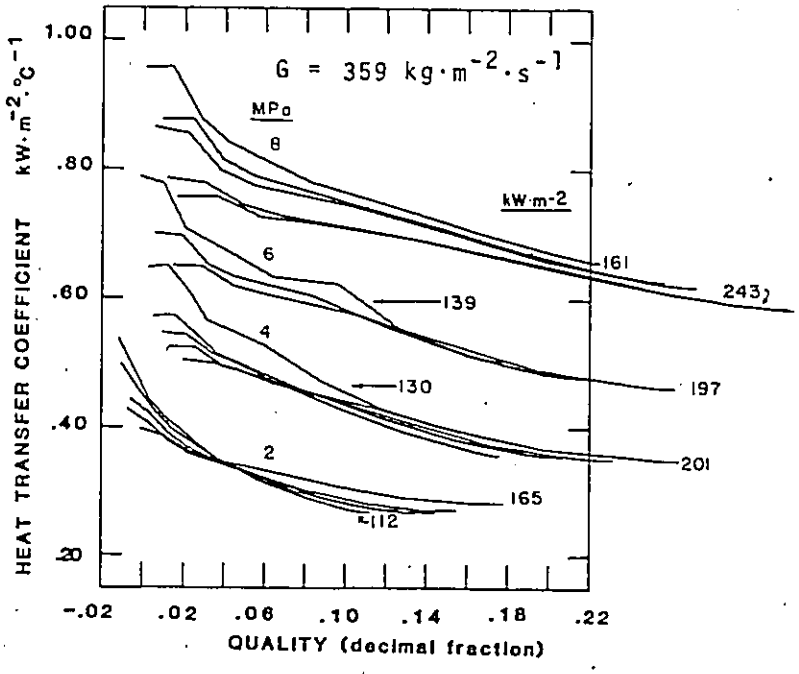


FIGURE 6.3.1: THE EFFECT OF PRESSURE ON THE HEAT TRANSFER COEFFICIENT AT DIFFERENT FLOW RATES.

ΔHIN = 100 kJ·kg^{-1}

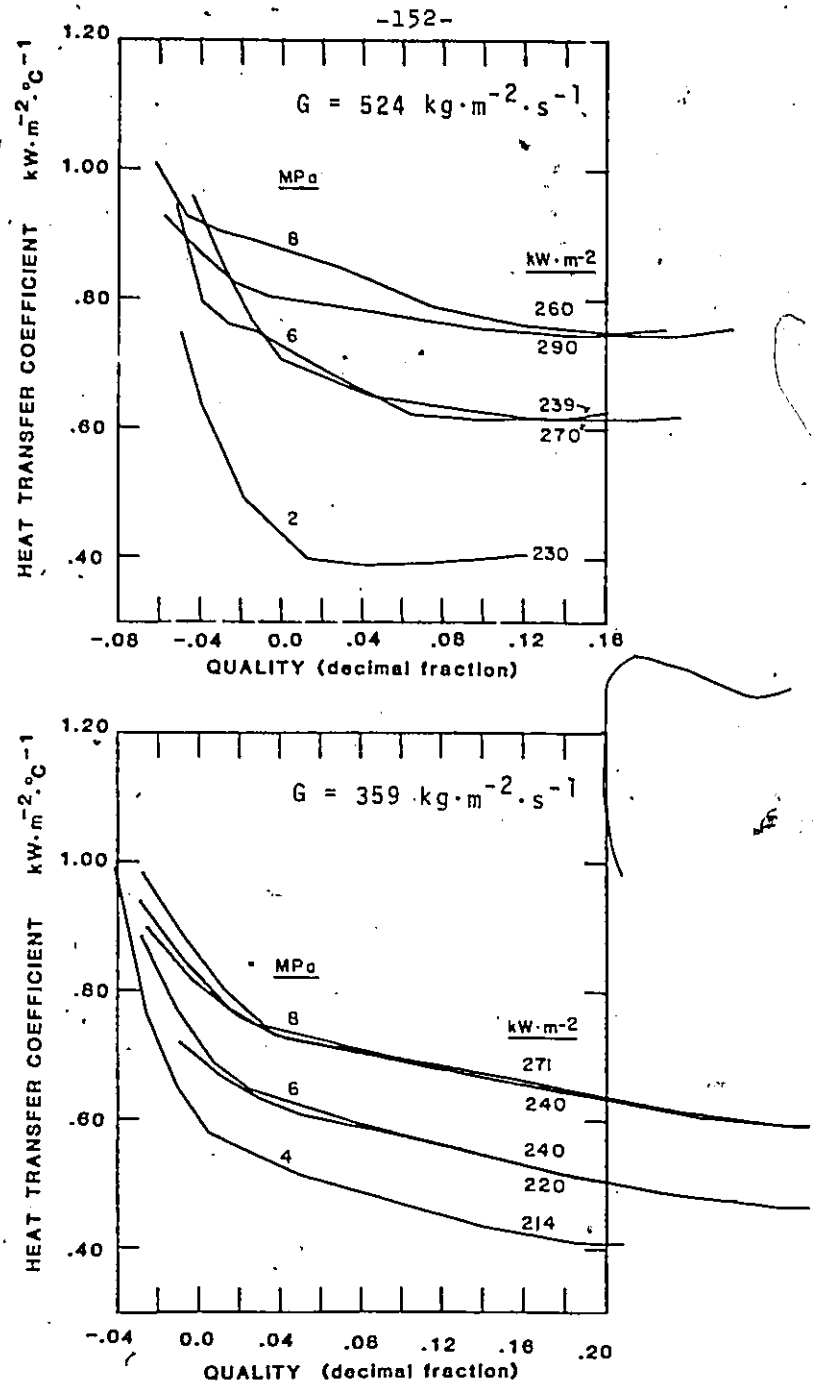


FIGURE 6.3.2: THE EFFECT OF PRESSURE ON THE HEAT TRANSFER COEFFICIENT AT DIFFERENT FLOW RATES.

Δ HIN = 182 kJ·kg^{-1}

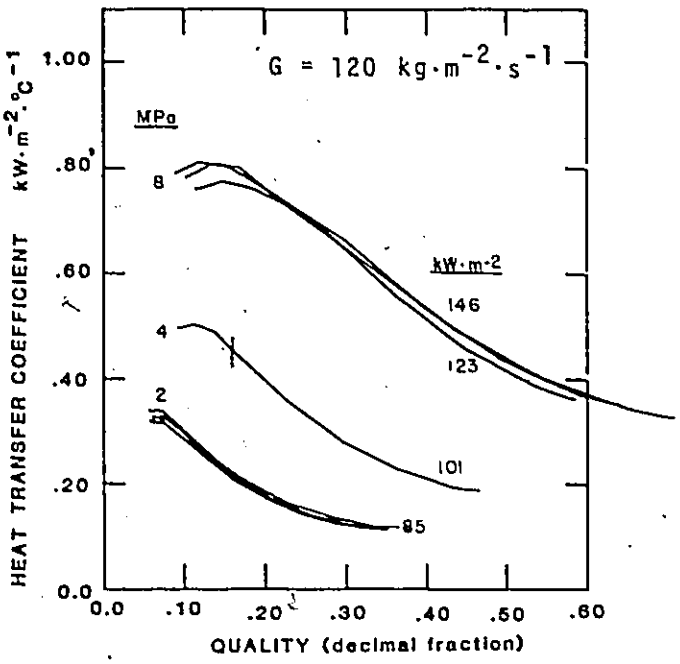


FIGURE 6.3.3: THE EFFECT OF PRESSURE ON THE HEAT TRANSFER COEFFICIENT AT DIFFERENT FLOW RATES.

Δ HIN = 100 kJ·kg^{-1}

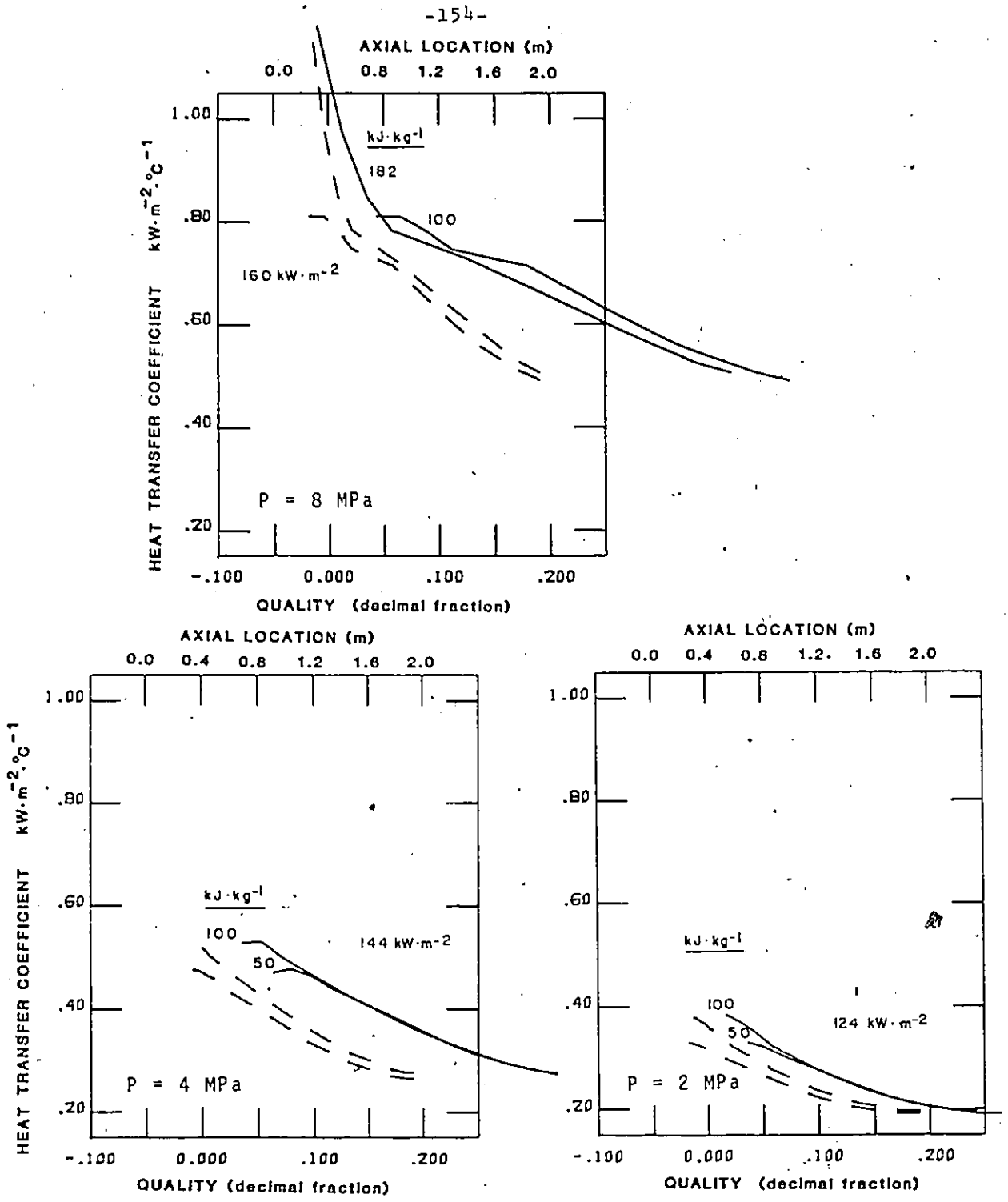


FIGURE 6.4.1: THE EFFECT OF INLET SUBCOOLING ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$G = 215\ kg \cdot m^{-2} \cdot s^{-1}$

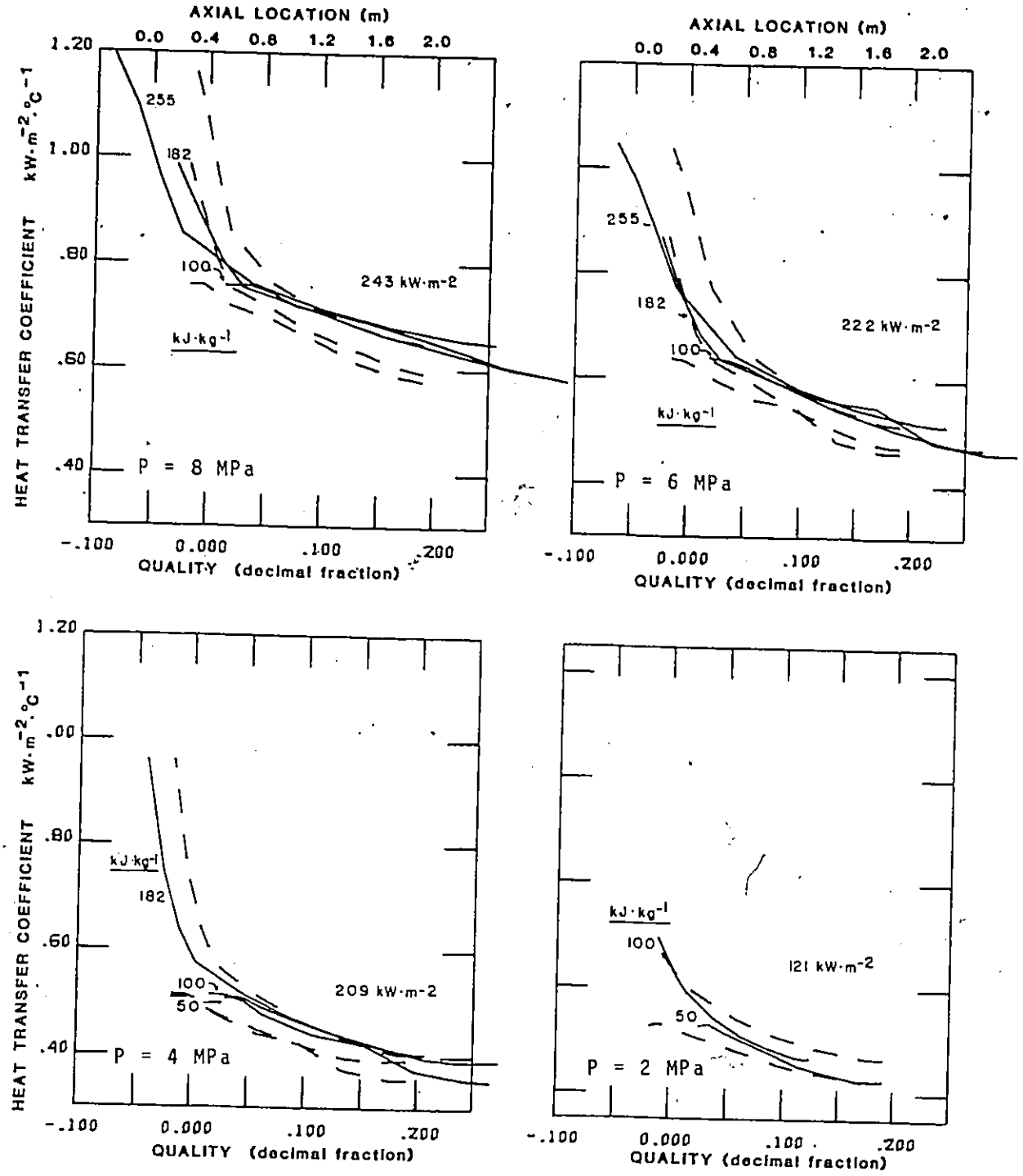


FIGURE 6.4.2: THE EFFECT OF INLET SUBCOOLING ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.
$G = 359\ kg \cdot m^{-2} \cdot s^{-1}$

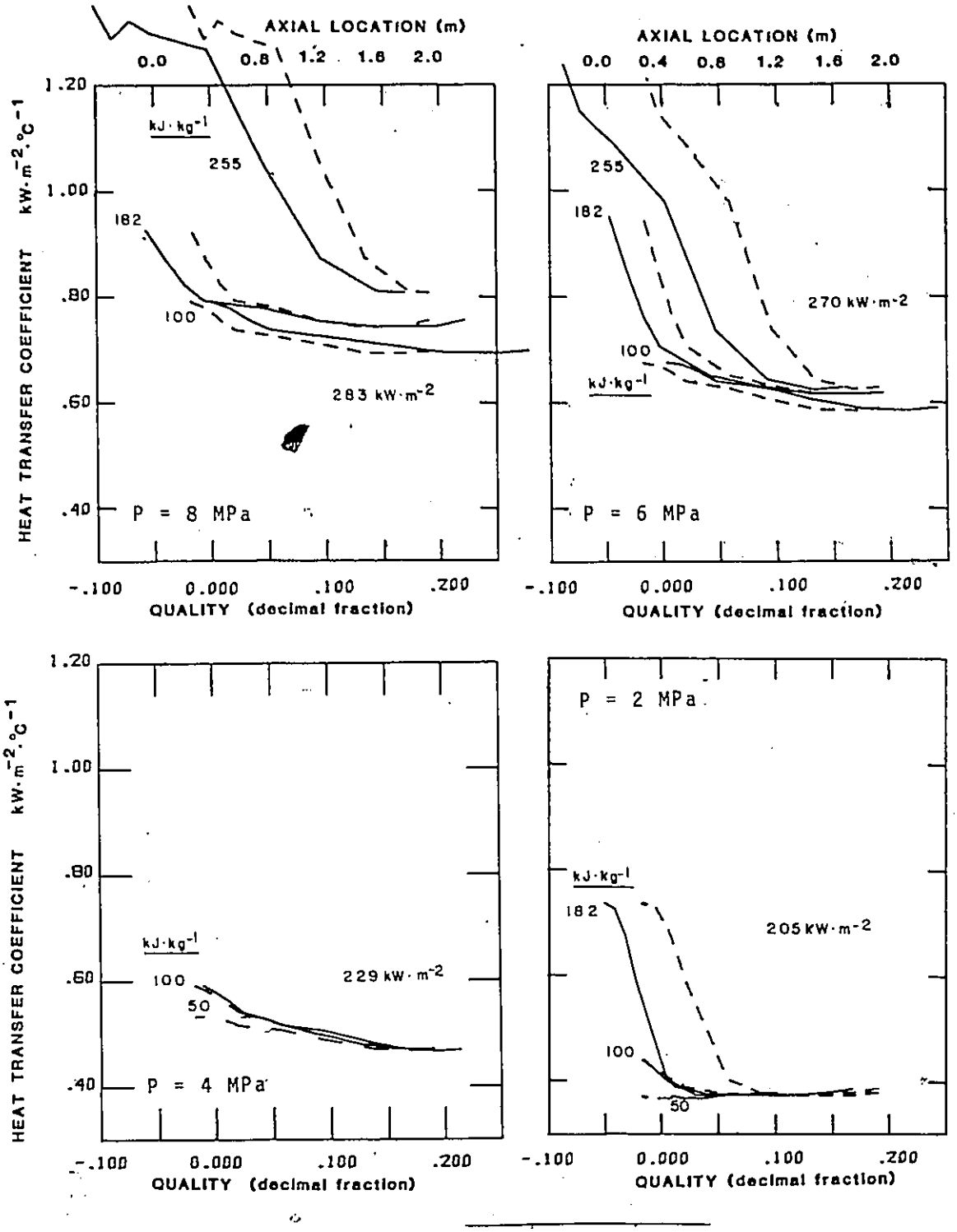
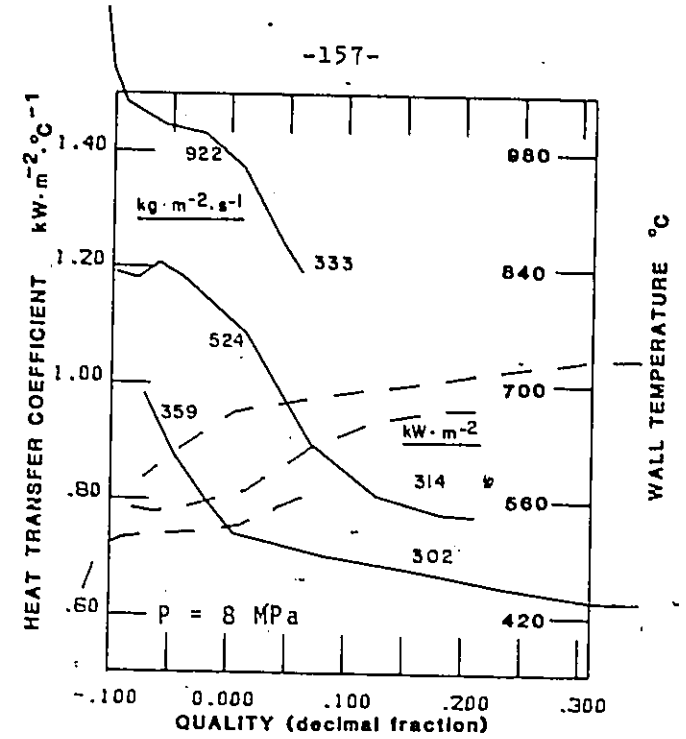


FIGURE 6.4.3: THE EFFECT OF INLET SUBCOOLING ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.
$G = 524\ kg \cdot m^{-2} \cdot s^{-1}$



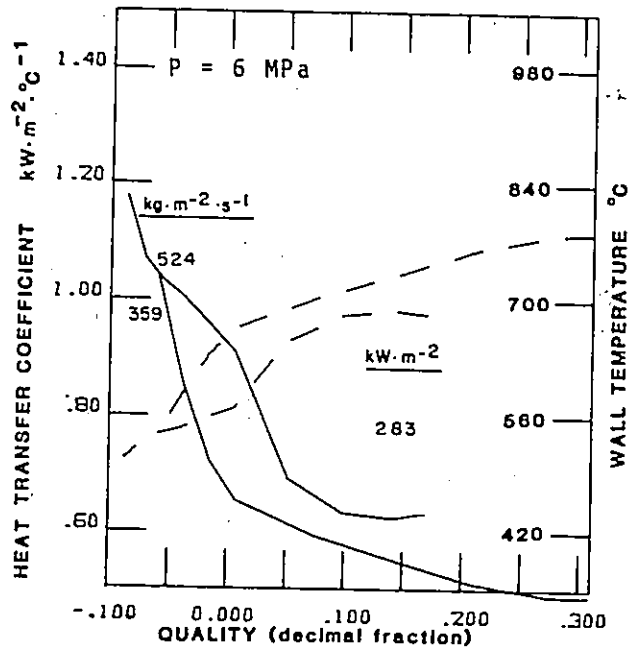


FIGURE 6.5.1: THE EFFECT OF MASS FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

$\Delta HIN = 255\ kJ \cdot kg^{-1}$

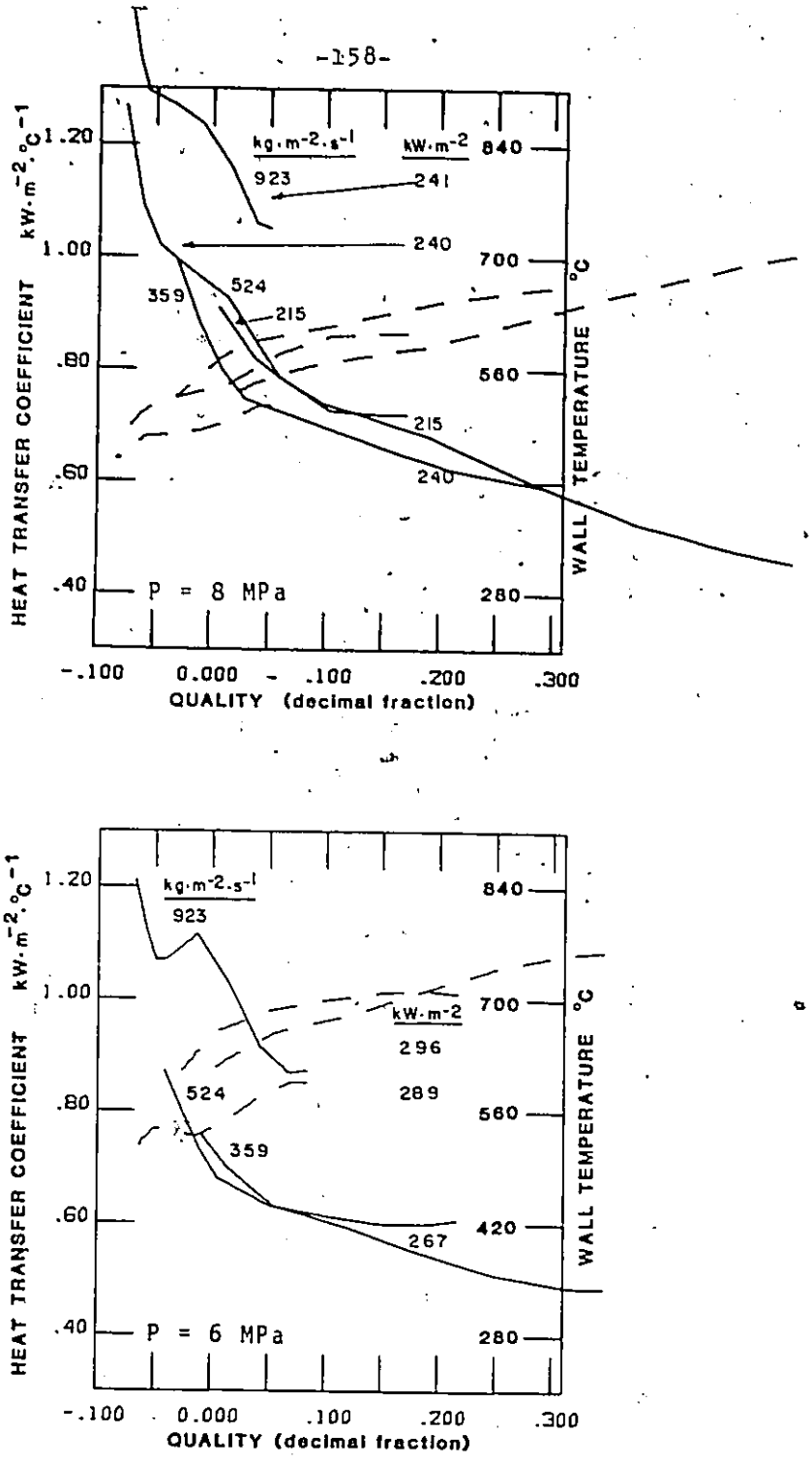


FIGURE 6.5.2: THE EFFECT OF MASS FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.
ΔH_{IN} = 182 kJ·kg^{-1}

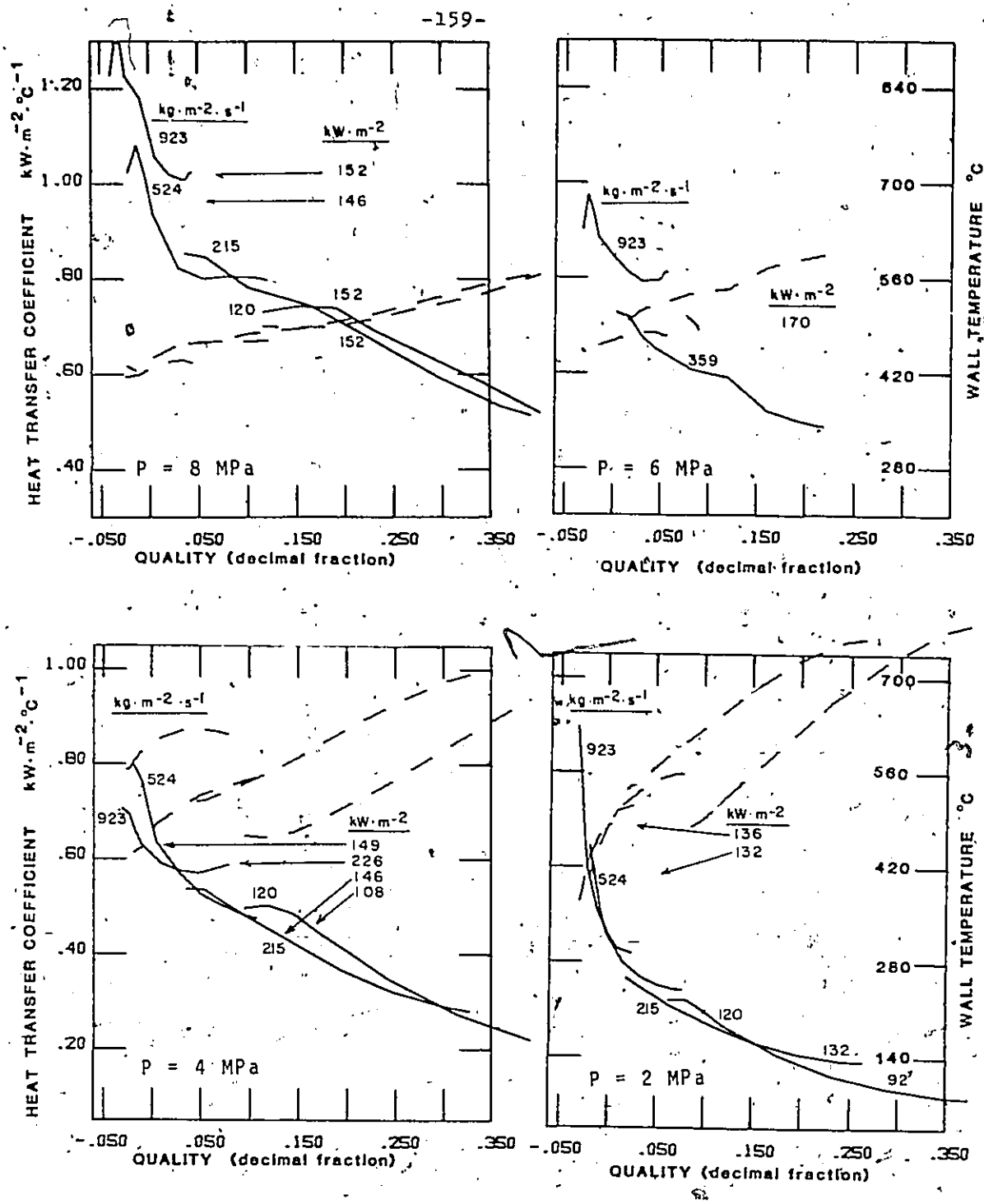
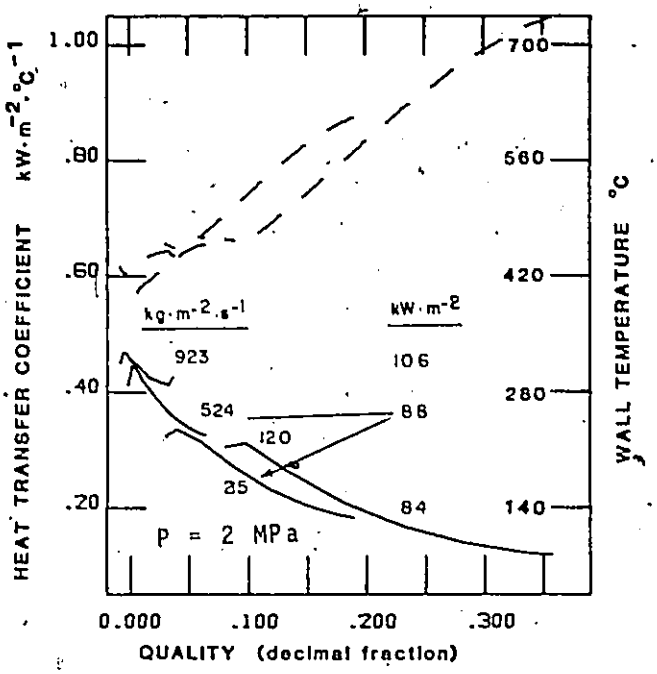


FIGURE 6.5.3: THE EFFECT OF MASS FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.

ΔH_{IN} = 100 kJ·kg^{-1}



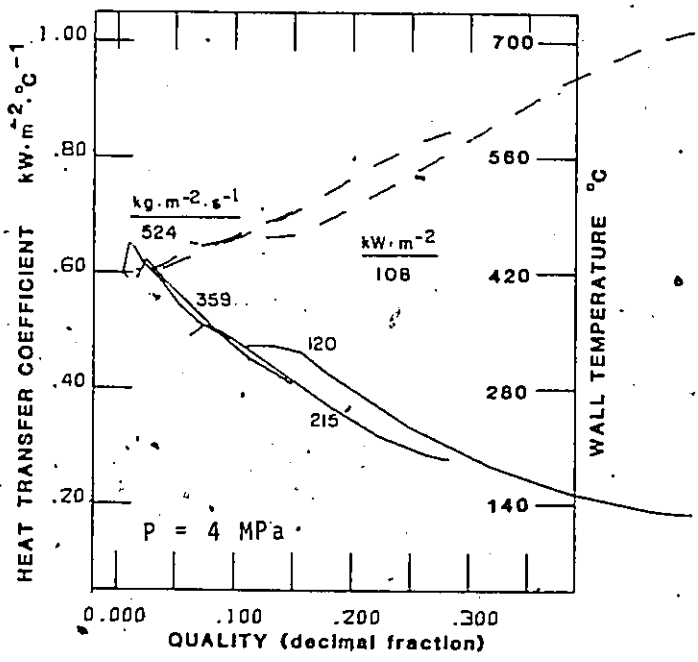


FIGURE 6.5.4: THE EFFECT OF MASS FLUX ON THE HEAT TRANSFER COEFFICIENT OVER A RANGE OF PRESSURES.
$\Delta HIN = 50\ kJ \cdot kg^{-1}$

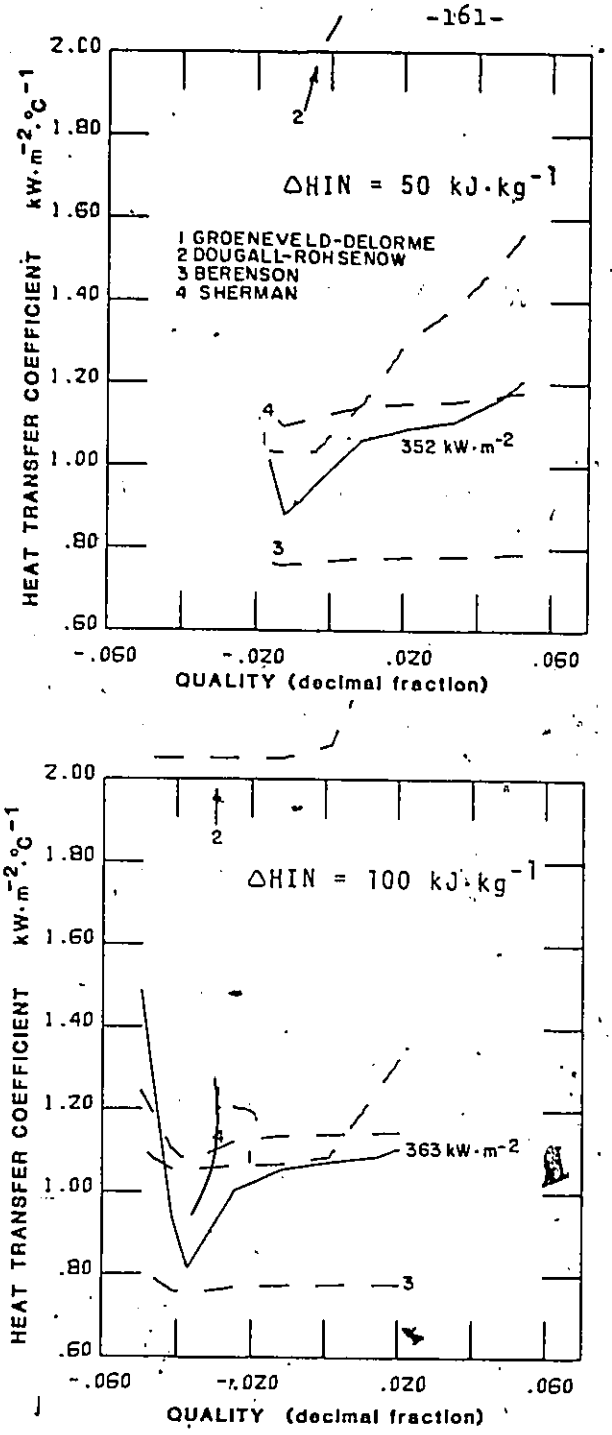


FIGURE 7.1: COMPARISON OF EXPERIMENTALLY MEASURED HEAT TRANSFER COEFFICIENTS WITH FOUR CORRELATIONS.

$G = 2750\ kg \cdot m^{-2} \cdot s^{-1}$

9 kPa

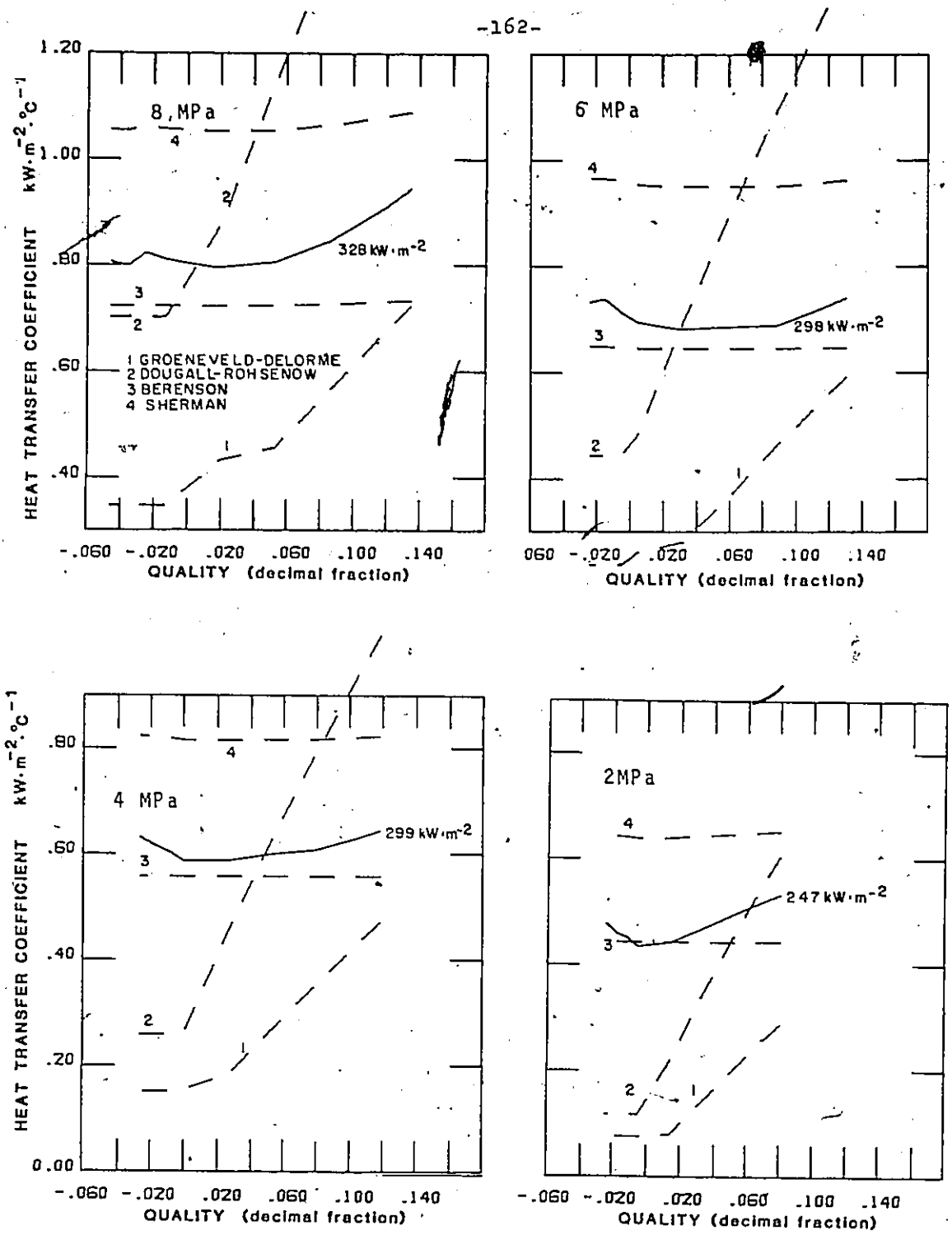


FIGURE 7.2: COMPARISON OF EXPERIMENTALLY MEASURED HEAT TRANSFER COEFFICIENTS WITH FOUR CORRELATIONS.

$G = 923\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 100\ kJ \cdot kg^{-1}$

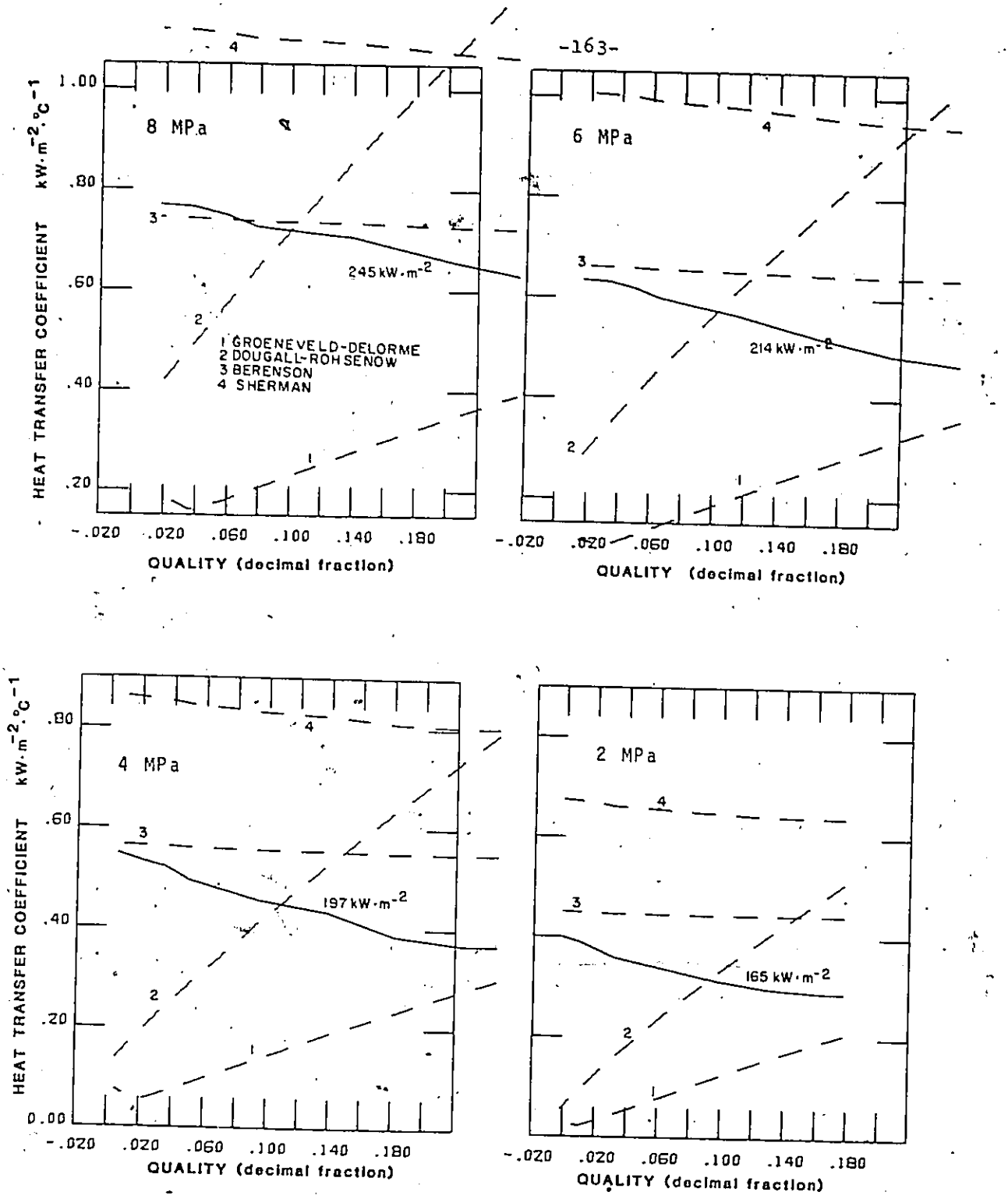


FIGURE 7.3: COMPARISON OF EXPERIMENTALLY MEASURED HEAT TRANSFER COEFFICIENTS WITH FOUR CORRELATIONS.

$G = 359\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 100\ kJ \cdot kg^{-1}$

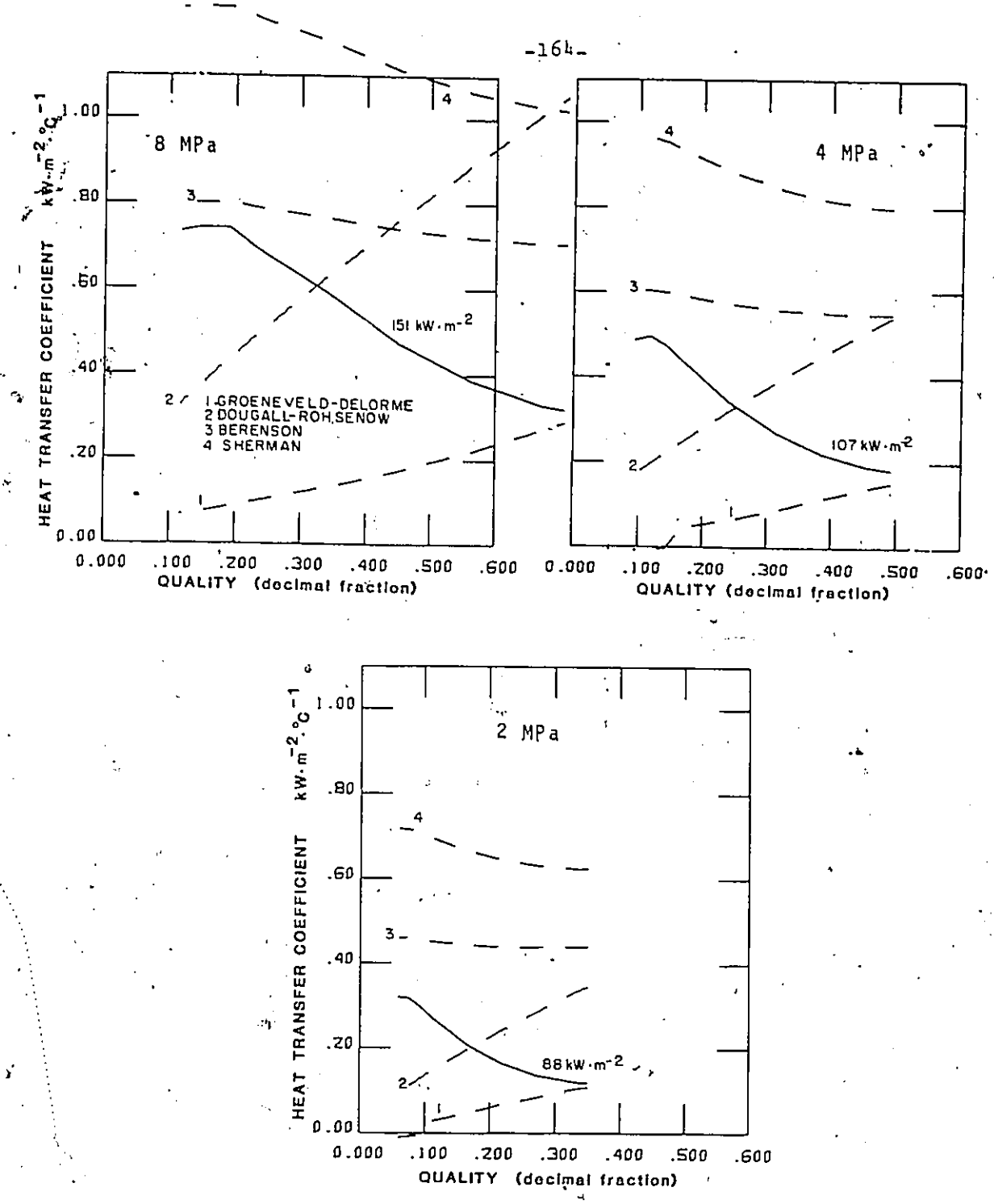


FIGURE 7.4: COMPARISON OF EXPERIMENTALLY MEASURED HEAT TRANSFER COEFFICIENTS WITH FOUR CORRELATIONS.

$G = 120\ kg \cdot m^{-2} \cdot s^{-1}$

$\Delta HIN = 100\ kJ \cdot kg^{-1}$

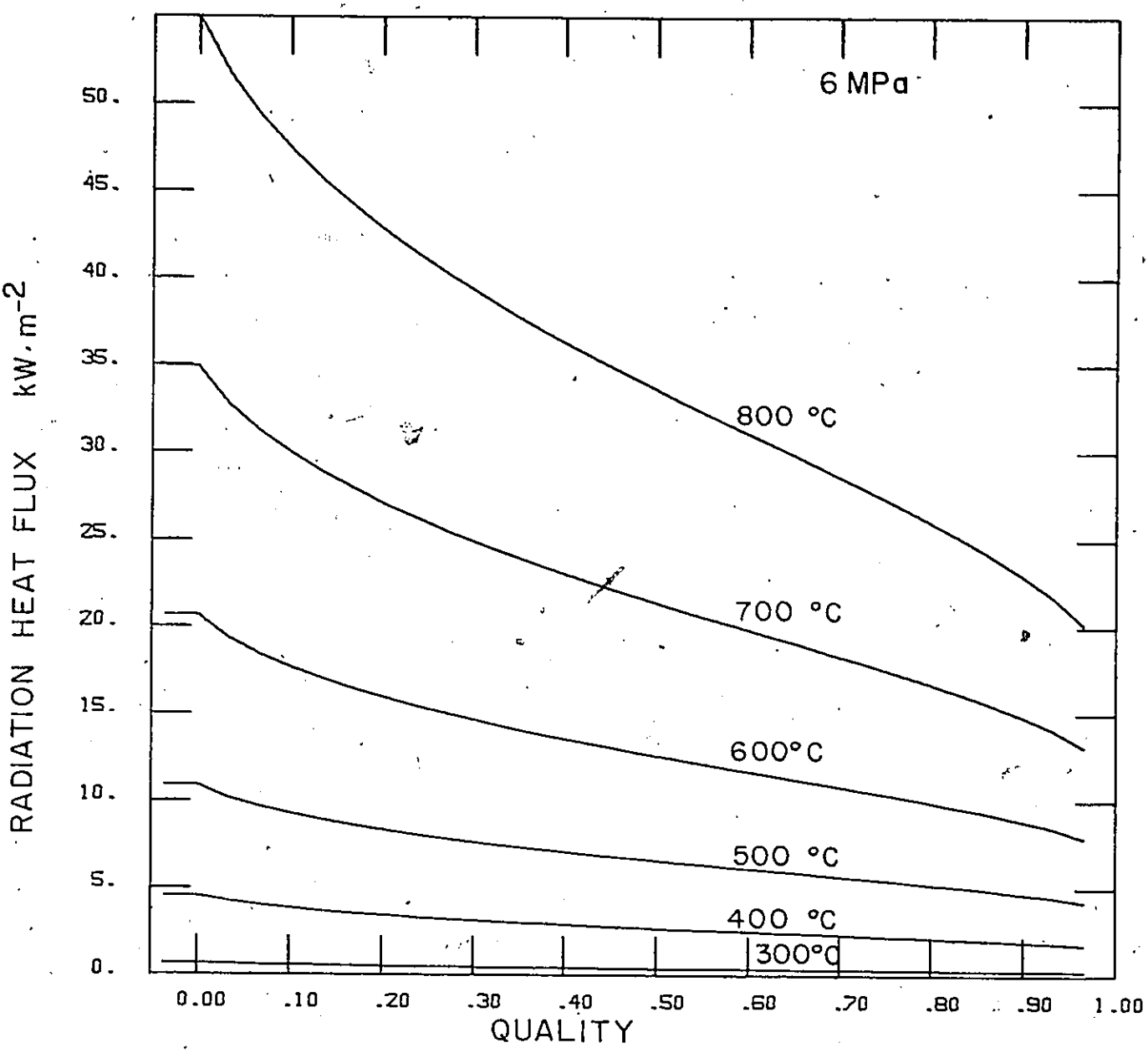


FIGURE A.1: Radiation heat flux at 6 MPa as a function of wall temperature and quality. The heat flux in the sub-cooled region was set equal to the value at X=0.

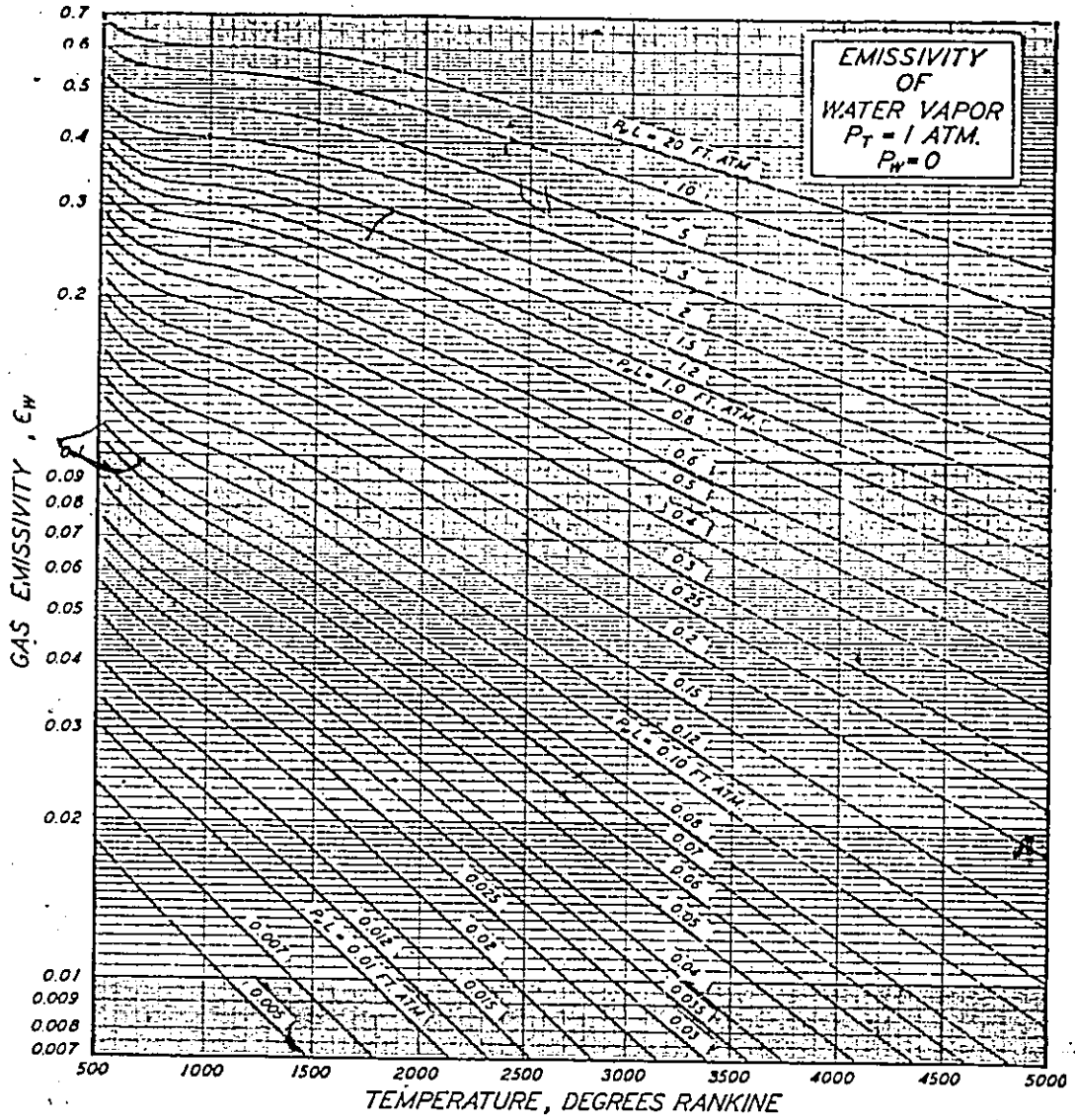


FIGURE A.2: THE EMISSIVITY OF WATER VAPOUR FROM MCADAMS[25].

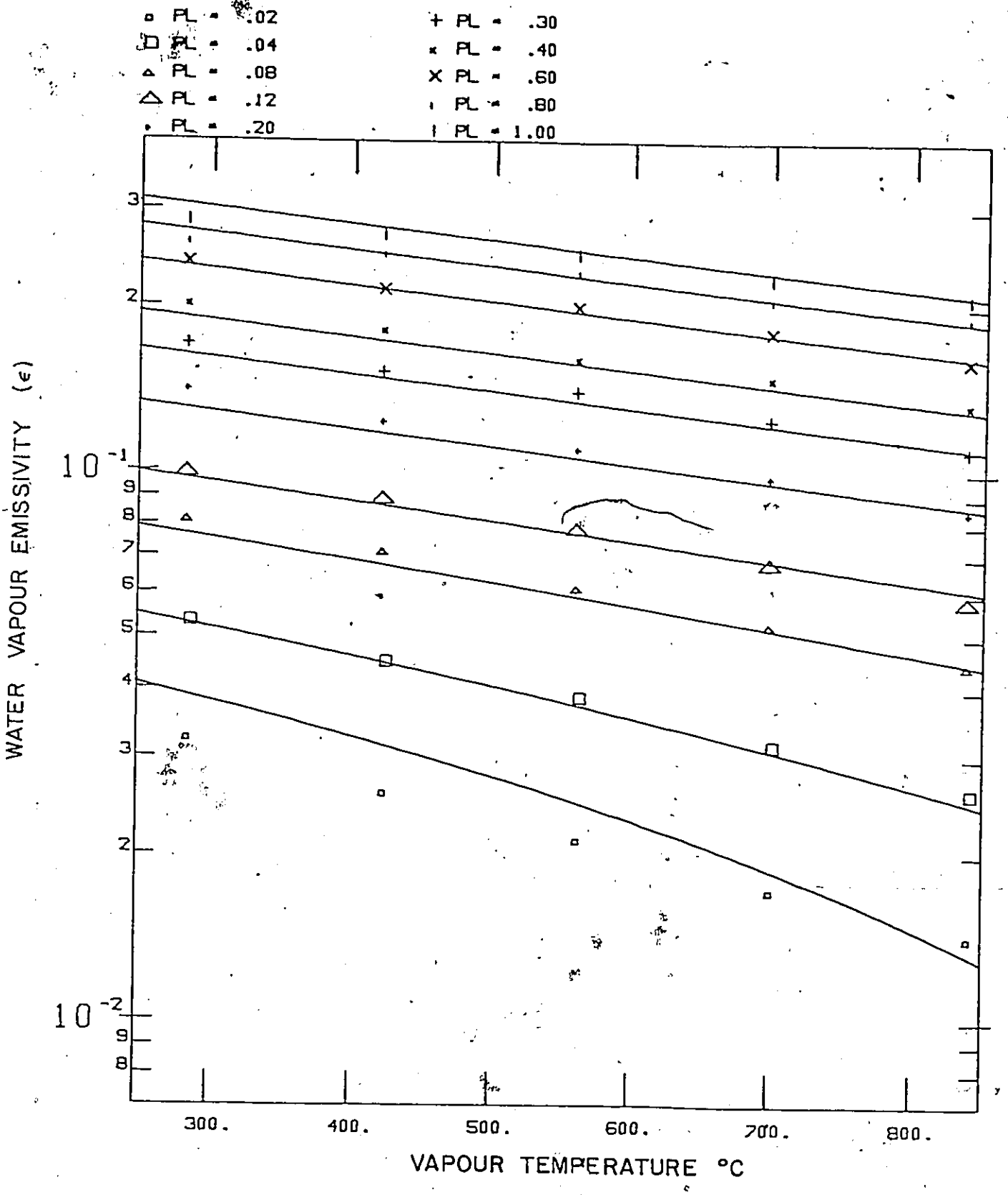


FIGURE A.3: A COMPARISON OF THE EMPIRICAL CORRELATION OF EMISSIVITY WITH DATA INTERPOLATED FROM FIGURE A.2.

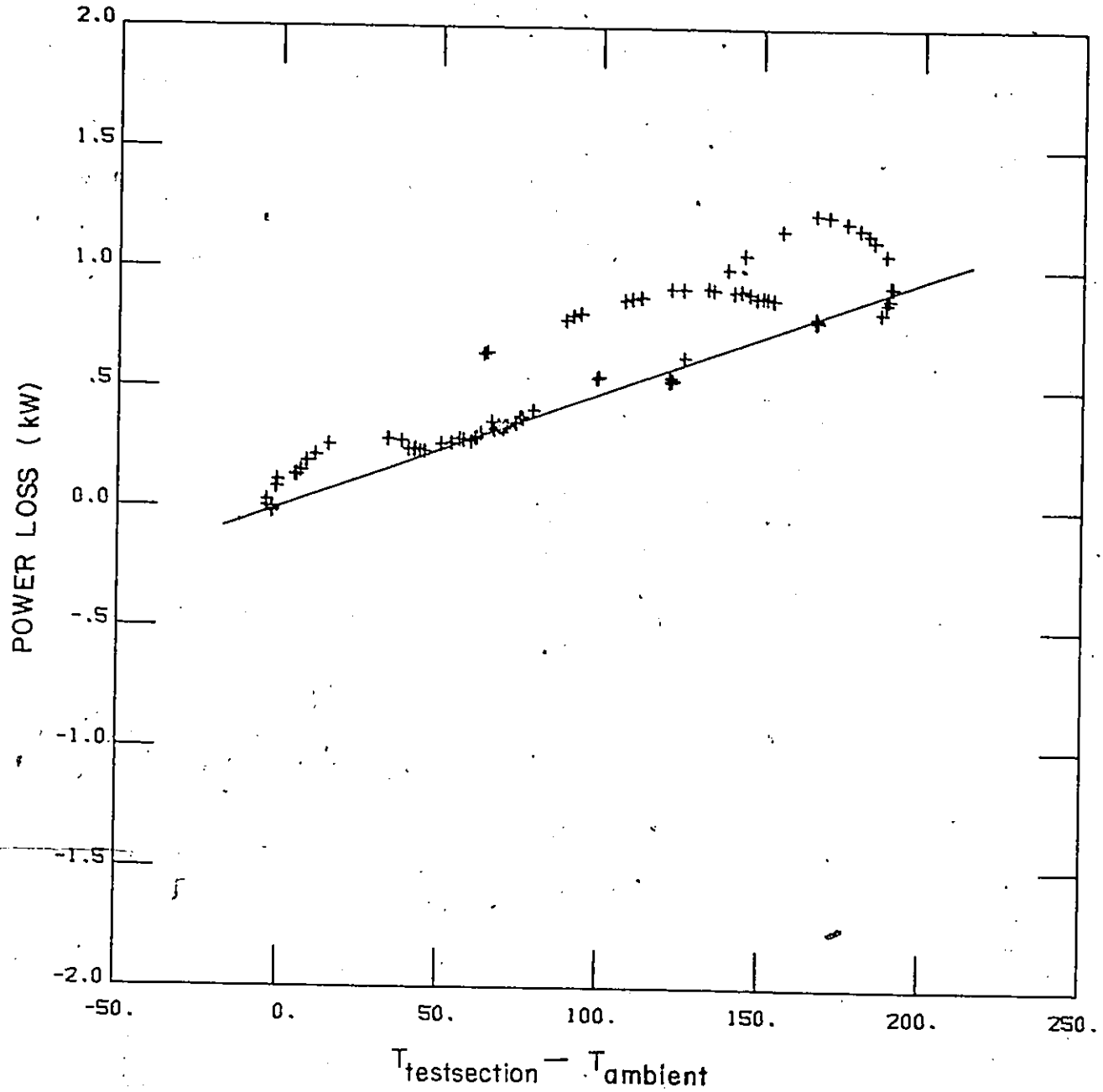


FIGURE B.1: ZERO POWER HEAT LOSS DATA.

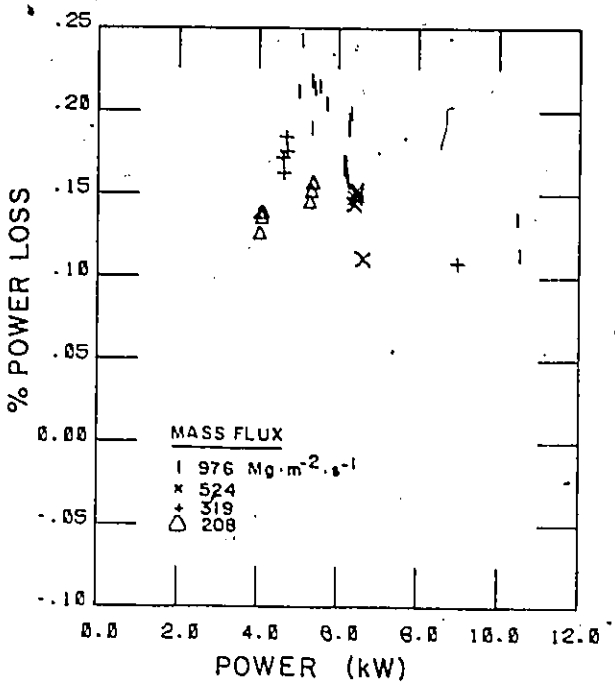


Figure B.2: Heat Balance Data.

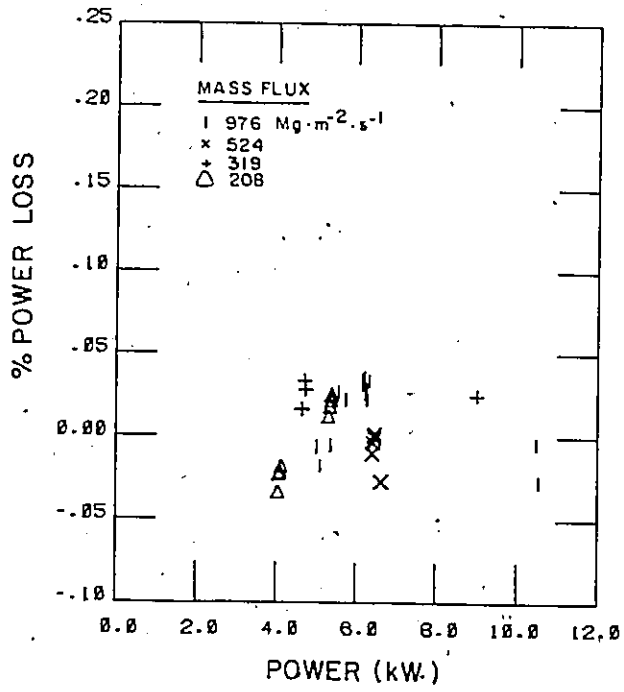


FIGURE B.3: HEAT BALANCE RESULTS CORRECTED FOR HEAT LOSS AT THE TWO POWER CLAMPS ACCORDING TO EQUATION B.2.

TABLE 8.1 - RUN MATRIX

INLET SUBCOOLING kJ·kg^{-1}	MASS FLUX kg·m^{-2}·s^{-1}					
	120	215	359	524	923	2750
50	2,4	2,4	3,2, 4	4,2	2	9
100	2,8 .4	2,4, 8	8,6,4, 3,2	8,6, 4,2	9,8,6 4,2	9
182		8	8,6,4	8,6,2	8,6	
255			8,6	8,6,9	9,8	

The numbers in the chart boxes indicate the nominal outlet pressure values where data have been obtained.

Explanation of Column Headings of Tables D.1 and D.2

RUN	- run number as described in Appendix D.
TIME	- time of day when the run was taken
DATE	- day and month when the run was taken
P OUT	- outlet pressure (kPa)
P DROP	- pressure drop between the inlet and outlet pressure taps (kPa). Fig. 3.2 shows the locations of the pressure taps
HOTP POW	- hot patch power (kW)
T/S POW	- test section power (kW)
FLOW	- mass flow rate through the test section ($kg \cdot h^{-1}$)
T IN	- inlet temperature (°C)
TC1 - TC20	- test section outside wall temperature measurement (°C). The locations of the thermocouples are shown in Fig. 3.2.
T HOTP	- hot patch temperature (°C)
MINF TEMP	- minimum film boiling temperature (°C)
MINF POWER	- test section power at the minimum film boiling temperature (kW)
MINF QUAL	- local thermodynamic equilibrium quality at the minimum film boiling temperature location
T/C	- thermocouple number at the minimum film boiling location. Fig. 3.2 shows the thermocouples and their locations along the test section.

TABLE D.1 WALL TEMPERATURE DATA

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
2311	14:37:42	07/08	2066.	39.	1.38	8.40	68.6	202.9	741	744	722	742	730	703	689	670	675	646	646	631	638	626	627	626	624	636	646	743
2311	14:39:36	07/08	2066.	39.	1.38	8.58	67.6	202.1	742	743	724	742	730	700	686	673	676	648	644	634	639	624	624	623	623	634	646	742
2311	14:41:04	07/08	2066.	39.	1.38	8.57	68.1	201.6	745	745	724	745	731	703	694	674	675	646	646	635	639	625	622	624	621	631	645	742
2311	14:48:36	07/08	2059.	41.	1.38	8.75	67.2	199.6	756	756	739	754	741	713	715	678	683	654	653	641	643	629	632	628	631	635	646	745
2311	14:49:50	07/08	2066.	41.	1.38	8.80	67.7	199.7	754	754	739	754	739	713	714	680	682	652	652	640	642	630	630	631	631	636	646	745
2311	14:52:11	07/08	2059.	41.	1.38	7.80	68.7	200.1	715	716	697	714	700	671	671	637	640	607	609	597	600	583	585	586	585	600	618	745
2311	14:53:39	07/08	2059.	39.	1.38	7.92	67.2	200.1	718	719	696	716	700	666	661	638	641	609	609	597	603	587	587	587	586	603	621	745
2311	14:54:27	07/08	2059.	41.	1.38	7.81	68.3	200.5	716	719	697	715	697	670	671	634	636	609	611	598	602	587	587	593	589	603	621	745
2311	14:56:07	07/08	2066.	41.	1.38	7.85	67.8	200.5	718	719	698	715	697	672	673	636	639	611	612	597	603	587	587	590	590	605	621	745
2311	14:57:48	07/08	2074.	39.	1.38	7.73	68.3	200.5	718	718	691	715	700	671	667	632	637	610	610	594	597	588	588	587	587	604	619	745
2311	15:01:45	07/08	2051.	39.	1.38	6.68	68.3	200.8	667	666	642	662	643	614	616	579	583	556	554	544	544	532	536	535	536	560	589	745
2311	15:05:51	07/08	2059.	41.	1.38	6.71	67.8	201.4	666	667	644	662	643	609	616	581	583	557	556	547	549	536	534	540	537	564	588	745
2311	15:07:18	07/08	2059.	41.	1.39	6.78	67.8	201.5	667	667	639	662	642	614	603	577	582	554	555	541	547	532	535	540	538	566	590	745
2311	15:08:32	07/08	2066.	41.	1.38	6.78	68.3	201.3	666	664	631	661	640	608	599	580	582	554	554	539	546	533	533	537	534	562	590	745
2311	15:12:15	07/08	2006.	41.	1.38	6.81	67.8	201.3	667	666	641	663	645	613	607	585	589	563	561	551	556	545	547	547	548	574	597	746
2311	15:14:37	07/08	2013.	39.	1.39	6.72	66.8	201.3	667	669	637	664	645	619	600	586	588	562	561	549	550	541	542	549	544	571	594	747
2311	15:15:52	07/08	2013.	41.	1.39	6.66	67.8	201.3	668	667	637	662	646	617	617	581	588	560	559	546	547	542	545	546	547	572	596	747
2311	15:16:52	07/08	2013.	41.	1.39	6.69	67.3	201.4	667	667	646	663	644	619	620	583	587	560	560	551	554	540	541	548	544	570	596	748
2311	15:22:50	07/08	2021.	41.	1.37	6.69	68.3	201.2	667	667	645	664	645	614	618	583	585	556	559	548	552	540	539	546	546	572	594	747
2311	15:26:46	07/08	2021.	41.	1.39	5.53	67.8	201.2	605	604	574	597	580	552	554	519	521	497	498	486	483	480	480	488	488	524	556	750
2311	15:28:13	07/08	2021.	41.	1.37	5.53	68.8	200.9	600	602	577	596	575	544	551	519	520	494	494	484	487	475	476	486	485	524	557	750
2311	15:29:13	07/08	2013.	41.	1.37	5.64	68.4	200.6	602	601	577	597	575	545	535	517	519	494	494	483	486	478	477	484	483	524	556	747
2311	15:30:14	07/08	2013.	39.	1.38	5.58	68.4	201.1	601	602	575	594	575	548	550	517	519	494	494	484	487	474	477	488	484	525	558	749
2311	15:31:32	07/08	2013.	39.	1.37	5.54	67.8	201.0	601	601	570	595	575	549	538	518	519	493	493	482	485	477	478	485	482	526	557	749
2311	15:37:30	07/08	2013.	41.	1.37	4.80	67.9	201.2	553	553	527	545	526	498	489	468	470	451	453	442	440	431	437	450	446	493	529	746
2311	15:38:57	07/08	2013.	39.	1.34	4.80	67.9	200.9	552	551	519	541	523	496	484	468	472	450	448	438	443	433	433	445	446	492	528	744
2311	15:39:49	07/08	2021.	39.	1.36	4.85	68.4	201.0	552	551	515	541	523	499	484	467	472	448	448	437	437	435	434	447	442	490	528	745
2311	15:41:03	07/08	2006.	41.	1.36	4.92	67.9	200.9	553	551	516	544	525	494	490	470	472	450	448	436	442	434	434	444	442	493	530	742
2311	15:42:17	07/08	2013.	41.	1.36	4.85	67.9	201.0	552	551	515	544	524	498	489	470	475	449	451	438	439	435	436	449	443	489	529	744
2311	15:44:39	07/08	2013.	41.	1.34	4.54	68.4	200.6	528	528	494	519	499	467	458	447	448	426	426	414	421	412	413	421	423	476	514	743
2311	15:44:59	07/08	2006.	41.	1.34	4.53	67.4	200.5	527	525	500	519	499	466	457	449	450	427	426	418	420	413	414	424	422	476	514	741
2311	15:48:15	07/08	2021.	41.	1.35	4.31	67.9	200.5	511	510	484	504	484	455	449	433	435	413	413	404	408	401	400	413	412	465	509	738
2311	15:49:55	07/08	2013.	39.	1.37	4.18	67.9	200.9	514	514	485	505	484	460	460	432	435	414	415	407	403	399	401	416	416	466	505	740
2311	15:51:23	07/08	2013.	39.	1.36	4.28	67.9	200.7	511	511	479	502	484	459	432	432	435	414	414	401	402	400	399	413	411	466	507	739
2311	15:53:17	07/08	2013.	41.	1.37	4.26	68.9	200.7	511	510	472	502	483	458	455	430	435	413	413	403	399	400	400	414	413	465	508	738
2311	15:55:52	07/08	2021.	41.	1.37	4.03	68.9	200.7	486	487	461	478	460	437	438	412	414	392	394	385	387	376	381	395	394	448	493	738
2311	15:56:26	07/08	2013.	41.	1.37	3.96	68.4	200.7	488	487	460	479	459	438	438	413	414	395	393	387	388	379	378	395	395	452	492	738
2311	15:57:26	07/08	2006.	39.	1.36	3.88	67.9	200.5	487	487	454	477	459	438	438	413	409	414	393	395	384	384	383	383	397	396	445	736
2311	15:57:59	07/08	2013.	39.	1.36	3.92	67.9	200.6	486	486	449	476	459	437	438	411	413	396	397	383	383	381	381	397	393	449	494	736
2311	16:06:52	07/08	2013.	50.	0.00	0.00	67.4	200.6	212	212	214	212	212	212	212	210	211	211	212	211	212	210	211	212	212	218	231	259
2311	16:06:52	07/08	2013.	50.	0.00	0.00	67.4	200.6	212	212	214	212	212	212	212	210	211	211	212	211	212	210	211	212	212	218	231	259
2421	11:29:01	26/09	1991.	44.	1.34	12.01	117.9	189.4	708	709	715	713	715	707	708	700	704	693	694	680	682	664	660	650	649	648	654	741
2421	11:30:01	26/09	1953.	44.	1.34	11.95	117.9	189.5	706	708	713	714	713	708	708	702	706	696	696	680	685	669	665	654	652	652	657	742
2421	11:31:01	26/09	2028.	44.	1.34	12.09	117.9	189.7	706	708	713	713	715	707	708	703	705	691	692	680	680	669	665	656	653	654	654	742
2421	11:32:42	26/09	2036.	44.	1.34	12.19	117.7	190.2	707	708	711	712	712	707	706	700	705	697	697	683	686	669	669	658	652	651	659	742
2421	11:33:42	26/09	2043.	44.	1.34	12.00	117.9	190.6	707	710	713	713	714	708	710	704	706	696	698	682	688	669	670	661	660	657	660	742
2421	11:37:51	26/09	1991.	44.	1.33	10.95	117.9	190.4	685	688	688	691	688	682	682	672	676	662	659	644	650	631	632	627	617	623	633	742
2421	11:40:13	26/09	1953.	44.	1.34	10.97	117.7	190.3	685	685	686	688	686	680	682	674	676	661	659	641	646	631	630	620	618	622	632	741
2421	11:41:13	26/09	2043.	44.	1.35	11.05	118.2	190.4	684	686	687	690	688	682	682	672	675	659	659	644	646	631	630	619	617	624	630	741
2421	11:42:54	26/09	2043.	44.	1.35	11.05	118.0	190.3	683	685	686	687	686	679	678	672	673	660	659	641	644	624	627	618	615	621	631	741
2421	11:47:03	26/09	2036.	44.	1.36	10.10	118.2	190.3	657	659	657	661	658	646	648	632	635	616	613	597	604	583	581	572	565	579	597	739
2421	11:48:30	26/09	2028.	44.	1.36	10.10	118.0	190.3	654	656	656	659	655	644	645	633	637	611	613	599	600	580	583	568	569	581	598	739
2421	11:49:44	26/09	2021.	41.	1.36	10.15	118.2	190.4	657	657	654	659	656	645	647	634	637	614	614	598	599	579	581	570	567	578	596	739
2421	11:51:11	26/09	2028.	44.	1.36	9.94	118.0	190.5	657	659	657	661	657	645	646	632	635	613	613	598	601	579	581	570	570	581	597	739
2421	11:56:00	26/09	2013.	44.	1.39	9.19	118.5	190.4	628	630	624	628	624	614	614	596	600	570	572	551	560	538	535	522	520	544	565	740
2421	11:57:28	26/09	2036.	44.	1.40	9.14	118.0	190.3	630	631	625	630	624	614	614	595	598	570	572	554	558	537	538	525	523	546	565	741
2421	11:58:56	26/09	2051.	44.	1.40	9.10	118.8	190.4	630	630	624	631	626	616	617	595	599	569	567	553	554	534	533	518	517	541	563	742
2421	12:00:36	26/09	1991.	44.	1.40	9.05	118.2	190.3	629	629	624	630	624	612	613	594	597	570	568	552	557	536	535	521	519	544	567	744
2421	12:04:59	26/09	2036.	44.	1.42	8.10	118.0	190.3	597	597	589	595	589	575	577	553	557	524	525	505	509	484	483	468	465	502	532	745
2421	12:06:26	26/09	2043.	44.	1.42	8.19	118.2	190.3	594	594	588	594	588	575	575	554	556	525	524	504	509	484	483	466	464	500	531	746
2421	12:07:53	26/09	2028.	41.	1.42	8.11	118.5	190.3	597	597	588	596	587	574	575	554	557	525	524	505	510	484	484	468	466	502	535	746
2421	12:09:20	26/09	2021.	44.	1.42	8.20	118.0	190.4	597	596	589	596	589	576	577	554	556	525	524	507	510	484	484	469	468	504	534	747
2421	12:12:49	26/09	2043.	44.	1.42	7.73	118.5	190.3	572	575	564	572	564	552	552	528	530	496	496	477	481	453	452	434	433	478	512	748
2421	12:14:16	26/09	2028.	44.	1.42	7.59	118.2	190.3	578	578	565	575	567	552	553	530	532	495	497	476	480	451	453	434	431	477	513	748
2421	12:15:29	26/09	2036.	44.	1.42	7.58	118.5	190.3	575	574	564	570	563	551	553	529	529	494	496	476	477	451	452	432	430	477	511	748
2421	12:16:16	26/09	2043.	44.	1.42	7.67	118.5	190.4	574	574	565	572	564	552	553	528	531	495	498	477	477	450	451	432	431	478	512	748
2421	12:19:31	26/09	1991.	44.	1.42	7.37	118.2	190.2	562	561	549	560	551	535	536	511	514	478	480	458	460	432	430	412	410	462	500	749
2421	12:20:31	26/09	2028.	44.	1.42	7.34	118.2	190.3	561	561	550	559	550	535	537	510	511	477	477	456	459	430	429	412	408	461	498	749
2421	12:21:18	26/09	2043.	44.	1.42	7.31	118.8	190.3	561	561	549	560	549	536	537	511	512	478	479	458	459	432	430	411	410	463	501	749
2421	12:22:18	26/09	2043.	44.	1.42	7.35	118.5	190.3	564	564	552	561	552	537	537	511	512	478	479	458	459	432	430	411	410	463	501	749
2421	12:23:59	26/09	2043.	44.	1.42	7.01	118.5	190.2	547	548	538	546	537	521	523	495	496	461	460	438	441	410	410	391	389	447	486	749
2421	12:25:40	26/09	2043.	44.	1.42	6.94	118.0	190.3	546	547	533	547	533	516	520	492	495	460	460	437	438	407	408	387	386	442	485	749
2421	12:26:53	26/09	2043.	44.	1.42	7.05	118.2	190.3	547	546	536	544	537	518	520	491	495	459	458	436	436	408	408	384	383	441	484	748
2421	12:28:07	26/09	2028.	44.	1.42	7.07	118.3	190.2	546	546	535	544	534	518	518	493	494	456	457	436	435	405	405	386	385	441	483	748
2421	12:31:35	26/09	2021.	47.	1.42	6.52	118.3	190.0	229	232	225	227	223	225	223	224	223	222	223	222	223	220	222	220	220	225	277	746
2421	12:32:22	26/09	2051.	47.	1.42	6.66	118.2	190.2	226	227	225	225	223	224	223	223	222	222	223	220	221	220	220	225	274	745
2321	14:46:00	26/09	2028.	41.	1.31	9.01	81.2	190.9	707	709	694	708	693	669	669	642	645	614	617	601	603	586	586	578	573	591	609	752
2321	14:47:27	26/09	2028.	41.	1.31	9.09	81.2	191.7	711	710	696	708	696	673	673	644	646	620	621	604	609	590	590	584	580	594	613	751
2321	14:58:20	26/09	2028.	41.	1.34	8.97	81.2	189.8	709	710	695	707	696	671	672	642	645	617	615	599	603	579	581	573	567	585	604	747
2321	15:24:50	26/09	2043.	41.	1.34	9.12	80.4	189.6	713	714	697	713	697	672	672	643	645	614	615	598	601	582	582	569	566	579	603	748

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
2321	15:25:51	26/09	2021.	41.	1.34	9.09	80.4	189.6	713	714	697	711	698	674	675	644	650	617	615	598	599	581	581	570	572	584	605	749
2321	15:26:51	26/09	2036.	41.	1.34	9.17	80.0	189.6	712	713	697	711	697	674	674	646	647	618	618	599	603	585	583	572	569	582	606	749
2321	15:28:46	26/09	1945.	41.	1.33	9.04	80.0	189.3	714	714	698	713	699	673	676	645	647	616	617	596	600	582	580	567	567	581	603	750
2321	15:30:13	26/09	1991.	41.	1.34	9.14	80.4	189.4	713	713	696	712	695	673	673	647	650	615	616	599	600	580	580	566	566	579	602	749
2321	15:33:02	26/09	2036.	41.	1.35	8.13	80.4	189.8	680	680	661	677	662	637	637	605	606	577	578	558	559	541	541	527	527	550	575	749
2321	15:34:16	26/09	2036.	41.	1.35	8.10	80.4	189.9	678	678	657	675	659	634	634	603	604	575	576	558	559	542	539	530	526	546	576	750
2321	15:35:57	26/09	2036.	41.	1.35	8.14	80.0	190.3	680	681	661	678	660	635	634	605	605	577	576	562	561	545	543	535	530	553	577	749
2321	15:37:11	26/09	2043.	41.	1.35	8.21	80.4	190.4	679	680	659	676	659	632	634	606	607	579	579	560	564	544	542	532	531	552	578	749
2321	15:42:28	26/09	2028.	41.	1.35	7.54	79.6	190.4	649	650	627	645	627	602	603	572	574	544	544	526	528	508	510	497	495	522	553	748
2321	15:43:43	26/09	1991.	41.	1.35	7.45	79.6	190.1	649	649	628	646	628	603	605	572	573	542	541	524	527	507	505	494	493	520	551	748
2321	15:44:30	26/09	2028.	41.	1.35	7.53	79.6	190.3	648	649	628	644	629	603	603	570	573	541	542	526	527	509	508	499	496	524	554	748
2321	15:45:31	26/09	2059.	41.	1.35	7.45	80.0	190.3	650	650	627	644	625	599	602	572	575	541	540	523	523	507	505	494	492	520	549	747
2321	15:49:53	26/09	2043.	41.	1.35	6.75	80.0	190.3	610	611	586	605	585	560	561	531	531	495	496	478	482	461	461	446	445	482	519	746
2321	15:51:07	26/09	2043.	41.	1.35	6.79	79.6	190.2	609	610	587	605	587	560	559	532	534	499	497	479	481	464	462	448	446	483	518	747
2321	15:52:34	26/09	2028.	41.	1.36	6.70	79.6	190.2	610	610	587	603	586	560	561	531	532	497	497	481	482	462	464	451	449	483	521	746
2321	15:53:35	26/09	2036.	41.	1.36	6.69	79.6	190.2	609	610	587	603	586	561	562	532	532	496	496	479	479	459	460	446	445	475	516	746
2321	15:57:17	26/09	1983.	41.	1.37	6.11	79.6	190.1	580	580	554	575	554	529	528	498	500	464	465	448	449	430	427	414	410	449	494	745
2321	15:58:17	26/09	2036.	41.	1.37	6.19	79.6	190.1	580	581	554	575	554	528	529	497	500	464	464	448	449	430	429	412	413	452	495	745
2321	15:59:31	26/09	2043.	41.	1.38	6.13	79.6	190.1	578	577	552	570	552	526	527	498	499	462	462	445	449	428	427	411	408	448	494	745
2321	16:00:58	26/09	2036.	41.	1.38	6.24	79.6	190.1	577	579	553	572	552	526	528	498	500	464	465	448	449	431	431	414	412	455	497	745
2321	16:04:26	26/09	1960.	44.	1.37	5.74	79.6	190.0	232	235	226	228	224	225	224	225	224	223	224	223	225	222	224	222	222	228	276	742
2321	16:05:26	26/09	1991.	44.	1.38	5.74	79.6	189.9	226	227	224	224	222	223	222	223	222	222	224	223	224	222	223	222	221	227	273	741
2521	13:59:07	29/09	2006.	47.	1.43	13.78	208.6	191.3	642	648	672	657	673	687	688	700	704	699	699	689	694	682	682	676	667	668	669	749
2521	14:01:28	29/09	1991.	50.	1.42	13.62	208.3	191.0	643	646	669	654	670	688	688	700	703	703	701	689	692	685	682	676	670	669	670	748
2521	14:04:56	29/09	2006.	47.	1.42	13.73	208.1	190.8	643	646	673	656	673	688	688	700	703	700	698	688	693	685	680	674	670	667	669	748
2521	14:06:25	29/09	2006.	50.	1.42	13.63	208.0	190.8	644	646	670	654	670	686	688	698	701	701	699	690	694	682	680	676	669	666	667	747
2521	14:08:05	29/09	1945.	50.	1.43	13.79	208.0	190.6	644	646	672	654	672	690	691	701	705	699	698	691	694	682	680	676	669	666	667	747
2521	14:12:14	29/09	1998.	50.	1.43	12.59	208.1	190.6	625	627	649	636	650	664	665	666	666	656	658	643	646	634	634	629	623	627	634	745
2521	14:14:49	29/09	1945.	50.	1.41	12.47	208.7	190.3	625	628	652	635	651	663	663	668	669	655	656	644	647	634	634	627	622	627	632	744
2521	14:17:38	29/09	1991.	50.	1.42	12.47	208.3	190.5	627	629	651	636	651	663	663	664	667	657	656	646	646	633	635	629	620	629	634	742
2521	14:21:47	29/09	2006.	47.	1.41	12.65	208.6	190.5	624	628	651	636	650	663	663	666	669	657	657	645	646	634	634	630	621	629	634	741
2521	14:23:56	29/09	1991.	50.	1.42	12.49	208.7	190.5	627	630	651	637	650	663	665	665	668	656	654	642	646	632	630	624	617	625	630	740
2521	14:27:11	29/09	2006.	50.	1.42	11.51	208.3	190.5	605	610	628	615	630	635	636	630	632	614	614	602	603	587	587	584	577	592	599	738
2521	14:29:05	29/09	1998.	47.	1.42	11.53	208.6	190.5	606	609	628	615	629	634	636	630	634	617	615	601	603	588	589	585	576	591	599	737
2521	14:30:46	29/09	2006.	50.	1.44	11.49	208.6	190.5	607	608	628	614	630	635	636	628	630	612	611	599	601	586	584	581	573	591	597	737
2521	14:31:46	29/09	1945.	50.	1.43	11.43	208.6	190.4	608	609	630	616	629	636	637	630	634	614	615	600	603	587	587	583	576	592	599	737
2521	14:32:46	29/09	1998.	50.	1.44	11.53	208.6	190.6	605	608	629	614	629	635	635	631	632	614	615	600	602	590	587	586	576	593	599	736
2521	14:37:36	29/09	2006.	50.	1.65	10.19	208.7	190.6	578	579	595	586	594	590	591	578	575	554	553	536	536	516	516	513	506	538	553	736
2521	14:39:18	29/09	1953.	50.	1.65	10.20	208.6	190.6	578	579	594	585	594	590	593	578	578	552	551	532	534	517	513	512	506	538	554	736
2521	14:42:49	29/09	1991.	50.	1.54	10.26	208.7	190.4	578	579	594	586	593	591	593	577	578	555	553	536	539	521	516	519	511	544	558	742
2521	14:44:16	29/09	2013.	50.	1.54	10.13	208.6	190.5	575	579	592	582	593	590	592	575	577	549	550	534	533	516	514	515	506	541	555	748
2521	14:48:52	29/09	1968.	50.	1.53	9.30	208.7	190.4	560	560	570	564	568	562	563	543	546	511	511	491	491	472	469	473	465	510	528	750
2521	14:50:33	29/09	1998.	47.	1.53	9.27	208.6	190.4	558	560	568	564	570	563	563	541	545	512	511	491	491	472	469	473	463	509	529	753
2521	14:53:07	29/09	1983.	47.	1.53	9.24	208.6	190.3	557	557	568	563	569	565	564	542	546	512	511	491	491	472	469	473	465	512	532	754
2521	14:54:34	29/09	2013.	47.	1.53	9.35	208.4	190.5	558	559	569	562	567	562	563	541	545	511	511	491	491	472	470	473	466	511	531	756
2521	14:58:17	29/09	1998.	47.	1.47	8.59	208.6	190.4	537	537	543	541	543	531	531	505	508	469	468	447	447	425	423	428	423	480	504	757
2521	15:00:11	29/09	1938.	47.	1.47	8.45	208.4	190.3	537	537	544	540	544	529	530	506	506	469	469	447	448	426	424	431	423	482	504	756
2521	15:02:06	29/09	1923.	50.	1.47	8.45	207.8	190.4	536	537	542	538	541	529	529	505	507	466	466	443	445	423	421	426	419	478	503	753
2521	15:03:33	29/09	1945.	50.	1.47	8.45	208.4	190.5	537	538	541	540	540	528	528	505	507	466	466	444	446	423	422	428	422	477	503	750
2521	15:06:21	29/09	1953.	50.	1.47	8.33	208.3	190.6	527	529	533	532	532	516	518	493	494	452	451	430	431	408	405	411	404	466	492	748
2521	15:07:48	29/09	2013.	47.	1.48	8.28	208.4	190.6	528	528	532	532	531	518	517	491	492	449	450	429	430	405	405	408	402	464	491	746
2521	15:09:29	29/09	2006.	50.	1.48	8.18	208.6	190.6	528	529	534	531	533	517	518	492	494	451	451	430	431	408	407	411	406	465	490	745
2521	15:11:37	29/09	2006.	47.	1.48	8.25	208.4	190.6	529	529	533	531	532	518	520	492	496	453	453	429	431	408	407	411	404	467	490	745
2521	15:15:06	29/09	1991.	47.	1.48	7.95	208.6	190.6	519	520	520	521	519	505	506	478	478	437	437	415	416	392	392	396	389	453	481	741
2521	15:16:47	29/09	2013.	47.	1.48	7.87	208.6	190.5	520	522	523	524	521	502	504	476	479	442	441	420	422	395	394	390	386	450	479	740
2521	15:19:21	29/09	1998.	47.	1.57	7.99	208.6	190.5	516	518	520	520	518	502	504	477	479	437	437	416	416	391	391	395	386	453	479	741
2521	15:21:42	29/09	1945.	50.	1.56	8.02	209.2	190.6	518	519	520	521	520	503	506	477	479	439	440	419	419	393	391	391	382	450	477	745
2521	15:24:03	29/09	1998.	50.	1.57	7.52	208.6	190.5	513	513	507	511	505	485	487	459	466	432	434	409	412	381	381	367	364	436	474	748
2521	15:25:58	29/09	1998.	52.	1.57	7.56	207.8	190.6	231	235	225	228	223	225	223	223	222	221	222	220	221	218	219	216	216	227	272	749
2521	15:26:58	29/09	1923.	52.	1.56	7.52	208.6	190.5	224	225	223	223	221	222	222	221	221	220	221	220	220	217	218	216	215	224	259	750
2511	13:41:46	30/09	1991.	52.	1.44	13.82	203.2	201.8	634	636	656	644	657	665	666	679	682	705	704	708	713	715	714	708	702	691	697	761
2511	13:43:13	30/09	2006.	52.	1.45	14:08	202.9	201.9	635	640	659	647	660	667	669	680	685	708	706	711	713	713	712	708	701	693	698	761
2511	13:44:27	30/09	1998.	50.	1.46	13.95	203.1	201.9	635	639	659	648	659	670	670	682	684	705	705	709	714	714	715	705	703	692	698	761
2511	13:45:54	30/09	2006.	52.	1.45	13.89	203.4	201.9	635	640	658	646	659	666	669	681	684	707	707	708	713	714	715	708	707	693	698	761
2511	13:47:08	30/09	2013.	52.	1.46	13.98	203.5	201.9	634	639	659	646	659	667	667	680	685	706	705	710	715	715	713	708	701	692	700	762
2511	13:49:56	30/09	1960.	50.	1.45	12.86	203.7	201.7	623	625	642	634	643	650	651	663	666	685	683	688	691	690	691	685	680	670	677	762
2511	13:51:23	30/09	2013.	50.	1.46	12.95	203.1	201.9	624	627	642	633	642	650	650	661	663	685	685	687	691	691	688	683	680	669	678	763
2511	13:53:04	30/09	1991.	50.	1.47	12.86	203.5	202.0	624	625	643	632	644	650	652	663	665	685	686	686	688	687	690	682	675	670	678	763
2511	13:54:31	30/09	2006.	50.	1.44	12.91	203.7	202.0	624	626	643	632	643	649	650	663	666	685	685	687	692	688	690	679	675	669	678	763
2511	13:57:33	30/09	1991.	50.	1.45	11.10	204.3	201.7	594	596	609	601	609	614	615	624	625	635	637	635	638	637	637	634	627	623	636	761
2511	13:59:00	30/09	2006.	47.	1.43	11.10	203.8	201.8	594	596	608	601	609	613	613	620	623	634	635	635	640	637	636	631	627	625	636	758
2511	14:00:54	30/09	2021.	50.	1.42	11.26	203.7	201.8	593	596	609	601	610	613	614	620	625	636	635	633	637	636	636	631	625	622	635	761
2511	14:01:54	30/09	1998.	50.	1.42	11.10	204.0	201.6	593	595	607	601	609	614	616	621	623	632	634	634	635	636	636	635	630	629	636	758
2511	14:04:15	30/09	1953.	47.	1.42	9.55	204.7	201.7	560	561	571	565	570	573	573	574	576	579	580	579	581	579	579	575	570	578	590	755
2511	14:05:29	30/09	2013.	47.	1.43	9.52	204.6	201.7	560	562	570	566	571	573	574	574	576	579	581	582	579	582	581	581	578	575	579	594	756
2511	14:06:29	30/09	1915.	47.	1.42	9.45	204.3	201.5	559	561	568	564	569	570	573	574	576	579	580	579	581	579	579	575	570	578	590	755
2511	14:07:56	30/09	2006.	47.	1.42	9.60	204.7	201.6	559	561	570	565	570	574	574	574	576	580	580	579	580	578	578	575	572	577	593	752
2511	14:13:12	30/09	2006.	47.	1.42	8.13	205.2	201.4	522	523	528	526	528	527	528	525	529	528	526	521	523	521	523	522	518	529	549	747
2511	14:14:39	30/09	2006.	47.	1.42	7.99	205.2	201.4	521	524	529	526	530	529	529	527	528	525	524	522	523	522	522	519	519	532	550	746
2511	14:15:53	30/09	1968.	47.	1.42	8.04	204.7	201.4	522	523	528	525	528	528	528	525	527	526	524	522	523	521	521	522	516	532	550	745

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
2511	14:17:07	30/09	2006.	47.	1.42	8.08	205.2	201.5	522	524	532	525	529	528	529	525	528	524	524	521	524	521	521	520	516	531	549	744
2511	14:21:03	30/09	2013.	47.	1.43	6.43	204.9	201.6	472	472	475	474	473	468	469	461	462	455	455	449	451	450	451	457	452	475	502	741
2511	14:22:43	30/09	1923.	47.	1.43	6.51	205.5	201.5	473	475	475	475	475	468	469	460	463	456	456	451	454	452	451	459	456	477	502	739
2511	14:23:17	30/09	2006.	47.	1.43	6.50	205.2	201.5	473	474	475	475	474	468	468	462	463	456	456	451	454	452	452	460	456	479	502	739
2511	14:24:17	30/09	1998.	47.	1.43	6.49	205.3	201.6	472	473	473	474	474	469	471	459	462	456	455	451	451	452	451	460	454	477	502	738
2511	14:28:18	30/09	2021.	47.	1.49	6.02	205.0	201.7	452	453	453	454	451	446	447	435	435	427	427	423	425	425	424	433	428	459	484	737
2511	14:29:59	30/09	2006.	47.	1.50	5.96	204.9	201.7	453	454	452	454	453	446	446	436	437	428	429	425	427	426	426	436	431	459	486	738
2511	14:31:13	30/09	1998.	47.	1.27	5.97	205.0	201.8	450	453	453	455	451	446	446	437	437	430	429	423	427	427	425	435	431	460	486	735
2511	14:32:27	30/09	1983.	47.	1.28	5.87	205.2	201.8	448	448	452	454	451	447	447	436	437	431	431	426	427	429	427	436	434	460	485	730
2511	14:34:34	30/09	2006.	47.	1.29	5.59	205.2	201.8	220	222	437	437	436	428	428	418	420	410	411	407	410	409	408	419	416	445	473	723
2511	14:35:34	30/09	2013.	47.	1.29	5.52	205.6	202.0	219	220	435	436	434	429	429	418	420	411	412	407	407	409	409	418	416	444	472	720
2511	14:36:34	30/09	2013.	47.	1.29	5.55	205.6	202.0	220	220	435	436	433	427	428	418	419	409	409	404	404	406	405	415	412	443	469	717
2511	14:38:30	30/09	1998.	47.	1.68	5.18	205.3	202.0	218	219	422	424	421	414	416	403	405	395	395	392	394	394	394	406	402	432	459	715
2511	14:40:24	30/09	2013.	47.	1.66	5.19	205.2	202.0	218	219	421	420	420	412	413	401	403	395	394	390	392	390	392	405	399	433	459	725
2511	14:41:37	30/09	1960.	47.	1.65	5.14	205.5	201.7	218	219	421	419	419	413	413	402	403	395	395	389	392	390	392	403	400	433	461	731
2511	14:42:24	30/09	2006.	47.	1.51	5.32	205.0	201.9	217	218	422	419	419	413	413	401	402	394	395	391	391	391	392	404	400	433	463	734
2511	14:44:58	30/09	1945.	47.	1.50	4.87	205.8	201.9	218	218	402	218	401	393	394	382	385	375	375	372	372	374	373	388	383	420	451	737
2511	14:45:58	30/09	1945.	50.	1.50	4.85	205.5	201.9	217	218	221	218	220	393	393	382	385	375	376	372	372	374	374	388	386	421	452	737
2511	14:46:46	30/09	1938.	50.	1.49	4.74	205.2	201.8	217	217	220	218	219	394	394	383	385	374	376	371	373	374	372	386	385	422	451	738
2511	14:48:40	30/09	2013.	50.	1.49	4.42	205.3	201.8	216	217	220	218	219	377	377	366	366	356	356	352	353	354	354	371	369	409	440	739
2511	14:49:27	30/09	2013.	50.	1.50	4.50	205.3	201.8	217	217	220	218	218	377	376	365	364	355	356	352	352	353	353	371	367	408	439	739
2511	14:50:54	30/09	2013.	50.	1.50	4.56	205.5	201.7	216	217	220	218	218	220	220	364	366	357	357	353	356	356	355	371	368	409	441	740
2511	14:51:40	30/09	1998.	50.	1.50	4.42	205.5	201.8	217	217	219	218	218	219	219	365	366	356	357	353	354	355	356	372	369	410	442	741
2511	14:53:21	30/09	2006.	50.	1.50	4.15	205.8	201.8	215	216	219	217	218	218	218	349	352	342	342	338	340	342	341	360	356	399	435	742
2511	14:54:48	30/09	2006.	50.	1.50	4.19	205.5	201.9	216	216	219	217	218	218	218	225	222	342	342	338	339	340	341	361	356	400	433	743
2511	14:55:22	30/09	2013.	50.	1.48	4.20	205.7	201.8	214	217	220	217	218	218	218	219	219	338	338	335	336	338	338	357	352	398	432	742
2511	14:56:08	30/09	2006.	50.	1.47	4.18	205.6	201.9	216	216	219	217	217	218	218	217	218	340	340	337	337	338	338	358	354	398	432	742
2511	14:57:22	30/09	1998.	50.	1.47	3.83	205.3	201.9	216	216	219	217	217	217	218	217	217	218	220	219	219	217	219	219	220	390	425	742
2511	14:58:09	30/09	2013.	52.	1.46	3.89	205.5	201.8	216	216	219	217	217	218	218	216	217	217	219	217	218	216	216	215	215	235	381	742
2411	14:32:12	01/10	1998.	44.	1.34	11.69	117.0	200.0	691	696	706	705	708	700	702	697	701	704	703	702	707	698	700	697	694	675	678	753
2411	14:34:06	01/10	1991.	44.	1.34	11.54	117.0	199.8	697	700	708	706	708	700	702	698	700	705	705	700	706	700	698	700	695	675	676	753
2411	14:35:47	01/10	2006.	44.	1.34	11.57	117.0	199.5	697	700	707	705	708	702	703	696	699	703	704	700	703	696	697	697	691	676	678	753
2411	14:38:22	01/10	1945.	44.	1.33	11.56	117.0	199.1	700	702	709	708	711	704	704	699	703	705	704	701	704	698	697	698	693	675	678	753
2411	14:40:16	01/10	2013.	44.	1.35	11.60	116.8	199.0	699	702	707	706	710	700	701	697	699	700	700	698	703	698	697	694	693	677	678	753
2411	14:41:16	01/10	2006.	44.	1.35	11.57	117.0	199.1	701	703	708	708	708	700	702	697	700	706	706	701	705	697	700	693	694	676	676	753
2411	14:44:31	01/10	1953.	44.	1.33	10.15	117.0	198.9	669	671	673	675	674	665	665	657	659	653	656	650	653	648	643	647	643	636	642	753
2411	14:46:12	01/10	1923.	44.	1.35	10.29	116.8	198.9	668	671	673	672	664	667	657	659	658	655	650	650	643	646	649	643	636	640	753
2411	14:47:39	01/10	1945.	44.	1.34	10.17	116.8	199.1	667	669	671	672	672	662	664	655	657	652	655	649	657	648	648	645	646	636	642	753
2411	14:48:47	01/10	1930.	44.	1.34	10.26	117.3	199.9	669	670	672	673	672	663	665	654	657	657	657	651	652	648	649	648	643	638	642	753
2411	14:52:58	01/10	2021.	41.	1.34	9.08	117.0	200.5	637	639	637	640	636	625	627	615	617	613	612	610	611	603	604	603	604	601	610	751
2411	14:54:52	01/10	1998.	41.	1.33	8.98	117.0	200.7	634	638	635	639	636	626	627	615	617	613	613	607	614	603	604	606	605	603	610	750
2411	14:56:21	01/10	2013.	44.	1.34	9.06	117.0	200.7	635	637	632	639	634	624	623	614	616	614	613	609	612	601	603	605	602	599	611	750
2411	14:58:01	01/10	2013.	41.	1.31	9.02	117.0	200.7	635	637	634	638	634	624	624	613	615	613	612	607	611	603	603	604	604	597	610	748
2411	15:02:30	01/10	2013.	41.	1.31	7.99	117.0	200.6	597	600	594	600	594	581	581	571	572	566	564	560	563	555	555	560	557	562	574	742
2411	15:04:11	01/10	1991.	41.	1.42	7.85	117.3	200.6	599	600	595	600	595	583	584	571	573	564	564	560	562	555	554	562	557	563	577	743
2411	15:05:51	01/10	1991.	41.	1.42	7.84	117.0	200.6	600	601	594	601	595	583	584	571	573	564	564	559	561	555	554	560	556	562	576	745
2411	15:07:45	01/10	1998.	44.	1.42	7.92	117.6	200.7	597	600	593	600	594	582	584	569	574	566	567	561	564	555	555	563	560	563	577	748
2411	15:11:54	01/10	1968.	41.	1.42	6.71	117.0	200.7	555	556	545	554	546	532	535	517	519	510	510	505	508	499	498	507	507	524	543	753
2411	15:13:34	01/10	1998.	41.	1.38	6.67	117.3	200.7	554	554	545	552	544	533	533	519	521	508	507	505	506	496	496	507	506	523	542	753
2411	15:15:28	01/10	2006.	41.	1.37	6.72	117.3	200.7	554	555	545	553	545	533	534	519	521	510	510	502	504	496	499	507	504	522	543	753
2411	15:16:15	01/10	2006.	41.	1.37	6.76	117.6	200.7	554	554	544	553	545	532	531	520	520	509	510	500	504	502	500	510	506	523	542	753
2411	15:20:10	01/10	1976.	41.	1.37	5.67	117.3	200.5	509	509	497	506	498	484	485	469	470	456	456	450	454	446	448	458	457	484	511	752
2411	15:21:37	01/10	1915.	41.	1.36	5.67	117.0	200.4	510	510	497	508	496	483	483	469	469	458	457	451	453	449	448	461	460	486	512	752
2411	15:23:04	01/10	1953.	41.	1.36	5.68	117.3	200.3	508	509	497	506	498	485	485	467	470	457	457	451	451	447	448	460	459	483	511	752
2411	15:24:04	01/10	2006.	41.	1.37	5.68	117.3	200.6	508	509	498	506	498	483	485	468	469	458	456	449	451	445	446	455	454	488	509	751
2411	15:27:33	01/10	1991.	44.	1.37	5.21	117.3	200.7	485	485	473	483	473	459	460	444	445	432	432	426	429	424	423	437	434	467	495	750
2411	15:29:00	01/10	1960.	41.	1.37	5.21	117.0	200.7	487	486	474	485	472	460	460	443	447	432	435	427	430	425	424	439	436	468	494	749
2411	15:30:00	01/10	1998.	41.	1.37	5.26	117.3	200.7	485	485	473	482	471	461	460	444	447	432	432	426	426	423	422	438	434	468	494	749
2411	15:31:27	01/10	1976.	44.	1.37	5.25	117.3	200.8	484	484	472	482	472	458	459	442	444	432	431	425	426	421	420	436	434	469	493	748
2411	15:34:43	01/10	1945.	41.	1.37	4.92	117.3	200.6	462	463	452	460	452	438	438	420	421	409	411	405	408	404	403	416	415	449	480	747
2411	15:36:23	01/10	2006.	44.	1.40	4.80	116.7	200.6	463	463	451	460	450	437	437	421	425	412	411	404	407	401	399	414	414	451	480	747
2411	15:37:37	01/10	2006.	44.	1.37	4.86	117.3	200.6	461	461	452	459	450	437	439	420	423	409	410	403	403	400	399	413	413	449	479	747
2411	15:39:04	01/10	2006.	44.	1.36	4.93	117.3	200.4	462	462	450	459	449	437	437	420	423	407	408	402	403	400	399	414	411	451	478	746
2411	15:41:25	01/10	1991.	44.	1.37	4.44	117.3	200.4	442	441	430	439	430	416	417	401	401	387	385	382	384	381	379	396	395	436	467	745
2411	15:42:52	01/10	2021.	41.	1.37	4.44	117.0	200.5	438	439	429	437	427	414	415	397	400	384	384	376	381	377	375	391	391	431	463	744
2411	15:43:52	01/10	1960.	41.	1.37	4.52	117.6	200.4	439	438	429	436	427	413	413	398	399	384	385	378	379	373	374	390	390	430	462	745
2411	15:45:06	01/10	2006.	41.	1.37	4.42	117.3	200.4	438	437	428	436	427	413	414	399	401	386	385	379	382	377	377	394	392	434	465	743
2411	15:47:54	01/10	2021.	41.	1.37	4.19	117.0	200.4	219	221	413	421	411	398	399	381	383	368	370	364	366	359	359	378	375	421	454	742
2411	15:48:40	01/10	1945.	41.	1.37	4.24	117.0	200.3	219	219	413	420	411	397	399	382	384	370	369	363	365	360	361	378	375	422	454	741
2411	15:49:27	01/10	1998.	44.	1.37	4.16	117.6	200.2	218	219	414	422	413	399	401	384	386	370	371	365	366	363	360	379	376	423	455	741
2411	15:50:27	01/10	2013.	44.	1.37	4.25	117.0	200.3	218	219	413	420	411	399	399	381	384	368	368	363	365	358	359	378	374	421	454	740
2411	15:52:48	01/10	1998.	47.	1.37	3.89	116.8	200.4	218	218	220	220	219	220	219	219	219	219	220	219	219	217	219	218	218	227	263	739
2411	15:53:48	01/10	2006.	44.	1.37	3.98	117.0	200.4	218	218	220	219	218	219	218	217	218	218	219	218	220	217	218	218	217	224	255	738
2511	10:54:37	03/10	1976.	47.	1.50	11.76	118.5	171.8	700	700	707	705	706	704	701	678	680	594	595	555	560	523	522	485	486	420	473	761
2511	10:56:04	03/10	2006.	47.	1.64	11.83	118.8	171.7	700	700	706	704	708	703	703	678	680	593	591	554	557	521	520	485	485	416	471	761
2511	10:57:32	03/10	2013.	44.	1.63	11.92	118.8	171.5	701	703	708	706	707	702	704	678	678	588	589	550	553	518	519	483	486	413	469	761
2511	10:59:26	03/10	2006.	47.	1.63	11.85	118.6	171.5	699	701	705	704	706	702	703	676	678	588	589	551	554	519	520	487	487	412	468	763
2511	11:02:41	03/10	1915.	47.	1.63	11.74	118.8	171.3	700	703	706	706	706	702	703	676	677	590	592	552	557	520	520	485	486	414	469	765
2431	11:08:35	03/10	1885.	44.	1.62	12.47	118.8	171.2	716	718	723	722	724	724	724	705	708	634	634	591	594	555	555	510	510	451	500	769
2431	11:10:16	03/10	2006.	44.	1.62	12.71	118.8	171.3	716	719	726	722	726	723	724	706	707	634	631	590	593	554	554	508	509	451	500	770

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
2431	11:11:57	03/10	1998.	47.	1.62	12.62	118.6	171.3	719	720	727	724	726	724	728	705	708	634	632	590	595	555	555	507	510	454	501	770
2431	11:13:24	03/10	2006.	47.	1.63	12.47	118.8	171.2	718	719	724	724	724	727	728	706	708	628	631	588	592	551	553	507	508	449	499	772
2431	11:14:51	03/10	1923.	47.	1.62	12.47	118.8	171.2	718	719	724	722	725	724	725	708	712	634	631	589	595	554	554	507	510	450	500	772
2431	11:18:19	03/10	2013.	47.	1.63	11.99	118.8	171.3	708	707	710	712	712	710	712	690	692	600	601	563	565	530	530	494	495	426	482	772
2431	11:20:54	03/10	1953.	47.	1.60	11.99	118.8	171.1	705	708	714	710	713	712	710	685	690	600	602	561	566	529	529	496	496	425	480	772
2431	11:23:55	03/10	1991.	44.	1.54	12.12	119.1	171.3	706	708	714	711	712	707	708	686	690	601	602	564	566	531	531	497	497	427	482	767
2431	11:25:22	03/10	2013.	47.	1.54	12.23	118.6	171.3	707	707	712	711	713	712	712	685	687	599	599	559	561	527	528	495	496	423	477	765
2431	11:32:40	03/10	1991.	47.	1.52	12.27	118.6	171.1	706	706	710	708	713	708	710	688	691	602	602	564	565	531	532	498	499	430	479	753
2431	11:33:26	03/10	2013.	47.	1.52	12.25	118.8	171.3	706	708	712	712	713	711	713	687	691	600	601	562	565	529	529	497	497	426	477	752
2431	11:34:53	03/10	2006.	47.	1.51	12.02	118.8	171.3	705	708	712	710	713	708	710	688	687	596	595	557	560	525	527	496	497	423	473	750
2431	11:38:22	03/10	2006.	47.	1.52	11.78	118.8	171.3	696	697	703	701	704	696	700	670	672	571	570	533	537	507	507	488	488	411	460	745
2431	11:39:35	03/10	2013.	47.	1.51	11.72	118.8	171.2	694	697	701	700	702	696	697	665	669	564	563	526	530	500	503	488	490	412	462	743
2431	11:41:16	03/10	1945.	44.	1.53	11.78	118.8	171.3	696	697	703	700	701	698	697	666	673	566	567	530	533	504	504	488	489	413	462	741
2431	11:43:36	03/10	1976.	44.	1.52	11.64	118.6	171.3	696	697	702	700	701	698	697	671	674	570	570	534	536	506	506	488	488	408	460	738
2431	11:49:20	03/10	1953.	47.	1.65	11.30	118.8	171.0	686	686	690	691	690	688	690	650	651	523	527	491	494	473	475	476	475	404	453	741
2431	11:51:14	03/10	2006.	47.	1.63	11.28	118.6	171.3	686	687	694	691	691	688	689	652	654	537	538	505	508	484	484	479	479	401	452	744
2431	11:53:35	03/10	1976.	44.	1.62	11.30	118.8	171.3	686	688	690	690	691	685	687	650	652	534	536	501	504	481	483	479	480	399	452	746
2431	11:55:56	03/10	2006.	47.	1.63	11.38	118.8	171.2	685	688	693	692	691	688	690	652	651	531	532	498	502	479	479	477	478	402	453	748
2431	12:01:12	03/10	2006.	50.	1.67	11.10	118.3	171.3	233	235	229	231	227	229	227	228	226	225	226	225	226	224	225	223	223	227	271	742
2431	12:01:32	03/10	2013.	50.	1.67	11.05	118.6	171.3	231	233	229	230	226	229	227	227	226	225	226	225	226	224	225	223	223	227	270	742
2211	11:32:54	08/10	2043.	39.	1.28	6.71	48.0	198.4	735	733	706	730	705	666	667	621	625	581	580	565	568	553	554	552	549	568	588	744
2211	11:33:42	08/10	2028.	39.	1.28	6.84	48.0	198.7	736	736	707	733	706	669	671	621	623	582	582	569	570	555	555	552	549	568	588	744
2211	11:34:42	08/10	1968.	39.	1.27	6.71	47.9	198.9	736	737	708	732	709	670	672	623	626	584	584	568	572	555	555	552	547	568	588	744
2211	11:30:33	08/10	2036.	39.	1.28	6.80	47.6	200.5	741	741	712	736	712	676	677	630	632	587	589	571	574	558	558	560	556	575	592	743
2211	11:41:14	08/10	2036.	39.	1.28	6.82	47.7	201.6	744	745	716	741	716	679	680	632	636	590	591	575	578	562	561	562	555	580	597	743
2211	11:43:49	08/10	2036.	39.	1.31	6.78	47.5	202.4	745	745	718	741	718	681	682	635	638	597	594	578	581	566	567	566	564	581	597	745
2211	11:44:50	08/10	1976.	39.	1.31	6.88	49.4	202.0	743	743	713	737	713	676	678	630	633	591	590	577	579	564	564	567	563	581	596	744
2211	11:45:37	08/10	2043.	39.	1.31	6.80	49.0	201.5	736	738	708	733	707	672	673	627	629	588	588	572	574	562	561	562	559	578	596	744
2211	12:04:41	08/10	2036.	39.	1.34	6.84	49.0	201.1	738	737	710	733	710	673	674	629	631	587	586	572	577	564	564	562	561	580	596	749
2211	12:05:41	08/10	1953.	39.	1.36	6.83	48.8	201.2	737	737	707	732	707	672	673	626	630	584	587	572	575	560	559	564	558	575	596	751
2211	12:06:41	08/10	2028.	39.	1.37	6.78	49.0	201.3	738	738	710	733	710	672	673	627	630	589	589	574	578	564	565	564	560	579	596	752
2211	12:07:42	08/10	2036.	39.	1.37	6.72	48.9	201.4	738	738	708	733	710	673	674	629	631	589	588	572	575	564	563	566	564	580	600	752
2211	12:10:44	08/10	2028.	39.	1.32	5.96	48.9	201.5	687	687	655	680	655	619	620	575	576	537	538	526	530	519	517	519	521	546	571	755
2211	12:11:45	08/10	2043.	39.	1.31	5.88	48.8	201.4	688	688	654	680	653	617	618	575	577	539	537	526	530	516	515	519	518	550	570	753
2211	12:12:45	08/10	2021.	39.	1.28	5.97	48.8	201.2	688	686	654	680	654	617	617	575	577	537	538	526	529	516	516	519	518	547	568	753
2211	12:13:45	08/10	2036.	39.	1.28	5.96	48.9	201.1	685	685	652	678	652	616	618	575	577	538	538	525	527	516	516	522	521	545	569	752
2211	12:17:56	08/10	2028.	39.	1.28	4.87	48.8	200.8	614	614	578	605	578	542	544	503	505	469	471	462	463	454	455	462	461	500	530	747
2211	12:19:10	08/10	2028.	39.	1.28	4.96	48.6	200.9	614	614	578	605	577	542	542	504	505	473	474	464	465	457	456	465	463	501	532	746
2211	12:20:24	08/10	2028.	39.	1.28	4.88	48.8	201.1	613	613	576	603	576	543	542	501	502	472	472	461	463	455	454	461	460	498	528	745
2211	12:22:36	08/10	2036.	39.	1.28	4.90	48.9	201.5	612	612	577	603	578	541	542	501	503	469	469	459	460	454	453	463	461	498	529	744
2211	12:26:10	08/10	2013.	39.	1.28	4.26	48.9	202.1	559	559	523	548	521	489	491	455	458	429	430	422	423	420	417	429	428	471	505	741
2211	12:27:10	08/10	1998.	39.	1.26	4.21	48.8	201.8	560	560	523	549	522	490	490	457	458	431	432	423	426	419	419	431	428	474	509	740
2211	12:27:57	08/10	2036.	39.	1.30	4.34	48.9	202.0	559	557	521	549	520	489	490	455	456	429	431	422	426	419	419	431	428	474	509	740
2211	12:28:44	08/10	2028.	39.	1.30	4.22	48.9	201.9	558	557	521	548	521	489	490	455	456	429	431	419	420	417	416	428	426	470	505	740
2211	12:33:04	08/10	1998.	39.	1.32	3.76	48.8	201.4	516	516	480	506	480	450	452	421	423	399	398	391	393	386	387	400	398	449	483	738
2211	12:34:19	08/10	2036.	39.	1.32	3.81	48.8	201.3	516	515	480	505	479	450	449	420	421	400	399	390	392	388	388	400	398	448	482	738
2211	12:36:27	08/10	2028.	41.	1.31	3.85	48.8	201.1	247	254	226	234	223	224	222	223	221	221	222	221	223	221	223	221	222	231	278	737
2211	12:37:55	08/10	2043.	41.	1.31	3.81	48.9	201.2	221	223	221	221	220	221	220	220	220	220	221	220	222	220	221	221	221	228	269	732
2221	15:09:48	08/10	2028.	41.	1.35	7.41	47.0	189.0	763	763	730	757	730	687	687	634	637	587	585	566	571	549	549	539	537	553	573	741
2221	15:11:42	08/10	2036.	39.	1.35	7.24	47.9	189.1	761	761	728	754	728	685	686	635	637	588	588	564	569	547	548	541	537	554	573	743
2221	15:12:55	08/10	2036.	41.	1.31	7.34	47.9	189.3	760	760	724	752	724	682	683	631	634	584	586	564	564	548	548	538	536	556	575	744
2221	15:14:09	08/10	2028.	39.	1.31	7.28	47.7	189.6	762	761	730	755	730	688	686	634	637	587	585	570	572	549	550	539	537	557	578	745
2221	15:15:37	08/10	2036.	39.	1.31	7.27	47.7	189.8	759	761	727	756	728	688	688	636	638	588	587	570	570	552	554	541	537	559	577	745
2221	15:19:05	08/10	1960.	39.	1.31	6.81	48.7	190.6	730	728	693	721	693	651	650	600	600	554	552	536	540	523	523	513	513	534	560	743
2221	15:20:06	08/10	2043.	39.	1.31	6.75	48.5	190.8	726	726	690	719	689	649	650	601	603	556	558	537	540	522	523	514	513	534	558	742
2221	15:21:19	08/10	2043.	39.	1.31	6.92	48.4	190.7	728	728	691	722	691	650	650	601	602	558	558	541	543	522	523	512	512	536	558	743
2221	15:22:46	08/10	2036.	39.	1.31	6.86	48.4	190.3	726	727	691	719	690	650	651	599	603	555	554	539	543	522	524	513	511	533	558	742
2221	15:24:54	08/10	2021.	41.	1.31	6.84	48.5	189.5	726	725	690	719	689	646	649	599	600	554	554	534	538	516	518	506	507	530	554	742
2221	15:29:30	08/10	2028.	39.	1.31	6.09	48.4	189.6	685	684	645	675	644	603	604	557	558	516	516	495	497	480	479	471	469	500	530	740
2221	15:30:58	08/10	2036.	41.	1.32	6.26	48.0	190.1	684	684	646	675	645	605	605	556	558	518	515	497	499	480	481	472	470	501	529	740
2221	15:32:38	08/10	1976.	41.	1.31	6.05	48.4	190.4	682	684	644	675	645	604	604	555	558	516	517	494	497	479	480	473	472	501	529	738
2221	15:33:52	08/10	2021.	39.	1.31	6.17	48.3	191.0	686	685	647	676	646	603	604	557	560	516	517	497	499	482	484	477	474	503	533	738
2221	15:39:09	08/10	1983.	41.	1.30	5.60	48.0	190.6	654	652	612	642	611	570	572	526	528	485	485	471	473	455	456	450	447	481	513	737
2221	15:40:36	08/10	1938.	39.	1.32	5.67	48.2	190.2	652	652	612	641	610	570	570	526	528	484	486	470	472	455	455	451	449	481	512	737
2221	15:41:36	08/10	2036.	41.	1.32	5.63	48.2	190.1	652	652	610	642	610	568	571	527	528	488	487	471	472	455	454	447	448	478	512	737
2221	15:42:36	08/10	2013.	41.	1.33	5.66	48.0	189.9	651	651	608	640	610	568	569	525	527	488	488	470	471	453	453	446	444	477	508	736
2221	15:47:13	08/10	2028.	41.	1.33	4.99	48.1	190.7	603	603	561	591	561	521	521	481	482	446	446	430	431	417	415	412	410	448	484	735
2221	15:48:27	08/10	2036.	41.	1.33	5.03	48.0	191.0	602	602	562	590	561	521	523	479	482	443	443	428	430	415	414	411	409	448	483	735
2221	15:49:15	08/10	2043.	41.	1.31	5.01	47.9	191.0	600	601	560	590	559	520	521	478	480	443	443	429	431	414	415	411	411	446	482	734
2221	15:50:29	08/10	2028.	39.	1.34	4.93	48.0	191.1	604	602	560	592	560	521	521	481	483	448	449	431	433	417	417	413	411	451	486	733
2221	15:54:51	08/10	2028.	41.	1.36	4.61	47.9	190.9	226	228	223	225	221	223	222	222	221	221	223	222	223	221	222	222	222	228	266	719
2221	15:55:39	08/10	2013.	41.	1.36	4.54	47.8	190.7	224	225	222	223	221	222	221	221	221	221	222	221	223	221	222	222	222	229	267	723
2121	13:19:23	09/10	2006.	39.	1.32	5.08	26.3	190.1	782	782	726	771	726	668	667	593	594	522	522	496	499	477	477	477	477	509	534	741
2121	13:39:59	09/10	1976.	39.	1.27	4.85	26.5	190.1	768	766	708	753	710	650	652	576	578	506	507	484	487	466	468	466	464	500	529	745
2121	13:40:46	09/10	2043.	39.	1.29	4.95	26.2	190.9	770	766	709	754	708	649	650	574	579	510	508	485	488	468	469	464	464	500	532	745
2121	13:42:41	09/10	2036.	39.	1.34	4.86	25.9	191.2	771	770	711	756	711	651	652	577	579	511	511	490	490	473	473	471	468	503	532	745
2121	13:43:55	09/10	2036.	39.	1.34	4.93	26.1	191.2	770	769	712	756	712	651	651	576	579	511	509	486	489	470	470	471	467	505	534	746
2121	13:44:42	09/10	2021.	39.	1.34	4.86	26.1	191.0	770	770	711	758	712	651	651	579	580	513	512	491	493	475	475	471	470	507	537	747
2121	13:45:29	09/10	2043.	39.	1.33	4.92	26.1	190.8	772	770	712	757	711	654	656	583	585	512	512	486	488	471	470	468	468	505	537	747
2121	13:48:31	09/10	2043.	39.	1.27	4.75	25.9	190.3	743	744	685	730	685	624	625	552	554	489	490	468	470	455	454	454	449	489	521	745

RUN.	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
2121	13:49:31	09/10	1991.	39.	1.26	4.60	25.9	190.3	744	741	682	728	682	624	625	555	558	486	487	470	470	452	454	452	450	490	520	744
2121	13:50:59	09/10	2036.	39.	1.27	4.70	25.9	190.3	743	742	682	728	685	623	624	556	559	490	490	469	471	452	453	449	449	489	522	743
2121	13:52:39	09/10	1945.	39.	1.27	4.69	25.8	190.3	743	741	683	728	684	624	625	552	553	489	489	465	466	451	450	452	450	486	519	742
2121	13:54:56	09/10	2036.	39.	1.27	4.68	25.8	190.9	744	744	685	730	685	625	627	552	554	487	487	468	471	450	450	451	450	488	521	740
2121	14:01:48	09/10	2021.	39.	1.25	4.42	25.7	192.5	718	715	656	701	656	599	600	531	533	471	471	451	453	439	439	442	437	477	511	736
2121	14:31:20	09/10	2043.	39.	1.34	4.37	25.8	189.5	710	711	650	697	652	592	592	524	525	462	462	445	448	430	431	431	431	470	503	744
2121	14:32:21	09/10	1991.	39.	1.35	4.41	25.7	189.7	714	712	650	697	651	594	593	525	526	466	466	444	445	433	433	435	435	475	507	745
2121	14:33:07	09/10	2036.	39.	1.36	4.42	25.7	189.8	713	712	652	697	652	594	594	523	526	467	467	449	450	430	431	435	433	476	508	745
2121	14:34:07	09/10	2028.	39.	1.39	4.36	25.5	189.5	714	713	653	698	654	595	597	525	528	466	466	446	448	431	430	434	435	474	507	746
2121	15:14:07	09/10	2043.	39.	1.32	4.06	25.8	191.0	676	674	614	659	614	556	557	494	498	440	441	422	424	413	411	416	412	462	497	748
2121	15:17:10	09/10	1991.	39.	1.33	4.03	25.9	192.5	677	675	617	662	617	561	563	497	500	446	445	429	430	419	418	423	421	465	502	749
2121	15:25:22	09/10	2021.	39.	1.32	4.12	25.9	189.9	674	673	614	659	615	557	558	494	496	442	443	426	429	414	413	415	415	461	498	745
2121	15:26:09	09/10	2028.	39.	1.32	4.03	25.8	189.8	675	674	615	660	616	558	560	494	496	442	443	426	427	413	413	416	414	459	495	749
2121	15:26:56	09/10	1938.	39.	1.32	4.01	26.1	189.6	673	671	612	657	612	555	557	493	494	442	443	423	425	411	412	414	413	459	494	748
2121	15:32:40	09/10	1998.	41.	1.32	3.66	25.9	191.6	224	224	222	222	220	221	220	220	220	220	222	220	222	220	221	222	221	229	266	719
2121	15:33:13	09/10	2043.	39.	1.32	3.72	26.1	191.9	223	224	222	222	220	221	220	220	220	221	220	222	220	221	222	221	229	266	716	
2111	09:38:24	10/10	2043.	39.	1.26	4.53	27.5	200.5	724	724	675	714	675	620	620	556	558	494	496	475	477	463	465	470	466	505	534	740
2111	09:42:21	10/10	2043.	39.	1.25	4.48	27.4	199.6	727	726	674	714	675	620	621	555	559	497	498	476	477	461	461	466	466	504	532	737
2111	09:55:44	10/10	2043.	39.	1.38	4.51	27.0	199.4	735	735	681	724	681	626	626	561	564	499	500	479	481	466	466	469	467	506	530	735
2111	09:56:31	10/10	2036.	39.	1.38	4.64	26.9	199.9	735	735	680	723	680	625	626	560	561	500	498	479	482	466	462	469	466	505	533	737
2111	09:57:19	10/10	2036.	36.	1.36	4.50	26.9	200.5	736	734	681	722	680	626	627	560	562	501	502	479	480	467	465	476	473	511	533	738
2111	09:58:05	10/10	2021.	39.	1.37	4.47	27.0	200.8	737	736	683	724	684	629	630	563	565	504	505	484	485	469	469	471	470	509	535	740
2111	10:01:34	10/10	2036.	39.	1.37	4.19	26.8	200.5	697	696	642	682	640	589	590	526	529	472	473	451	455	442	441	453	451	492	523	745
2111	10:04:05	10/10	2036.	39.	1.36	4.15	27.0	201.0	695	693	640	682	639	586	587	529	529	472	472	454	458	442	443	451	451	492	521	748
2111	10:05:25	10/10	2028.	36.	1.33	4.18	26.8	201.3	692	693	641	681	640	590	592	528	531	472	473	454	458	443	442	451	449	491	523	749
2111	10:06:39	10/10	2043.	39.	1.33	4.16	26.9	201.4	694	693	641	682	640	588	590	526	529	473	471	455	457	443	444	455	452	495	524	749
2111	10:10:34	10/10	1991.	39.	1.33	3.92	27.0	201.4	664	663	610	650	610	561	561	502	504	453	454	436	438	428	427	437	436	485	515	751
2111	10:11:48	10/10	2036.	39.	1.33	3.90	26.8	201.2	665	666	613	652	612	562	564	501	504	452	453	434	436	425	426	438	436	486	516	750
2111	10:12:48	10/10	2021.	39.	1.33	3.82	26.7	201.0	667	665	611	651	611	561	562	501	502	449	446	434	436	426	426	435	432	484	514	751
2111	10:13:49	10/10	2006.	39.	1.33	3.86	27.0	200.8	665	665	611	651	611	559	560	500	501	449	449	434	434	424	425	437	434	479	513	751
2111	10:16:24	10/10	2013.	39.	1.31	3.56	26.7	200.4	634	633	580	620	579	529	530	472	474	429	428	415	417	407	408	420	418	469	503	750
2111	10:17:25	10/10	2036.	39.	1.31	3.58	26.8	200.2	632	632	579	618	580	529	530	472	474	429	430	414	416	403	405	419	420	471	503	750
2111	10:18:11	10/10	2043.	39.	1.31	3.57	26.8	200.2	631	630	578	617	578	528	528	472	473	425	426	412	414	406	407	419	417	468	500	749
2111	10:19:11	10/10	2036.	39.	1.31	3.54	26.7	200.0	631	630	578	617	577	526	528	471	472	424	425	411	413	408	409	418	416	468	501	749
2111	10:23:21	10/10	1976.	39.	1.30	3.30	26.5	200.5	225	226	222	223	221	226	220	220	220	220	221	220	221	220	221	221	221	229	262	730
2111	10:24:09	10/10	1945.	39.	1.30	3.27	26.8	200.6	223	223	221	221	220	220	220	219	220	220	220	220	221	219	220	221	220	228	260	726

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
4321	10:57:56	06/08	3997.	39.	1.68	10.75	78.8	227.3	720	722	703	719	703	666	675	640	643	615	614	601	605	591	590	585	586	603	618	758
4321	11:00:04	06/08	3982.	39.	1.68	10.88	79.2	226.4	725	725	697	722	703	669	661	639	642	614	614	597	606	589	590	579	581	600	618	759
4321	11:01:27	06/08	3997.	39.	1.65	10.79	78.8	227.2	724	726	704	722	703	672	674	640	640	614	617	600	604	586	589	582	583	600	617	760
4321	11:03:20	06/08	4004.	39.	1.66	10.69	79.2	227.9	728	728	705	721	706	675	676	639	643	614	617	601	602	585	590	586	587	607	621	755
4321	11:05:44	06/08	3997.	39.	1.64	10.88	79.2	228.1	731	730	708	724	708	672	678	642	646	619	617	603	609	591	591	586	587	607	621	755
4321	11:07:52	06/08	3997.	39.	1.65	10.75	79.6	228.8	731	731	703	725	707	672	678	643	647	620	621	603	608	596	594	587	590	604	625	753
4321	11:10:15	06/08	4019.	39.	1.65	10.70	79.6	229.4	730	732	705	726	708	676	676	642	646	624	620	605	607	596	593	590	590	607	624	754
4321	11:11:11	06/08	3989.	39.	1.67	9.76	80.0	229.6	693	693	667	684	667	635	637	603	608	580	581	570	569	556	558	554	555	575	596	752
4321	11:16:50	06/08	3989.	39.	1.66	9.89	80.0	229.5	692	693	662	685	665	630	619	603	604	582	580	569	570	559	557	552	551	578	597	752
4321	11:18:28	06/08	3997.	39.	1.66	9.80	79.6	229.6	690	691	665	686	665	631	636	606	608	580	579	568	572	555	556	550	554	578	597	751
4321	11:20:36	06/08	4004.	39.	1.60	9.71	79.6	229.8	693	692	667	686	667	637	638	603	608	583	582	569	568	557	558	555	554	577	594	750
4321	11:22:14	06/08	3989.	39.	1.60	9.77	80.0	229.7	690	691	667	685	667	633	640	606	609	581	580	569	574	559	557	553	554	577	595	747
4321	11:25:07	06/08	3982.	39.	1.60	9.79	80.0	229.9	691	691	656	684	667	634	623	603	607	579	578	565	570	558	557	554	552	575	596	744
4321	11:30:18	06/08	3974.	39.	1.60	8.76	79.6	230.2	652	652	627	643	625	597	597	565	568	547	549	532	534	521	521	519	517	543	566	739
4321	11:32:11	06/08	3997.	39.	1.60	8.84	80.4	230.1	650	650	624	642	625	594	596	563	566	543	542	531	536	519	519	516	516	538	564	738
4321	11:33:49	06/08	3997.	39.	1.60	8.94	80.0	229.7	649	648	615	640	621	593	581	564	567	542	545	528	532	515	518	516	512	540	564	736
4321	11:36:13	06/08	4004.	39.	1.60	8.81	80.0	229.1	645	646	619	639	618	587	593	563	565	540	541	529	532	516	516	510	511	536	562	733
4321	11:37:50	06/08	3982.	39.	1.60	8.77	80.0	228.9	646	646	619	639	619	588	592	562	564	540	539	526	532	516	516	510	510	512	536	560	731
4321	11:43:48	06/08	4004.	39.	1.60	7.99	80.4	228.6	610	610	584	601	582	551	558	527	531	506	508	496	499	483	482	473	476	506	531	719
4321	11:45:25	06/08	3989.	39.	1.59	7.95	80.4	228.6	606	606	573	597	580	554	540	523	528	504	506	491	493	479	480	472	472	501	530	716
4321	11:47:02	06/08	3997.	39.	1.60	7.93	80.4	228.6	608	607	581	600	579	553	555	528	528	505	505	494	495	480	478	474	474	503	527	713
4321	11:49:12	06/08	3997.	39.	1.60	8.10	80.4	228.6	608	609	582	601	581	556	555	529	531	507	510	498	500	481	484	479	478	510	528	706
4321	11:53:52	06/08	3997.	39.	1.82	7.99	80.0	228.8	614	614	586	605	588	560	562	532	537	514	515	503	503	490	494	493	493	517	539	698
4321	11:33:10	06/08	3974.	39.	1.68	11.07	79.6	231.6	742	743	721	736	720	690	692	656	660	634	635	621	623	609	613	609	609	624	641	764
4321	13:35:18	06/08	3982.	39.	1.67	10.97	80.0	231.6	744	745	718	741	724	694	682	657	662	634	636	620	624	612	613	612	609	627	642	764
4321	13:36:55	06/08	4012.	39.	1.68	11.07	80.0	231.9	743	743	722	737	722	689	691	658	662	634	634	622	623	609	611	609	607	628	640	765
4321	13:42:37	06/08	3997.	39.	1.67	11.23	79.6	230.8	745	745	716	740	721	690	678	659	662	634	634	618	625	610	610	610	609	627	642	763
4321	13:43:59	06/08	4012.	39.	1.68	11.15	80.4	231.0	742	744	716	738	724	691	676	656	660	633	632	617	620	610	609	608	605	625	641	764
4321	13:49:27	06/08	3982.	39.	1.67	10.00	80.4	230.7	697	698	671	691	670	642	646	611	614	588	587	577	579	565	564	564	564	588	608	763
4321	13:51:51	06/08	3989.	39.	1.68	10.01	80.4	230.6	698	701	674	694	675	644	646	614	617	589	592	579	584	567	568	568	567	589	611	763
4321	13:52:58	06/08	3997.	39.	1.67	9.75	80.0	230.5	697	696	671	692	672	642	642	610	613	585	587	571	574	564	564	564	564	587	606	762
4321	13:55:23	06/08	4012.	39.	1.67	9.98	80.4	230.3	699	700	674	695	674	638	646	613	616	589	590	578	579	568	566	564	565	591	609	761
4321	13:59:02	06/08	3997.	39.	1.74	8.89	80.0	230.5	659	659	625	650	631	603	596	572	577	550	550	539	542	528	531	529	527	557	583	764
4321	14:00:55	06/08	4004.	39.	1.74	8.98	80.4	230.6	655	656	630	648	629	602	603	574	577	548	550	539	543	527	529	527	527	557	583	767
4321	14:02:33	06/08	3989.	39.	1.74	9.11	80.4	230.7	659	659	634	654	631	605	604	575	579	551	554	541	545	528	533	532	533	563	585	767
4321	14:03:55	06/08	4004.	39.	1.74	9.08	80.4	230.7	658	658	631	651	631	606	607	577	579	551	554	541	546	532	533	531	533	561	586	769
4321	14:09:06	06/08	4004.	39.	1.74	7.91	80.3	230.5	603	602	572	596	578	548	539	523	527	505	506	494	494	483	485	481	481	520	553	768
4321	14:10:59	06/08	3989.	39.	1.68	7.78	80.4	230.9	603	603	577	594	575	551	551	523	529	505	506	495	494	480	483	482	483	521	551	770
4321	14:12:21	06/08	4004.	39.	1.68	7.80	80.4	230.8	601	601	572	591	572	549	538	520	524	504	503	491	493	479	480	479	478	521	553	769
4321	14:13:44	06/08	3989.	39.	1.68	7.90	80.3	230.8	597	598	565	589	572	547	532	521	524	501	502	488	490	479	481	480	477	516	549	767
4321	14:15:20	06/08	4012.	39.	1.68	7.90	80.3	230.8	599	598	566	590	572	549	532	521	523	501	503	489	492	480	481	480	478	520	553	765
4321	14:22:02	06/08	4004.	39.	1.67	6.92	80.7	230.6	551	549	526	543	524	496	489	480	481	463	462	452	454	439	440	437	435	485	521	767
4321	14:24:10	06/08	4004.	39.	1.68	7.15	80.3	231.0	553	552	528	545	528	506	507	479	482	465	467	453	452	442	442	440	443	486	521	766
4321	14:26:33	06/08	3989.	39.	1.67	6.75	80.3	230.6	548	546	523	540	523	494	491	477	480	458	459	448	449	437	436	436	435	483	520	765
4321	14:27:40	06/08	3997.	39.	1.73	6.74	80.3	231.0	545	546	521	537	519	497	499	474	477	458	460	448	450	435	435	434	435	481	517	764
4321	14:32:21	06/08	3997.	41.	1.73	6.63	80.3	230.9	263	264	256	262	261	258	244	261	260	260	262	259	261	260	261	260	260	271	298	763
4321	15:19:34	06/08	3009.	39.	1.55	9.85	80.2	212.9	722	722	697	718	701	669	664	641	645	618	617	601	604	590	589	582	582	602	621	760
4321	15:21:02	06/08	3024.	39.	1.55	10.00	79.6	213.7	723	724	698	719	704	670	665	643	648	619	617	603	608	594	592	586	585	604	624	760
4321	15:24:33	06/08	3024.	39.	1.55	10.00	80.0	213.5	724	726	705	721	705	681	680	647	650	620	624	609	612	595	595	588	588	609	625	757
4321	15:25:35	06/08	3016.	39.	1.55	9.95	79.6	212.2	725	726	700	722	705	678	665	644	648	619	620	602	606	590	590	585	584	602	621	757
4321	15:31:51	06/08	3024.	41.	1.62	9.91	80.1	211.5	720	722	702	718	700	670	673	638	641	612	612	596	601	581	579	574	573	590	611	757
4321	15:33:33	06/08	3009.	41.	1.62	9.86	79.3	212.6	720	722	699	716	698	671	673	640	642	612	614	597	602	584	584	579	578	595	617	759
4321	15:34:48	06/08	3024.	39.	1.62	9.86	78.9	212.9	719	719	693	715	697	670	656	635	639	610	612	594	597	578	582	574	577	596	614	759
4321	15:36:13	06/08	3016.	41.	1.61	9.89	79.4	213.0	720	721	701	718	701	671	673	642	644	615	614	600	603	589	588	581	583	601	620	759
4321	15:38:37	06/08	2971.	39.	1.61	8.92	79.4	212.9	686	685	654	679	661	632	619	603	608	577	575	559	564	550	551	546	543	571	597	760
4321	15:40:09	06/08	3039.	41.	1.60	9.04	79.8	212.6	685	685	654	678	660	628	622	600	603	576	576	560	565	547	548	539	540	565	591	760
4321	15:42:16	06/08	3031.	41.	1.60	9.10	79.4	212.4	683	683	659	678	659	627	632	602	604	574	574	560	562	545	547	536	540	564	588	761
4321	15:44:05	06/08	3031.	39.	1.61	9.08	79.5	212.1	684	684	662	680	663	630	635	603	605	575	576	561	564	546	545	540	540	564	588	761
4321	15:46:12	06/08	3024.	41.	1.60	9.08	79.9	211.8	684	681	654	678	660	625	617	599	601	573	573	555	561	544	544	533	534	561	587	760
4321	15:52:01	06/08	3031.	41.	1.60	7.78	79.1	211.5	630	630	602	621	600	577	577	546	546	518	518	503	506	485	488	476	477	510	544	760
4321	15:52:59	06/08	3039.	39.	1.58	7.73	79.5	211.3	630	630	596	621	603	575	561	545	547	517	518	500	503	488	489	476	473	509	542	758
4321	15:53:58	06/08	3031.	41.	1.56	7.78	79.1	211.2	627	626	600	620	599	567	573	544	546	514	514	502	505	486	485	472	472	504	542	757
4321	15:55:13	06/08	3039.	41.	1.62	7.76	79.1	211.1	627	627	596	618	598	572	562	543	544	514	515	499	503	484	484	471	468	505	539	756
4321	15:56:11	06/08	3031.	41.	1.62	7.75	79.5	211.1	625	625	601	619	599	573	574	544	544	514	515	501	503	484	484	473	472	504	539	755
4321	16:00:57	06/08	3024.	41.	1.62	6.87	79.1	210.7	582	581	551	575	556	527	523	502	504	475	474	458	465	441	441	426	425	467	508	755
4321	16:02:45	06/08	3046.	39.	1.64	6.90	79.1	210.9	581	581	548	573	554	528	517	497	501	472	473	456	456	437	437	422	420	462	506	755
4321	16:03:27	06/08	3031.	39.	1.64	6.81	79.1	210.9	578	578	553	571	551	525	524	497	498	471	473	456	459	436	436	423	422	464	505	755
4321	16:04:25	06/08	3016.	39.	1.64	6.83	78.7	211.0	578	578	552	570	551	526	528	496	499	470	473	458	460	435	437	423	422	464	505	755
4321	16:04:48	06/08	3031.	41.	1.64	6.87	78.7	211.1	580	579	552	570	551	527	527	496	501	472	472	455	456	436	438	423	422	464	506	755
4321	16:06:20	06/08	3016.	41.	1.64	6.93	78.7	211.4	578	578	545	569	550	526	517	499	501	472	473	458	461	442	440	428	426	470	509	753
4321	16:08:55	06/08	3031.	44.	1.64	6.72	79.6	212.1	258	261	246	253	248	248	235	248	247	246	247	245	247	245	247	246	246	255	288	753
4321	16:08:55	06/08	3031.	44.	1.64	6.72	79.6	212.1	258	261	246	253	248	248	235	248	247	246	247	245	247	245	247	246	246	255	288	753
4311	11:55:16	07/08	3024.	39.	1.56	10.03	84.9	222.5	724	724	704	722	709	685	675	659	663	640	639	629	631	622	622	625	622	634	646	754
4311	12:00:48	07/08	3009.	39.	1.57	9.77	81.4	223.8	724	726	701	723	708	683	669	654	657	633	638	623	627	617	617	619	617	631	642	753
4311	12:16:29	07/08	3024.	39.	1.60	9.85	82.5	222.1	722	724	706	720	706	681	682	652	656	630	631	619	623	610	611	614	614	625	642	754
4311	12:17:30	07/08	3024.	39.	1.59	9.79	83.2	222.1	724	724	708	722	708	678	685	653	657	634	634	625	627	616	614	614	617	631	646	754
4311	12:19:38	07/08	3016.	39.	1.60	9.86	83.2	222.9	724	726	702	724	710	683	675	655	659	637	638	625	630	617	619	621	616	630	646	755
4311	12:21:46	07/08	3024.	39.	1.59	9.82	82.8	223.3	722	724	701	720	708	681	670	652	657	634	635	623	626	617	617	619	617	632	646	755
4311	12:24:07	07/08	3031.	39.	1.60	9.49	83.2	223.7	719	718	700	715	701	676	678	649	650	630	630	619	623	610	611	614	612	628	642	755
4311	12:28:57	07/08	3024.	39.	1.59	8.21	83.2	223.7	657	657	632	652	637	608	613	585	589	565	562	554	558	550	550	552	554	580	602	754

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	PLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
3311	12:30:38	07/08	3039.	39.	1.59	8.15	83.2	223.5	656	657	636	651	636	611	598	583	587	564	565	555	557	549	548	556	552	581	599	755
3311	12:32:05	07/08	3039.	39.	1.59	7.91	83.6	223.2	648	647	625	644	627	599	604	574	576	555	558	548	554	539	540	545	547	573	596	754
3311	12:33:05	07/08	3024.	39.	1.59	7.93	83.6	223.1	646	646	625	641	624	594	600	575	575	556	556	544	551	541	539	545	545	570	595	754
3311	12:34:33	07/08	3009.	39.	1.58	7.88	84.0	223.0	646	646	618	642	625	602	588	572	575	558	555	544	548	542	543	548	547	573	597	756
3311	12:38:55	07/08	3024.	39.	1.58	6.75	82.0	223.0	590	590	566	583	566	542	544	517	519	501	500	490	494	484	485	495	494	532	563	754
3311	12:39:55	07/08	3031.	39.	1.58	6.77	81.2	223.0	594	594	569	586	568	544	546	516	518	498	502	491	493	486	486	495	496	533	561	756
3311	12:41:23	07/08	3016.	39.	1.56	6.82	81.2	222.7	591	590	566	586	566	538	530	518	519	501	500	490	495	485	485	495	494	532	562	754
3311	12:43:57	07/08	3016.	39.	1.58	6.82	81.6	223.0	591	590	566	584	566	538	545	518	520	501	503	490	495	485	484	493	494	532	561	755
3311	12:45:24	07/08	3009.	39.	1.58	6.73	82.0	223.0	587	587	556	581	562	537	527	515	516	497	496	486	493	483	483	494	493	528	561	755
3311	12:50:56	07/08	3024.	39.	1.56	6.22	81.2	223.0	564	563	531	557	540	512	504	494	495	475	476	465	472	464	465	474	473	517	549	753
3311	12:51:56	07/08	3009.	39.	1.58	6.25	81.6	223.4	563	563	538	555	538	516	520	492	495	477	476	469	466	464	465	477	473	515	548	756
3311	12:53:24	07/08	3024.	39.	1.58	6.17	82.0	223.1	564	563	534	558	541	517	502	490	494	475	474	465	468	462	464	476	471	516	548	755
3311	12:54:24	07/08	3024.	39.	1.58	6.22	81.6	223.4	562	562	541	557	538	518	518	494	496	476	474	466	469	459	462	474	473	515	548	756
3311	12:57:40	07/08	3016.	39.	1.58	5.58	82.4	223.3	527	527	505	521	505	484	485	462	463	443	444	437	441	429	432	448	445	492	530	755
3311	12:58:41	07/08	3024.	39.	1.57	5.49	81.6	223.2	525	524	495	518	502	484	486	458	460	442	443	433	437	432	432	447	444	490	530	754
3311	13:00:22	07/08	3031.	39.	1.57	5.66	81.6	223.1	530	531	510	524	507	482	487	463	466	447	448	440	444	436	436	447	448	496	531	753
3311	13:11:19	07/08	3016.	41.	-.01	5.13	82.0	222.6	242	242	235	241	242	242	224	239	241	242	243	239	240	242	242	244	242	250	264	276
4331	10:19:32	25/09	4080.	41.	1.70	11.79	83.0	210.1	715	718	689	710	690	660	662	625	627	594	592	563	564	521	521	468	469	461	505	751
4331	10:27:13	25/09	4080.	41.	1.70	11.79	83.7	210.5	715	716	682	710	687	656	657	624	628	590	590	558	563	516	519	464	464	456	500	751
4331	10:28:20	25/09	4087.	41.	1.70	11.82	83.7	210.7	715	715	686	709	686	658	659	625	625	590	592	561	564	518	520	466	467	459	501	751
4331	10:29:12	25/09	4087.	41.	1.70	11.70	83.7	210.7	715	715	685	707	685	657	659	625	627	590	591	561	563	519	521	467	468	460	503	751
4331	10:30:19	25/09	4087.	41.	1.70	11.79	83.7	210.7	714	715	686	708	688	657	657	624	627	590	591	564	563	521	521	465	468	461	503	752
4331	10:32:11	25/09	4072.	41.	1.73	11.80	83.3	210.2	713	713	685	708	685	658	657	624	627	589	589	566	560	524	517	465	467	459	501	752
4331	10:37:07	25/09	4072.	44.	1.70	11.36	83.7	210.0	433	456	274	295	272	272	269	270	267	266	268	266	267	265	266	265	265	271	322	748
4331	10:37:59	25/09	4072.	44.	1.70	11.55	83.7	210.1	272	276	269	270	267	268	266	267	265	265	266	265	266	264	266	265	264	270	319	746
4311	11:18:20	25/09	4095.	39.	1.48	11.61	84.8	240.3	724	724	715	726	716	691	693	666	670	644	646	637	639	631	626	630	627	631	637	726
4311	11:19:57	25/09	4080.	39.	1.48	11.57	85.1	240.0	726	728	715	730	715	691	691	665	668	646	644	640	640	632	630	629	630	631	640	725
4311	11:21:19	25/09	4042.	41.	1.47	11.54	85.1	239.7	730	730	716	730	718	691	694	665	669	644	646	638	637	634	629	627	627	629	639	724
4311	11:23:12	25/09	4072.	39.	2.16	11.52	82.5	240.2	738	739	721	737	724	696	696	669	672	646	646	642	640	632	630	631	627	633	640	730
4311	11:24:04	25/09	4072.	39.	2.17	11.66	82.9	240.8	737	739	724	738	724	698	700	670	674	649	649	640	640	638	631	631	631	636	642	742
4311	11:28:28	25/09	4080.	39.	1.68	10.94	82.9	242.0	715	715	698	713	699	675	675	644	646	625	627	615	620	612	611	614	611	623	637	767
4311	11:29:34	25/09	4034.	39.	1.68	10.74	83.2	241.5	715	716	698	713	698	673	674	643	646	625	624	615	618	609	609	614	612	623	635	771
4311	11:30:57	25/09	4087.	39.	1.57	10.96	82.9	241.5	713	715	697	713	697	672	673	642	644	625	623	614	617	609	608	612	610	623	639	773
4311	11:32:19	25/09	4072.	39.	1.55	10.74	82.9	241.3	714	715	696	712	696	672	672	642	644	623	624	614	617	608	607	611	608	622	638	773
4311	11:33:11	25/09	4080.	39.	1.52	10.86	82.9	241.2	714	715	696	712	697	670	672	643	646	621	621	613	616	609	609	613	608	624	638	772
4311	11:34:03	25/09	4064.	39.	1.52	10.91	82.9	241.1	715	716	696	713	697	672	674	643	646	624	624	614	617	607	608	610	609	621	637	772
4311	11:37:12	25/09	4080.	39.	1.55	9.62	83.3	240.8	673	675	652	671	654	627	629	602	602	581	584	572	577	571	569	573	573	593	613	769
4311	11:38:34	25/09	4087.	39.	1.54	9.62	84.0	240.8	670	670	649	666	649	623	623	599	599	581	582	572	575	568	567	572	569	591	611	767
4311	11:40:11	25/09	4042.	39.	1.53	9.63	79.4	240.5	685	683	660	680	662	634	635	603	606	584	585	577	580	570	571	574	574	594	613	767
4311	11:41:49	25/08	4072.	39.	1.54	9.82	79.8	241.2	685	685	660	679	662	633	634	605	607	585	585	575	578	570	571	575	573	593	613	766
4311	11:43:27	25/09	4080.	39.	1.54	9.75	79.0	241.7	682	685	659	680	660	634	634	606	608	584	583	576	578	572	571	576	574	594	612	764
4311	11:46:50	25/09	4057.	39.	1.54	8.42	79.4	241.5	632	631	606	626	607	581	582	555	558	537	538	529	532	525	525	531	528	557	582	763
4311	11:48:12	25/09	4087.	39.	1.54	8.42	79.4	241.4	631	630	606	625	605	579	581	554	556	539	537	529	532	525	524	531	531	558	582	762
4311	11:49:34	25/09	4087.	39.	1.53	8.38	79.8	241.1	630	630	606	624	606	580	581	553	555	534	535	529	532	525	524	532	530	557	581	761
4311	11:50:41	25/09	4072.	39.	1.54	8.39	79.4	240.8	630	629	604	622	603	579	581	552	555	535	536	528	529	521	522	529	528	555	581	761
4311	11:53:35	25/09	3997.	39.	1.54	7.21	79.4	240.2	570	569	543	562	543	521	523	498	500	483	483	476	479	472	473	481	478	516	547	758
4311	11:54:28	25/09	4042.	39.	1.54	7.14	79.8	240.0	569	569	544	561	542	521	523	498	500	480	482	476	478	471	472	480	478	515	548	758
4311	11:55:19	25/09	4080.	39.	1.54	7.25	79.4	239.8	566	567	543	559	541	518	518	496	498	482	483	473	478	471	472	476	477	513	545	758
4311	11:56:26	25/09	4072.	39.	1.54	7.10	79.8	239.7	566	565	542	559	541	519	518	495	496	481	483	474	478	469	469	477	478	514	546	758
4311	11:57:18	25/09	4027.	39.	1.54	7.25	79.4	239.8	566	565	541	558	540	517	518	495	497	481	481	474	477	470	470	478	476	515	545	757
4311	11:59:26	25/09	4087.	41.	1.57	6.57	79.8	240.4	536	537	512	530	512	492	494	472	473	457	459	454	454	449	449	455	456	496	531	757
4311	12:00:33	25/09	4019.	41.	1.57	6.52	79.8	240.5	537	537	514	530	512	494	493	471	472	458	458	451	455	448	449	458	456	499	532	757
4311	12:01:39	25/09	4072.	39.	1.58	6.52	80.2	240.5	536	536	515	529	512	491	492	472	475	458	461	451	455	449	449	458	458	498	532	759
4311	12:02:47	25/09	4080.	41.	1.57	6.65	79.8	240.4	534	537	513	530	511	492	491	470	472	460	459	451	453	449	448	459	456	498	532	758
4311	12:04:09	25/09	4087.	41.	1.57	6.69	79.4	240.1	534	534	512	530	511	491	492	470	472	456	457	451	451	448	446	456	455	498	531	758
4311	12:06:03	25/09	4087.	41.	1.58	6.22	79.8	239.8	517	518	496	511	496	477	477	457	460	443	443	436	439	433	432	443	439	485	522	759
4311	12:07:25	25/09	4087.	41.	1.59	6.31	79.8	239.9	516	516	494	509	494	473	475	457	458	442	442	436	438	433	432	443	439	483	521	759
4311	12:08:48	25/09	4034.	39.	1.57	6.35	79.8	240.0	516	516	493	510	493	474	475	454	455	442	442	436	439	433	432	442	441	484	521	760
4311	12:09:40	25/09	4012.	41.	1.56	6.28	79.8	240.1	518	518	497	512	496	474	474	455	457	442	444	437	436	432	432	443	441	485	523	761
4311	12:12:18	25/09	4080.	39.	1.55	5.94	79.8	240.3	497	496	474	488	475	457	458	438	442	428	428	423	423	419	418	430	426	475	512	758
4311	12:13:10	25/09	4095.	41.	1.55	5.91	80.2	240.3	496	495	473	489	473	458	459	437	438	427	426	420	424	420	417	427	427	472	511	759
4311	12:14:32	25/09	4080.	41.	1.55	5.88	79.8	240.3	496	496	474	489	473	456	456	438	440	427	427	421	424	416	418	428	427	474	512	757
4311	12:15:54	25/09	4034.	41.	1.54	5.80	80.2	240.0	495	495	476	490	476	458	458	439	439	426	428	421	423	417	418	429	427	472	511	757
4311	12:18:03	25/09	4095.	41.	1.55	5.44	79.8	240.3	265	267	263	264	262	262	261	261	261	261	262	261	262	260	262	262	262	272	338	755
4421	13:56:36	25/09	4064.	41.	1.56	13.80	116.6	229.5	705	708	708	713	709	695	696	680	681	669	670	660	662	650	649	642	640	646	655	761
4421	13:58:14	25/09	4080.	41.	1.57	13.79	116.8	229.5	710	710	708	715	707	696	698	680	684	669	669	659	662	651	650	642	641	646	653	760
4421	14:00:37	25/09	4080.	41.	1.58	13.86	116.8	229.6	711	713	707	715	708	696	697	680	685	667	670	661	658	650	648	641	641	650	655	759
4421	14:02:01	25/09	4042.	41.	1.58	13.96	116.8	229.8	713	714	711	716	713	697	697	682	685	669	671	657	659	647	645	642	642	646	656	760
4421	14:03:09	25/09	4072.	41.	1.59	13.71	116.5	229.8	713	715	712	718	712	697	699	680	682	670	669	659	663	650	650	646	642	647	657	760
4421	14:05:52	25/09	4072.	41.	1.58	12.63	116.8	230.0	687	690	682	688	682	667	667	650	652	638	637	626	630	617	615	610	606	618	631	760
4421	14:07:15	25/09	4095.	41.	1.57	12.61	117.0	230.1	688	689	680	689	681	665	667	647	652	634	635	623	629	615	614	608	607	619	631	760
4421	14:08:22	25/09	4064.	41.	1.57	12.71	117.0	230.2	688	689	682	689	682	667	669	650	652	636	636	625	629	615	617	610	608	617	631	759
4421	14:10:00	25/09	4072.	41.	1.59	12.74	117.0	230.3	685	688	680	687	681	666	667	649	651	636	636	623	627	615	615	608	607	620	632	759
4421	14:14:10	25/09	4027.	41.	1.57	11.61	116.7	229.7	657	657	646	656	646	630	631	614	614	596	597	587	589	574	576	566	568	586	601	759
4421	14:15:33	25/09	4095.	41.	1.58	11.61	116.7	229.5	652	653	646	653	646	630	632	611	614	597	595	584	587	572	571	564	562	581	599	757
4421	14:17:11	25/09	4087.	41.	1.57	11.57	117.0	229.4	652	656	644	654	646	630	630	612	614	596	597	584	587	570	571	564	561	582	599	757
4421	14:18:19	25/09	4057.	41.	1.57	11.50	117.2	229.4	656	656	645	653	646	632	631	613	615	595	597	586	587	571	572	567	564	583	600	757
4421	14:22:14	25/09	4080.	41.	1.57	10.83	117.2	229.4	625	627	614	624	617	599	599	582	586	565	564	552	554	536	537	527	527	552	575	754
4421	14:23:38	25/09	4042.	41.	1.57	10.69	117.2	229.4	628	628	616	625	617	601	600	581	585	565	566	551	554	539	538	532	528	555	576	753
4421	14:24:45	25/09	4080.	44.	1.54	10.71	117.2	229.4	627	629	615	626	615	601	601	581	583	565	564	551	555	537	537	528	530	552	575	752

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
4421	14:26:23	25/09	4034.	44.	1.54	10.53	117.2	229.2	628	627	617	627	616	603	604	582	584	563	564	552	555	536	538	529	527	550	575	750
4421	14:31:54	25/09	4080.	44.	1.55	9.92	115.6	229.7	601	603	588	599	588	573	575	555	557	536	538	523	528	508	506	500	497	529	552	733
4421	14:33:01	25/09	4080.	44.	1.55	10.05	115.6	229.8	602	603	588	600	590	574	575	555	557	537	538	523	527	507	508	500	499	530	551	731
4421	14:34:24	25/09	4095.	41.	1.55	9.98	115.6	229.9	599	602	588	599	589	574	575	555	557	537	538	523	527	507	508	500	499	530	551	731
4421	14:36:06	25/09	4064.	44.	1.55	9.98	115.6	230.0	601	603	588	600	590	573	573	556	556	538	536	522	527	505	505	498	495	527	552	730
4421	14:40:17	25/09	4064.	44.	1.80	9.19	115.6	230.1	571	572	560	570	558	541	542	525	527	504	504	489	492	473	472	465	465	501	532	751
4421	14:42:10	25/09	4072.	41.	1.71	9.00	115.9	230.1	570	571	560	567	557	543	544	524	528	504	505	489	491	473	473	466	466	504	533	756
4421	14:43:35	25/09	4102.	41.	1.71	9.06	115.9	230.0	570	570	559	567	557	543	542	524	526	502	504	489	491	470	471	465	462	504	533	759
4421	14:44:27	25/09	4080.	41.	1.70	9.08	115.6	229.9	572	571	557	567	558	542	543	522	526	505	503	488	490	471	472	464	463	504	533	759
4421	14:46:51	25/09	4027.	44.	1.65	8.22	115.9	229.6	542	543	529	539	528	514	516	497	497	474	473	456	460	440	440	434	433	478	516	761
4421	14:48:14	25/09	4095.	44.	1.65	8.31	115.9	229.7	541	543	528	539	528	513	514	495	498	473	472	455	458	437	438	433	431	477	513	761
4421	14:49:37	25/09	4042.	44.	1.65	8.26	115.9	229.5	543	543	528	540	528	513	514	494	497	471	472	454	457	436	436	428	428	472	512	760
4421	14:50:44	25/09	4064.	44.	1.65	8.26	116.1	229.5	543	543	528	538	527	513	513	494	497	472	470	454	455	435	435	429	427	476	512	760
4421	14:52:38	25/09	4087.	47.	1.65	7.83	115.6	229.5	280	286	268	273	265	266	264	265	263	263	264	262	263	261	261	270	336	759
4411	15:16:03	25/09	4057.	41.	1.58	13.99	116.4	241.2	719	722	724	726	726	715	716	700	705	694	693	688	690	681	683	685	682	677	676	751
4411	15:17:10	25/09	4034.	41.	1.59	13.98	116.4	241.2	720	721	726	727	727	714	715	702	706	696	696	686	690	685	685	685	682	677	676	751
4411	15:18:28	25/09	3989.	41.	1.59	14.05	116.4	240.9	722	724	726	728	727	715	718	702	703	693	692	687	693	685	685	683	680	675	676	751
4411	15:19:46	25/09	4087.	41.	1.57	13.99	116.4	240.4	721	724	726	728	728	714	715	700	702	692	692	688	691	681	681	682	681	673	676	750
4411	15:21:05	25/09	4095.	41.	1.57	14.05	116.7	240.1	723	725	726	728	727	714	715	699	703	693	693	686	687	681	681	681	682	671	675	750
4411	15:24:32	25/09	4087.	41.	1.57	12.54	116.4	239.5	690	693	687	693	687	674	675	658	659	648	649	642	646	640	640	639	641	641	648	749
4411	15:25:49	25/09	4087.	41.	1.57	12.49	116.4	239.3	689	690	685	691	685	671	673	657	659	649	650	643	646	637	638	640	638	639	646	749
4411	15:27:08	25/09	4019.	41.	1.57	12.49	116.4	239.2	691	692	685	693	685	672	675	657	660	650	650	642	645	638	635	640	640	639	648	748
4411	15:28:29	25/09	4102.	41.	1.58	12.56	116.7	240.1	689	691	687	693	688	675	675	657	660	652	651	642	644	640	637	641	639	640	646	748
4411	15:29:48	25/09	4027.	41.	1.64	12.61	116.7	240.8	689	692	686	693	687	675	674	659	660	650	651	644	648	640	640	643	640	640	648	748
4411	15:34:21	25/09	4110.	41.	1.65	11.13	116.4	241.0	648	649	641	648	640	625	629	609	612	603	601	595	599	591	593	596	597	603	618	753
4411	15:35:38	25/09	4049.	41.	1.65	10.95	116.9	240.4	650	649	641	650	642	627	629	611	614	601	602	594	596	591	591	596	596	602	615	754
4411	15:36:59	25/09	4042.	41.	1.65	10.95	116.9	239.9	649	649	640	648	641	625	625	608	613	600	600	595	601	591	589	595	594	600	617	756
4411	15:38:18	25/09	4019.	41.	1.65	11.08	116.7	239.7	647	648	638	646	639	625	626	607	609	601	600	592	596	588	589	592	590	604	617	759
4411	15:45:40	25/09	4004.	41.	1.65	9.75	116.7	239.5	604	604	594	603	594	580	581	564	567	555	555	548	554	546	545	554	550	567	590	765
4411	15:46:57	25/09	4087.	41.	1.65	9.73	116.9	239.7	606	607	594	605	594	579	582	564	565	556	556	549	553	545	545	554	550	570	589	766
4411	15:48:16	25/09	3997.	41.	1.63	9.63	116.7	239.9	606	606	595	603	595	579	581	564	565	555	555	549	552	546	546	553	549	570	589	767
4411	15:49:35	25/09	4087.	41.	1.64	9.65	116.6	240.3	605	606	594	604	594	581	581	565	568	553	555	549	550	546	545	554	552	571	590	766
4411	15:52:15	25/09	4095.	41.	1.64	8.26	117.2	240.8	556	556	545	554	545	530	531	516	516	507	506	500	504	497	498	508	505	534	560	767
4411	15:53:33	25/09	4057.	41.	1.64	8.26	116.7	240.8	557	557	545	556	544	531	532	515	517	506	507	500	503	497	498	507	505	530	560	768
4411	15:54:51	25/09	4087.	41.	1.63	8.40	117.2	240.7	557	557	545	556	546	532	532	516	517	507	507	500	503	496	499	509	505	533	560	767
4411	15:56:10	25/09	4072.	41.	1.65	8.33	116.7	241.0	557	558	546	555	546	530	533	517	518	506	508	502	504	498	498	509	506	537	560	768
4411	16:00:55	25/09	4049.	41.	1.65	7.06	116.9	241.2	510	510	499	506	499	486	488	471	473	463	464	458	460	455	455	468	466	502	532	769
4411	16:02:48	25/09	4087.	41.	1.65	7.18	116.9	241.2	506	508	497	507	496	483	485	471	472	461	461	457	459	452	455	466	464	502	533	769
4411	16:03:41	25/09	4080.	41.	1.63	7.11	117.2	241.2	509	508	498	506	497	486	486	469	471	460	462	456	457	455	454	466	465	501	532	771
4411	16:04:17	25/09	4087.	41.	1.63	7.18	117.2	241.2	507	509	497	506	496	485	486	469	473	460	461	455	457	454	453	466	462	501	532	770
4411	16:06:26	25/09	4087.	41.	1.63	6.63	117.2	241.0	485	488	476	484	476	463	463	449	452	440	441	437	437	432	433	445	445	484	518	769
4411	16:07:28	25/09	4027.	41.	1.62	6.53	117.2	240.8	486	486	474	483	474	463	464	449	451	442	441	434	437	432	433	444	445	486	520	769
4411	16:08:20	25/09	4072.	41.	1.63	6.63	117.2	241.0	488	488	476	483	473	463	464	450	452	441	442	435	437	432	433	447	445	486	521	770
4411	16:09:27	25/09	4102.	41.	1.63	6.63	117.2	241.0	485	486	475	482	473	461	463	448	451	441	441	434	437	433	434	445	444	487	518	769
4411	16:11:01	25/09	4064.	41.	1.63	6.30	117.2	241.0	473	473	461	469	461	450	450	436	437	428	428	423	424	420	421	433	433	475	509	768
4411	16:12:08	25/09	4072.	41.	1.59	6.25	116.9	241.0	471	473	463	469	462	450	450	437	439	429	429	423	426	421	419	434	434	477	511	767
4411	16:13:00	25/09	4080.	41.	1.58	6.25	116.9	241.0	472	472	460	469	460	449	450	437	437	430	430	424	424	421	420	433	432	475	510	766
4411	16:14:53	25/09	4064.	41.	1.59	6.02	117.2	240.8	463	464	455	460	453	441	443	429	429	420	420	415	416	412	413	426	426	469	504	763
4411	16:15:45	25/09	4080.	44.	1.59	6.09	117.4	240.8	462	463	453	459	452	440	442	426	431	419	420	414	416	412	411	425	424	466	503	763
4411	16:17:54	25/09	4095.	44.	1.59	5.71	116.6	240.7	263	266	263	263	261	262	261	261	260	260	262	261	262	260	262	261	261	415	494	760
4411	16:18:31	25/09	4057.	44.	1.58	5.69	117.2	240.7	261	262	261	260	261	260	260	259	259	260	261	260	261	259	260	260	271	338	758
4211	13:48:20	14/10	4027.	39.	1.53	7.91	48.5	241.1	705	706	665	696	665	624	625	579	581	548	548	538	541	528	529	532	532	554	574	743
4211	13:51:45	14/10	4019.	39.	1.52	7.96	48.4	241.2	711	711	670	701	670	628	630	586	586	554	553	539	545	530	531	537	535	557	573	742
4211	13:52:37	14/10	4019.	39.	1.53	7.91	48.1	240.9	712	713	672	702	672	630	631	585	587	552	551	539	541	532	532	536	532	555	572	742
4211	13:53:44	14/10	4004.	39.	1.53	7.85	48.2	240.1	712	711	672	703	670	628	629	584	585	550	552	539	543	530	529	534	531	556	573	741
4211	13:55:07	14/10	3997.	39.	1.53	7.96	48.4	239.6	711	711	666	700	668	626	627	582	585	548	548	534	537	528	528	532	532	554	570	741
4211	14:02:36	14/10	4012.	39.	1.53	6.96	48.2	240.9	653	653	614	643	614	576	578	538	539	507	509	498	500	493	492	498	498	527	546	737
4211	14:04:14	14/10	4004.	39.	1.53	7.01	48.2	240.9	655	654	615	644	614	578	579	539	541	508	508	498	500	492	491	499	495	525	546	736
4211	14:05:21	14/10	3997.	39.	1.51	6.91	48.0	240.9	656	656	614	644	614	576	575	539	540	507	506	496	499	490	489	497	497	525	545	736
4211	14:06:14	14/10	4027.	39.	1.51	7.08	48.1	240.7	656	654	615	644	613	578	577	537	538	508	508	495	497	492	491	500	496	526	543	734
4211	14:07:37	14/10	3989.	39.	1.51	7.01	48.0	241.1	655	655	615	644	614	576	578	536	539	508	508	500	502	491	490	498	496	523	545	733
4211	14:10:32	14/10	4019.	39.	1.51	6.53	48.2	240.7	623	622	582	611	581	548	548	512	512	484	485	475	476	468	469	477	474	508	528	731
4211	14:11:40	14/10	4012.	39.	1.52	6.44	47.9	241.0	621	620	581	610	581	545	546	508	509	483	483	475	476	468	470	474	474	509	529	730
4211	14:13:33	14/10	4034.	39.	1.52	6.39	48.2	241.0	620	620	579	609	579	544	546	509	512	481	482	474	476	467	467	475	475	506	528	729
4211	14:14:41	14/10	4019.	39.	1.53	6.52	48.1	241.0	617	618	576	607	577	543	542	506	510	483	484	472	476	469	468	478	475	505	529	729
4211	14:17:20	14/10	3944.	39.	1.69	6.01	48.0	240.9	596	595	554	584	556	521	521	487	489	465	464	456	457	452	452	460	460	494	517	732
4211	14:18:28	14/10	3989.	39.	1.69	6.10	48.0	240.9	592	594	556	583	556	522	522	488	491	464	465	456	460	452	454	465	459	495	517	735
4211	14:19:50	14/10	3966.	39.	1.69	6.01	48.0	240.9	595	595	555	584	554	520	522	488	490	465	466	456	457	451	453	461	462	497	519	738
4211	14:21:03	14/10	3997.	39.	1.69	6.01	47.9	240.8	596	594	554	584	554	520	522	488	489	464	464	455	458	454	452	463	460	496	520	742
4211	14:23:42	14/10	4012.	39.	1.61	5.63	48.2	240.7	568	567	530	556	528	499	499	468	470	448	446	438	441	436	436	448	446	483	510	746
4211	14:25:19	14/10	4012.	39.	1.61	5.69	48.1	240.7	567	566	528	555	528	497	497	465	468	447	446	439	439	436	435	446	447	483	511	746
4211	14:26:42	14/10	3929.	39.	1.61	5.58	48.0	240.5	566	565	529	554	527	498	496	466	467	444	445	437	438	436	433	446	444	482	510	747
4211	14:27:50	14/10	3997.	39.	1.61	5.72	48.0	240.4	565	564	528	554	527	496	496	466	467	444	443	438	439	434	435	446	444	484	511	747
4211	14:32:11	14/10	3974.	41.	1.67	5.31	48.1	240.5	267	269	262	264	261	261	260	260	259	260	261	260	261	261	261	261	270	306	749
4211	14:33:03	14/10	4019.	41.	1.67	5.30	48.0	240.5	261	263	261	261	260	260	259	259	259	259	260	259	261	259	260	261	260	269	301	747
4111	10:49:45	15/10	4027.	39.	1.52	5.76	27.3	240.3	716	716	657	701	656	597	597	533	535	485	485	466	471	461	460	465	465	505	528	744
4111	10:51:07	15/10	4004.	39.	1.52	5.78	27.4	239.7	718	716	655	700	653	597	598	535	537	486	487	469	472	460	460	467	465	505	528	744
4111	11:01:49	15/10	4004.	39.	1.51	5.88	27.7	240.4	718	715	655	700	654	597	599	536	538	487	486	471	471	463	462	468	466	505	527	742
4111	11:03:11	15/10	4019.	39.	1.51	5.91	27.6	241.2	720	718	657	703	657	599	600	538	540	487	486	469	472	463	464	467	466	504	527	742
4111	11:08:53	15/10	3997.	39.	1.49	5.46	27.3	239.9	684	684	621	667	621	566	568	509	512	465	466	455	456	442	443	451	449	490	514	741

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
4111	11:10:00	15/10	3951.	39.	1.49	5.32	27.7	239.2	684	681	621	665	620	566	568	507	509	462	463	449	452	442	442	451	451	490	513	740
4111	11:15:41	15/10	4042.	39.	1.49	5.34	27.4	239.1	681	680	621	665	620	564	566	508	510	461	462	448	450	438	437	448	448	487	511	737
4111	11:17:49	15/10	3982.	39.	1.49	5.41	27.6	239.7	680	677	617	662	617	562	562	506	508	463	461	449	452	443	443	450	448	489	512	736
4111	11:27:06	15/10	4019.	39.	1.48	5.07	27.3	241.0	658	657	599	642	597	545	546	489	491	450	450	438	441	433	432	443	440	480	504	731
4111	11:28:13	15/10	4019.	39.	1.48	5.10	27.7	240.4	655	653	595	638	594	543	544	490	491	451	452	435	437	429	430	441	439	483	504	731
4111	11:29:36	15/10	3936.	39.	1.48	5.15	27.6	240.4	654	654	596	637	594	544	546	488	491	451	450	437	440	432	430	439	442	479	503	730
4111	11:32:01	15/10	4012.	39.	1.48	4.82	27.6	240.5	295	305	266	277	264	264	262	261	260	259	261	260	260	260	261	261	261	268	295	723
4111	11:32:53	15/10	3997.	39.	1.48	4.86	27.6	240.6	266	267	262	264	260	261	260	259	259	259	259	259	260	259	260	261	261	268	295	723
4121	14:43:04	15/10	3989.	39.	1.57	5.93	25.8	229.1	728	728	659	712	659	597	597	529	532	477	478	460	464	455	454	459	456	491	517	748
4121	14:51:06	15/10	3929.	39.	1.50	5.91	26.1	231.0	733	731	664	713	663	601	601	534	537	481	482	465	466	456	456	460	460	496	519	745
4121	14:54:58	15/10	4027.	39.	1.50	5.88	26.0	230.9	732	731	664	713	664	601	603	533	535	480	484	464	467	455	455	460	459	495	520	743
4121	14:53:05	15/10	4019.	39.	1.50	5.92	26.2	230.6	728	730	662	712	660	597	599	532	534	478	477	463	466	453	453	459	456	495	519	741
4121	14:54:19	15/10	4012.	39.	1.50	5.90	25.9	231.0	731	730	662	712	662	599	599	534	535	480	480	465	467	453	454	459	458	496	519	739
4121	15:07:23	15/10	4027.	39.	1.61	5.49	26.4	229.6	699	696	632	680	631	573	573	510	511	461	462	448	449	439	438	446	445	487	515	766
4121	15:10:04	15/10	4027.	39.	1.61	5.55	26.3	230.0	693	690	625	673	625	567	568	505	509	460	460	446	448	439	441	444	443	484	514	766
4121	15:11:56	15/10	4019.	39.	1.57	5.63	26.3	232.7	693	693	627	674	627	567	568	506	510	464	465	449	450	441	439	448	447	488	516	766
4121	15:15:36	15/10	4019.	39.	1.58	5.56	26.5	231.0	697	696	630	676	631	571	571	510	511	463	464	448	451	440	440	449	445	489	517	764
4121	15:16:13	15/10	4019.	39.	1.57	5.59	26.8	230.3	696	693	629	676	628	569	570	509	511	463	464	449	449	438	439	447	448	488	516	763
4121	15:20:37	15/10	3966.	39.	1.56	5.25	26.4	229.1	265	266	262	264	260	261	260	259	259	259	260	259	260	259	260	261	260	268	293	745
4121	15:22:16	15/10	4027.	39.	1.57	5.24	26.4	231.1	260	263	261	261	259	260	259	258	259	259	260	259	260	259	259	261	260	268	292	733
4221	10:36:22	16/10	3959.	39.	1.59	8.02	48.5	229.6	697	694	649	682	650	605	608	562	564	528	527	516	518	507	505	508	503	528	550	749
4221	10:37:14	16/10	4019.	41.	1.59	7.88	48.9	229.8	697	696	650	685	651	608	609	562	563	530	531	517	519	507	509	507	504	530	552	749
4221	10:38:06	16/10	4012.	41.	1.59	7.96	48.8	229.6	697	696	649	684	650	608	608	563	566	530	530	519	521	508	508	507	507	533	551	749
4221	10:41:46	16/10	3982.	39.	1.59	8.04	48.8	230.8	697	696	650	685	650	606	608	561	564	529	530	518	520	509	509	507	508	532	553	749
4221	11:06:44	16/10	4012.	41.	1.61	8.07	48.9	229.5	697	696	652	685	651	609	610	564	566	530	529	519	519	508	508	508	507	533	553	753
4221	11:08:50	16/10	4004.	39.	1.61	7.91	48.8	230.7	696	694	651	685	649	608	610	565	568	532	532	522	524	509	511	511	509	537	556	752
4221	11:13:47	16/10	3997.	39.	1.62	8.01	49.0	229.2	697	696	652	685	650	608	610	563	565	532	530	519	518	508	509	511	506	534	553	752
4221	11:22:03	16/10	3951.	41.	1.60	8.02	48.8	229.1	696	694	651	683	650	607	609	565	565	532	530	520	521	509	508	506	506	531	550	750
4221	11:25:40	16/10	4027.	39.	1.61	7.56	48.9	230.3	667	667	622	656	621	580	581	541	542	509	509	496	500	490	490	490	488	516	540	748
4221	11:28:04	16/10	4012.	39.	1.61	7.57	48.9	231.1	672	670	624	657	624	583	585	544	545	512	510	499	503	494	493	496	491	521	541	747
4221	11:30:28	16/10	3936.	39.	1.62	7.56	48.8	231.7	672	669	627	659	626	584	586	544	546	514	513	504	504	494	493	495	492	523	543	747
4221	11:33:58	16/10	3997.	39.	1.59	7.48	48.7	230.9	672	670	625	659	626	584	584	543	546	513	512	501	503	492	492	495	490	519	544	746
4221	11:37:23	16/10	4012.	41.	1.61	7.04	48.8	229.7	644	643	596	630	597	560	560	520	521	491	491	482	484	473	473	472	471	501	526	744
4221	11:39:16	16/10	3989.	41.	1.62	7.07	48.9	230.1	642	641	596	629	596	559	559	520	521	494	492	482	485	474	473	472	472	505	525	744
4221	11:40:54	16/10	4012.	41.	1.61	7.25	48.9	231.2	643	643	599	631	599	561	562	521	523	494	495	483	485	475	474	477	475	506	528	744
4221	11:47:51	16/10	4004.	41.	1.58	7.17	48.9	230.9	645	644	603	632	600	561	562	525	526	497	497	484	487	476	476	476	475	506	528	744
4221	11:50:15	16/10	4019.	41.	1.61	6.85	48.9	230.4	624	623	578	610	578	542	542	505	507	480	479	471	471	460	462	464	458	491	515	742
4221	11:51:22	16/10	4019.	41.	1.61	6.82	48.7	230.7	623	621	578	611	578	540	540	504	507	477	477	468	469	460	461	461	459	492	514	742
4221	11:52:14	16/10	3944.	39.	1.61	6.89	48.9	231.0	620	620	577	608	575	540	541	506	506	478	480	466	470	460	461	462	460	491	515	741
4221	12:02:22	16/10	3929.	41.	1.68	6.79	48.8	231.3	624	623	580	611	580	543	543	508	508	479	480	470	472	461	462	466	464	497	519	748
4221	12:06:48	16/10	4012.	41.	1.69	6.31	48.9	230.9	592	591	551	580	551	516	516	481	483	460	459	449	452	442	442	445	444	479	507	752
4221	12:08:56	16/10	3921.	41.	1.65	6.34	49.0	229.9	590	589	549	577	547	514	515	481	482	459	457	449	450	441	440	443	442	478	505	753
4221	12:11:48	16/10	4042.	41.	1.65	6.32	48.9	229.3	589	587	547	574	545	513	513	479	481	455	456	445	449	437	439	440	438	476	499	753
4221	12:13:54	16/10	4012.	41.	1.65	6.33	48.8	229.3	586	587	544	575	544	511	513	479	481	455	456	445	449	437	439	440	438	474	498	752
4221	12:17:26	16/10	4019.	41.	1.66	6.11	48.9	230.7	570	570	530	558	530	496	498	464	465	444	444	434	437	427	429	431	428	468	493	752
4221	12:19:19	16/10	4019.	41.	1.63	6.08	48.8	231.0	268	270	263	265	262	262	261	261	260	260	262	261	262	260	262	262	262	270	296	748
4221	12:20:11	16/10	4004.	41.	1.62	5.97	48.8	231.0	262	264	262	262	260	261	260	259	259	259	261	260	261	260	261	261	261	269	293	744
4521	14:03:55	28/10	3989.	50.	1.56	16.65	202.4	229.4	685	686	705	694	705	709	708	710	711	708	622	698	704	690	689	688	680	688	685	750
4521	14:05:38	28/10	4034.	50.	1.56	16.51	202.5	229.5	685	687	706	694	706	708	709	710	713	708	621	697	703	688	689	686	682	688	685	751
4521	14:06:45	28/10	3944.	50.	1.56	16.49	202.4	229.6	685	685	704	694	706	708	707	710	713	711	621	699	704	693	690	691	685	690	687	751
4521	14:07:36	28/10	3989.	50.	1.53	16.61	202.3	229.7	685	685	705	693	704	710	711	712	713	708	621	698	701	691	692	691	681	689	686	751
4521	14:09:43	28/10	4019.	50.	1.54	15.26	202.6	229.8	665	667	682	671	682	682	684	680	685	674	621	665	668	657	655	653	648	659	661	751
4521	14:10:34	28/10	4027.	50.	1.57	15.42	202.7	229.8	665	666	680	673	680	682	682	682	681	673	621	664	667	654	654	654	646	661	661	751
4521	14:11:42	28/10	4027.	50.	1.57	15.29	202.6	229.8	665	667	680	672	680	682	682	680	682	673	621	662	669	652	654	652	646	657	659	751
4521	14:12:34	28/10	3989.	50.	1.57	15.23	202.4	229.5	665	666	682	672	682	682	684	677	682	672	620	662	666	652	652	651	643	659	659	751
4521	14:17:29	28/10	3989.	50.	1.57	13.89	202.5	229.5	638	638	648	642	647	647	647	639	642	627	620	615	618	602	602	604	595	616	622	750
4521	14:18:35	28/10	4012.	50.	1.57	13.89	202.4	229.6	637	638	646	642	646	646	649	640	642	627	620	615	620	606	606	605	596	617	623	750
4521	14:19:57	28/10	4027.	50.	1.57	13.88	202.5	229.3	639	640	648	643	648	647	646	640	642	627	620	614	619	603	603	601	597	615	621	750
4521	14:22:05	28/10	3966.	50.	1.57	13.79	201.9	229.4	638	636	647	642	649	645	646	639	643	627	620	612	618	602	601	601	596	615	621	750
4521	14:24:29	28/10	3997.	50.	1.57	12.48	202.6	229.3	609	609	617	612	617	612	613	602	603	584	619	571	573	559	557	557	553	580	591	749
4521	14:25:35	28/10	4027.	50.	1.57	12.54	202.6	229.1	607	608	613	612	614	611	611	599	601	581	619	566	569	554	555	555	550	578	588	748
4521	14:26:42	28/10	4027.	50.	1.57	12.54	202.5	229.3	609	609	615	612	614	610	611	600	602	581	619	566	570	554	554	554	550	578	588	747
4521	14:40:30	28/10	4027.	50.	1.68	12.50	202.5	228.9	608	608	615	612	612	610	613	597	600	576	618	563	567	551	551	553	547	578	588	754

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
6421	12:15:01	05/08	6010.	39.	1.89	13.15	114.6	254.1	672	673	666	673	666	646	652	637	639	625	627	614	621	603	604	594	598	620	635	780
6421	12:17:34	05/08	6018.	39.	1.89	13.04	114.3	254.3	671	672	664	669	665	649	652	630	637	621	622	613	613	597	599	592	593	615	634	782
6421	12:18:45	05/08	5987.	39.	1.89	13.11	114.3	254.3	675	675	666	673	667	650	652	634	639	625	625	614	617	601	603	596	597	621	635	782
6421	12:21:05	05/08	5980.	39.	1.89	13.24	114.2	254.6	673	676	669	675	670	652	653	639	640	625	628	617	621	603	606	599	601	627	639	782
6421	12:22:34	05/08	6003.	39.	1.89	13.22	114.4	254.6	673	675	669	674	666	648	654	637	639	625	627	617	621	603	604	597	600	624	638	783
6421	12:24:00	05/08	5980.	39.	1.89	13.29	114.2	254.6	675	676	665	675	669	648	640	637	639	627	626	614	622	606	606	598	602	625	639	781
6421	12:27:23	05/08	5987.	39.	1.90	11.83	113.9	254.6	642	642	630	638	633	618	602	600	603	590	590	577	583	566	567	560	563	591	612	783
6421	12:28:33	05/08	5995.	39.	1.91	11.86	113.9	254.6	639	639	631	637	630	614	617	597	600	586	589	578	579	563	564	557	560	590	609	782
6421	12:30:11	05/08	6003.	39.	1.90	11.93	121.3	254.4	630	631	625	629	626	610	612	595	600	584	586	573	575	559	560	552	556	587	606	783
6421	12:31:05	05/08	5995.	39.	1.90	11.94	120.8	254.2	631	631	624	628	625	610	611	595	600	585	585	573	573	557	560	550	554	587	607	783
6421	12:32:45	05/08	6003.	39.	1.90	11.84	121.0	253.7	630	631	618	629	624	609	596	594	597	581	581	568	570	554	554	549	550	584	605	783
6421	12:34:08	05/08	5987.	39.	1.90	12.09	121.0	253.9	631	632	624	631	625	610	612	597	600	583	585	571	575	556	559	553	555	587	605	782
6421	12:35:16	05/08	6003.	39.	1.89	11.93	121.0	254.0	631	631	620	627	625	611	600	594	600	584	585	571	573	556	558	551	551	584	606	783
6421	12:38:29	05/08	6003.	39.	1.89	10.96	121.2	254.4	599	599	592	595	591	580	581	564	567	549	552	536	535	521	523	518	519	559	584	783
6421	12:39:37	05/08	5987.	39.	1.90	10.86	121.2	254.3	598	597	592	597	591	578	569	562	567	550	550	535	537	521	523	516	519	559	585	782
6421	12:41:48	05/08	6003.	39.	1.89	10.99	120.9	254.5	600	601	593	599	592	577	583	566	570	552	553	541	544	526	525	519	523	560	585	781
6421	12:43:58	05/08	5987.	41.	1.90	10.56	120.6	254.8	600	602	594	599	594	581	582	566	568	552	555	541	545	526	528	525	526	563	589	782
6421	12:44:51	05/08	6018.	41.	1.89	11.09	120.9	254.8	600	600	589	600	594	577	577	566	570	553	553	540	544	528	528	521	525	563	586	780
6421	12:49:35	05/08	5987.	41.	1.88	9.86	121.1	255.1	564	562	550	561	556	539	528	530	532	512	513	497	502	486	486	483	486	532	561	779
6421	12:50:27	05/08	6010.	39.	1.89	9.77	121.4	255.5	562	563	555	561	556	544	545	529	532	511	513	500	499	483	485	482	483	530	558	780
6421	12:52:08	05/08	5987.	41.	1.89	9.82	121.3	255.4	561	561	551	562	555	537	529	529	530	513	512	498	502	486	486	481	487	530	560	778
6421	12:53:32	05/08	5987.	41.	1.90	9.76	121.1	255.7	560	560	553	557	554	541	542	526	529	508	509	497	499	479	484	483	483	531	558	779
6421	12:54:41	05/08	5995.	39.	1.90	9.71	121.6	255.7	560	559	548	555	552	541	527	527	530	511	511	495	495	483	484	483	484	530	559	779
6421	12:58:39	05/08	5980.	41.	1.90	8.80	121.5	255.6	530	530	525	529	521	513	513	499	498	478	479	463	467	449	450	452	455	506	536	778
6421	12:59:47	05/08	6003.	41.	1.89	8.75	121.5	255.4	529	528	518	527	522	511	498	494	499	475	477	459	462	448	449	449	450	503	536	777
6421	13:01:11	05/08	5972.	41.	1.89	8.70	121.5	255.3	526	527	521	525	520	506	511	495	499	475	475	460	464	448	446	449	449	503	535	776
6421	13:03:37	05/08	5980.	41.	1.87	8.90	120.7	255.1	530	529	519	528	523	509	500	499	500	477	477	461	466	449	450	449	451	505	536	775
6421	13:06:04	05/08	5980.	39.	1.87	8.77	121.5	255.2	527	528	515	524	521	504	500	496	498	473	474	458	462	445	445	446	447	498	534	774
6321	15:06:00	05/08	6003.	39.	1.66	11.94	83.5	256.8	692	692	667	689	675	642	633	620	623	605	605	596	601	588	590	583	583	602	615	731
6321	15:08:25	05/08	5987.	39.	1.66	11.78	83.5	257.6	694	695	669	690	675	644	651	623	625	608	608	597	601	591	591	584	589	602	618	728
6321	15:10:20	05/08	5995.	39.	1.78	11.78	83.8	258.1	694	696	675	690	675	650	652	626	628	607	608	599	604	591	590	587	591	607	617	730
6321	15:12:15	05/08	6018.	39.	1.78	11.94	83.4	257.7	696	696	669	692	678	646	639	623	627	607	607	596	604	592	591	587	591	605	618	729
6321	15:13:22	05/08	5987.	39.	1.78	11.96	83.4	257.4	696	696	672	693	678	646	638	623	629	610	608	599	606	593	593	588	590	608	618	729
6321	15:15:33	05/08	5980.	39.	1.78	11.90	84.1	257.3	698	700	680	696	679	646	654	628	632	610	611	602	605	594	593	590	595	609	620	730
6321	15:19:16	05/08	5987.	39.	1.78	10.85	83.8	257.4	662	662	640	655	641	615	617	588	592	577	578	569	572	560	560	556	559	578	594	730
6321	15:21:41	05/08	6003.	39.	1.78	10.85	84.1	257.2	660	660	639	654	639	613	614	591	592	575	577	568	572	559	560	556	559	578	594	730
6321	15:23:21	05/08	6003.	39.	1.78	10.74	84.1	256.7	653	655	635	650	631	609	611	587	587	572	574	563	566	553	554	551	551	574	591	730
6381	15:24:44	05/08	5995.	39.	1.77	10.88	84.1	256.4	659	658	630	652	638	609	599	587	589	573	572	565	566	556	556	553	554	575	593	728
6321	15:27:40	05/08	6018.	39.	1.78	9.21	84.4	256.2	600	601	579	593	578	559	560	536	540	526	526	515	517	502	504	502	502	529	552	729
6321	15:28:48	05/08	5995.	39.	1.78	9.27	84.1	256.2	599	600	579	594	578	556	557	536	537	525	525	516	519	503	505	500	503	530	552	728
6321	15:29:56	05/08	6018.	39.	1.78	9.39	84.0	255.8	597	597	578	591	578	552	546	535	539	522	522	514	517	502	502	497	499	528	551	726
6321	15:31:03	05/08	5995.	39.	1.78	9.28	84.4	256.0	599	598	573	591	578	556	545	533	538	524	524	513	514	503	503	499	499	528	552	726
6321	15:32:26	05/08	5987.	39.	1.78	9.27	84.4	255.8	596	597	577	591	575	549	554	536	538	523	522	515	517	502	503	498	500	529	552	726
6321	15:36:38	05/08	5980.	39.	1.78	7.78	82.2	256.1	534	533	507	527	514	494	482	482	484	470	472	460	464	449	449	443	447	485	513	723
6321	15:38:02	05/08	6010.	39.	1.72	7.67	82.6	256.1	534	533	515	528	513	493	488	483	484	470	469	460	464	449	449	444	446	486	516	720
6321	15:39:10	05/08	5995.	39.	1.72	7.78	82.6	256.0	532	532	515	527	515	492	498	482	482	470	470	460	463	449	449	444	447	485	513	718
6321	15:40:17	05/08	6018.	39.	1.72	7.67	82.6	256.0	531	532	515	528	511	492	497	482	483	468	468	460	464	448	448	444	447	483	513	715
6321	15:44:31	05/08	6010.	39.	1.71	7.07	82.6	255.6	286	285	278	284	285	285	267	284	284	285	285	284	282	285	285	285	285	294	302	397
6321	15:44:31	05/08	6010.	39.	1.71	7.07	82.6	255.6	286	285	278	284	285	285	267	284	284	285	285	284	282	285	285	285	285	294	302	397
6331	20:25:42	14/08	6003.	39.	1.92	14.30	80.6	241.1	767	768	745	764	745	715	718	682	685	662	663	649	654	628	629	604	603	601	613	726
6331	20:27:06	14/08	5980.	39.	1.92	14.74	80.2	241.9	764	766	742	762	743	712	714	682	685	662	662	646	654	630	629	611	607	607	617	727
6331	20:28:45	14/08	5950.	39.	1.86	14.74	80.6	242.6	777	778	754	774	757	725	727	694	696	673	675	659	665	642	643	623	620	620	628	731
6331	20:29:22	14/08	5912.	39.	1.87	14.66	80.2	242.7	777	778	753	774	753	723	724	694	698	672	672	657	663	641	643	622	620	620	631	732
6331	20:32:03	14/08	5980.	39.	1.86	13.39	80.6	243.4	744	745	720	740	720	689	691	661	661	641	640	627	634	609	610	588	587	592	608	735
6331	20:34:44	14/08	5987.	39.	1.85	13.64	80.2	243.8	750	751	726	745	726	698	699	667	670	647	646	634	637	615	617	597	596	600	613	736
6331	20:35:38	14/08	5987.	39.	1.85	13.55	80.6	243.9	747	748	723	745	723	693	695	665	665	646	644	631	635	612	614	597	596	599	615	737
6331	20:36:31	14/08	5889.	39.	1.83	13.59	80.6	243.7	760	760	734	754	735	706	706	675	678	653	654	640	646	625	625	608	606	612	623	737
6331	20:44:21	14/08	5927.	39.	1.85	12.21	81.0	240.4	697	696	669	690	669	642	646	615	619	594	597	578	581	549	551	520	521	532	558	736
6331	20:45:41	14/08	6003.	39.	1.83	12.33	81.0	239.7	697	698	669	691	670	642	646	617	621	596	595	579	581	550	550	518	520	532	555	735
6331	20:47:04	14/08	5987.	39.	1.84	12.33	80.6	239.7	697	698	673	691	673	643	645	617	620	594	595	577	580	549	549	518	518	528	553	734
6331	20:48:13	14/08	5852.	39.	1.84	12.19	80.6	239.3	696	696	669	690	669	642	642	614	615	594	594	575	578	546	546	514	513	525	550	733
6331	20:52:27	14/08	5889.	39.	1.84	10.92	80.6	238.9	650	650	624	642	625	598	599	574	578	549	550	523	527	490	491	456	456	472	507	730
6331	20:58:29	14/08	5980.	39.	1.89	11.04	81.0	239.6	651	652	625	646	627	602	603	578	581	555	555	532	534	499	500	466	466	483	515	729
6331	21:00:09	14/08	5897.	39.	1.89	11.04	81.0	239.7	652	652	624	644	625	598	599	575	578	552	552	529	533	497	498	465	466	483	515	729
6331	21:02:02	14/08	5987.	39.	1.89	10.94	81.0	239.7	644	644	618	637	619	596	597	572	575	548	547	524	526	492	492	460	460	476	510	727
6331	21:02:55	14/08	5972.	39.	1.96	10.97	80.9	239.7	648	646	619	641	621	598	599	573	578	550	549	527	530	494	495	463	463	482	512	727
6331	21:11:33	14/08	6003.	41.	1.96	11.68	80.9	240.0	294	296	292	292	290	291	290	290	289	289	290	290	290	288	290	290	290	298	327	724
6341	21:51:14	14/08	5995.	39.	1.98	15.65	80.9	223.0	783	782	761	781	762	730	733	701	705	669	670	643	641	597	594	542	544	509	534	726
6341	21:52:21	14/08	5995.	39.	1.98	15.59	81.3	222.8	784	785	759	781	761	728	731	700	704	670	668	640	639	592	589	537	541	505	532	724
6341	21:53:30	14/08	5965.	39.	1.98	15.63	81.3	222.9	786	786	764	784	764	732	734	700	706	670	671	640	640	591	592	540	541	506	532	722
6341	21:54:22	14/08	5995.	39.	1.98	15.63	80.9	223.0	788	786	764	783	765	730	733	701	703	667	669	636	641	590	592	539	541	505	532	721
6341	21:55:14	14/08	5920.	39.	1.98	15.63	81.3	223.0	789	791	765	787	765	733	734	701	705	669	669	638	643	593	593	542	542	508	532	719
6341	21:56:53	14/08	5905.	39.	2.06	15.63	81.3	223.1	789	791	765	788	766	733	733	699	704	669	670	637	640	591	592	541	542	507	533	719
6341	21:59:35	14/08	5950.	39.	2.25	14.68	81.7	223.3	762	762	735	756	733	704	704	673	676	637	638	603	604	554	557	506	508	470	503	724
6341	22:01:13	14/08	6003.	39.	2.17	14.65	81.7	223.4	761	762	734	756	733	703	704	674	676	636	637	601	606	555	558	507	510	475	505	730
6341	22:02:53	14/08	5889.	39.	2.16	14.66	80.9	223.5	760	760	730	752	732	703	701	672	674	636	636	599	603	555	555	508	509	476	508	732
6341	22:03:44	14/08	5912.	39.	2.18	14.55	81.3	223.6	762	762	731	756	731	703	704	673	675	636	638	601	605	556	558	508	510	477	509	734
6341	22:12:36	14/08	5967.	39.	2.07	13.62	81.7	223.4	718	718	696	713	697	667	669	641	643	606	606	578	582	546	549	516	518	477	508	735
6341	22:15:32	14/08	6003.	39.	2.07	13.73	81.3	223.2	716	715	693	711	693	669	670	644	645	603	603	577	580	547	548	517	518	478	510	735
6341	22:15:55	14/08	5912.	39.	2.07	13.71	81.3	223.1	715	716	692	710	691	667	669	640	643	603	603	575	579	545	547	516	516	474	507	735

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
6341	22:17:18	14/08	5987.	39.	2.07	13.76	81.3	223.1	715	715	693	711	693	671	671	640	644	605	606	577	580	547	547	517	518	476	510	735
6341	22:17:56	14/08	5935.	39.	1.99	13.74	80.9	223.1	716	714	695	712	694	666	668	641	645	603	603	575	579	545	547	518	518	478	508	735
6341	22:19:20	14/08	6003.	39.	1.99	13.59	81.3	223.2	712	713	690	708	689	665	667	639	642	598	599	570	573	541	541	515	516	473	506	732
6341	22:21:47	14/08	5980.	39.	2.04	12.75	81.3	223.2	685	685	662	680	662	637	637	609	612	567	567	541	542	511	512	485	486	443	479	728
6341	22:22:56	14/08	5927.	39.	2.04	12.79	81.3	223.0	685	684	660	678	660	639	639	607	611	560	561	531	534	506	507	491	492	441	479	727
6341	22:24:04	14/08	5889.	39.	2.04	12.63	81.3	223.1	681	681	657	676	660	635	635	607	608	561	560	531	533	506	507	489	491	443	479	726
6341	22:24:55	14/08	5920.	39.	2.11	12.65	81.3	223.1	680	679	656	675	656	632	634	602	604	553	553	525	528	501	502	487	488	436	476	726
6341	22:26:19	14/08	5912.	39.	2.11	12.60	81.3	223.1	680	678	654	673	655	632	633	602	604	554	555	526	531	502	503	487	489	439	474	727
6341	22:30:17	14/08	5995.	41.	2.12	11.53	81.3	223.2	295	297	292	293	290	291	290	290	289	289	290	289	290	288	289	290	290	297	320	723
6341	22:30:17	14/08	5995.	41.	2.12	11.53	81.3	223.2	295	297	292	293	290	291	290	290	289	289	290	289	290	288	289	290	290	297	320	723
6521	15:52:48	08/09	6018.	44.	1.97	15.81	208.8	254.9	640	642	660	650	662	664	666	658	663	650	652	640	643	632	633	636	631	655	659	758
6521	16:18:19	08/09	6010.	44.	2.03	16.45	205.0	255.5	656	658	678	666	680	678	680	676	680	669	670	661	665	652	650	658	654	676	681	786
6521	16:19:59	08/09	6010.	44.	2.01	16.63	205.8	255.5	655	658	677	666	677	679	682	676	678	672	671	661	667	652	653	657	652	678	682	786
6521	16:21:22	08/09	5942.	44.	2.01	16.59	205.3	255.8	657	659	678	666	678	679	682	676	681	669	671	659	665	651	654	659	654	676	682	786
6521	16:22:46	08/09	5995.	44.	2.01	16.49	205.3	255.9	659	660	676	668	680	680	682	678	681	669	673	661	667	652	654	659	653	677	682	786
6521	16:24:25	08/09	6025.	44.	2.01	16.89	205.3	255.8	659	660	676	666	676	680	680	676	680	670	672	660	667	652	654	659	653	677	682	786
6521	16:25:48	08/09	6010.	44.	2.01	16.37	205.1	255.4	659	662	678	668	678	681	682	676	680	670	670	660	664	652	654	657	652	675	682	786
6521	16:28:44	08/09	5995.	44.	2.01	14.61	205.4	254.9	611	613	631	619	632	636	637	633	635	625	628	612	618	610	611	615	612	636	646	786
6521	16:30:08	08/09	5927.	44.	2.01	14.74	205.3	255.0	613	614	631	621	632	634	635	633	636	624	625	613	617	608	608	615	612	636	646	786
6521	16:31:23	08/09	6003.	44.	2.01	14.61	205.2	255.1	613	614	630	620	632	634	637	632	637	623	625	610	616	609	607	614	610	635	645	786
6521	16:34:38	08/09	5995.	44.	2.01	14.74	205.1	255.6	617	618	634	624	634	638	640	635	635	622	625	610	615	605	605	613	608	636	646	786
6521	16:36:18	08/09	6003.	44.	2.01	14.78	205.3	255.6	619	620	636	626	635	637	639	632	634	623	625	611	615	607	607	612	609	636	646	785
6521	16:40:35	08/09	5965.	44.	2.00	12.92	205.3	255.6	575	576	589	581	589	594	594	583	588	574	576	568	572	567	569	574	572	602	616	786
6521	16:42:16	08/09	5957.	47.	2.01	12.76	205.5	255.5	574	575	589	580	591	592	594	585	589	575	576	566	571	568	567	575	570	601	616	787
6521	16:44:29	08/09	6003.	41.	1.97	12.76	205.3	255.8	573	574	590	579	590	592	594	585	589	575	576	566	571	568	567	574	570	601	616	787
6521	16:46:10	08/09	6033.	44.	1.98	12.87	205.3	255.7	574	575	591	581	592	593	594	582	587	573	575	565	570	567	568	573	570	602	617	786
6521	16:48:07	08/09	5920.	44.	1.96	12.75	205.5	255.5	574	575	592	580	593	591	594	584	587	575	577	566	571	567	568	573	572	602	617	786
6521	16:51:50	08/09	6003.	44.	1.98	11.00	204.8	255.8	529	529	538	533	537	533	534	521	527	510	511	509	512	504	505	512	514	560	582	785
6521	16:55:19	08/09	6003.	44.	1.98	11.06	205.3	255.9	530	530	537	532	537	532	536	520	523	508	511	509	512	503	505	514	514	561	582	785
6521	16:57:12	08/09	6025.	47.	1.98	10.98	205.3	255.9	528	528	538	532	538	529	532	521	523	507	510	507	511	501	502	513	513	559	581	784
6521	16:58:36	08/09	5995.	44.	1.98	10.92	205.4	255.9	529	530	537	533	538	532	534	522	525	509	511	509	513	504	505	514	514	560	583	784
6521	17:00:14	08/09	6018.	41.	1.98	10.94	205.4	255.9	527	528	537	532	536	531	533	521	523	507	510	507	511	502	505	516	513	560	583	784
6521	17:32:13	08/09	6010.	41.	2.00	10.93	205.1	256.1	529	529	538	532	539	532	535	522	527	511	513	511	514	507	508	512	516	560	583	785
6521	17:33:21	08/09	6033.	44.	1.99	10.95	204.9	256.1	527	528	537	533	537	532	535	521	526	510	512	509	513	504	505	514	515	559	582	785
6521	17:34:24	08/09	5995.	44.	1.99	11.02	204.8	256.1	529	530	540	534	541	532	535	523	527	511	512	511	514	508	508	517	518	560	582	785
6521	17:35:32	08/09	6018.	47.	1.99	10.99	204.8	256.1	528	530	538	533	537	531	532	521	525	511	512	510	514	506	507	516	516	560	582	786
6521	17:38:34	08/09	6028.	41.	2.00	9.46	205.1	256.2	479	479	483	481	484	475	477	465	467	460	460	450	454	444	445	457	458	516	545	786
6521	17:39:35	08/09	6010.	47.	2.00	9.48	204.6	255.9	477	478	484	483	484	477	479	465	469	460	462	451	454	444	446	459	458	518	547	786
6521	17:41:05	08/09	5995.	41.	2.02	9.38	204.7	256.0	478	479	483	483	483	476	478	467	470	460	462	453	455	447	447	461	460	517	548	786
6521	17:42:33	08/09	6025.	47.	2.02	9.57	204.9	256.0	477	477	485	483	484	477	479	466	469	460	462	452	455	446	447	459	458	517	547	786
6521	17:44:30	08/09	6018.	41.	2.02	9.44	204.9	256.3	478	478	485	483	483	476	477	464	468	460	461	451	454	445	446	459	459	518	547	786
6521	17:47:21	08/09	6025.	50.	2.03	8.55	204.8	256.1	291	293	289	290	288	288	287	287	286	286	288	287	287	283	285	285	286	490	519	784
6421	09:28:37	09/09	6018.	41.	1.88	14.61	118.7	255.8	687	689	689	693	688	677	679	663	667	656	656	646	651	640	640	636	636	646	652	761
6421	09:30:31	09/09	6018.	39.	1.88	14.71	119.0	256.8	691	692	690	694	690	677	682	665	666	657	658	649	654	641	642	642	639	650	658	763
6421	09:31:39	09/09	6018.	39.	1.89	14.74	119.0	257.0	691	693	690	695	691	677	680	663	667	657	659	650	653	642	642	643	640	650	659	763
6421	09:33:32	09/09	5942.	41.	1.88	14.59	118.7	255.9	694	695	690	697	691	679	680	664	668	658	657	647	651	640	640	638	639	648	657	764
6421	09:35:27	09/09	6010.	41.	1.89	14.70	118.7	255.4	693	694	691	696	691	676	678	664	666	653	655	646	650	638	640	636	635	646	656	764
6421	09:40:26	09/09	5965.	41.	1.90	13.54	118.9	255.9	670	670	663	671	663	650	651	637	639	627	629	620	624	611	612	610	609	625	636	767
6421	09:42:05	09/09	6018.	41.	1.90	13.61	118.6	256.6	668	669	664	670	663	650	650	637	639	627	627	620	622	609	610	612	610	623	635	767
6421	09:44:14	09/09	6033.	41.	1.90	13.58	118.7	256.5	669	670	665	671	665	651	652	637	639	627	629	618	624	610	610	610	610	626	638	769
6421	09:45:21	09/09	6025.	41.	1.90	13.57	118.6	256.3	669	670	663	670	663	650	650	636	638	625	628	618	622	610	610	611	609	625	637	769
6421	09:46:30	09/09	6003.	39.	1.90	13.72	118.4	256.1	669	672	663	670	665	652	654	639	639	629	628	620	623	610	612	611	608	624	636	769
6421	09:49:26	09/09	5972.	41.	1.88	12.19	118.6	255.9	632	633	624	632	625	610	613	596	598	586	588	578	580	569	567	566	567	589	607	767
6421	09:51:04	09/09	6025.	41.	1.88	12.20	118.6	255.8	631	632	623	631	622	611	613	597	597	585	586	575	578	565	566	564	563	587	603	767
6421	09:53:31	09/09	6018.	41.	1.88	12.17	118.6	255.8	631	632	622	629	622	609	611	595	599	586	588	574	579	564	566	566	564	587	604	765
6421	09:55:10	09/09	5995.	41.	1.88	12.27	118.6	255.8	631	631	623	629	624	608	610	596	600	585	587	577	578	564	566	564	563	588	603	765
6421	09:57:20	09/09	6025.	41.	1.88	12.17	118.9	255.8	631	632	624	631	625	609	610	596	600	585	584	575	580	564	565	565	562	587	602	766
6421	10:05:42	09/09	6018.	41.	1.88	10.78	118.6	255.8	582	584	574	581	575	563	564	548	550	535	536	522	526	511	511	512	510	544	566	761
6421	10:08:06	09/09	6003.	41.	1.88	10.76	118.6	255.8	582	583	574	581	573	562	566	549	552	535	535	523	528	512	512	513	511	544	567	761
6421	10:11:01	09/09	6018.	41.	1.88	10.71	118.9	255.8	582	584	573	580	574	563	564	548	550	534	536	523	525	510	511	511	511	544	567	761
6421	10:13:42	09/09	6018.	41.	1.88	10.58	118.6	255.7	581	581	572	579	572	559	563	549	552	534	535	521	525	509	510	511	510	542	565	759
6421	10:17:39	09/09	5972.	41.	1.88	10.56	118.9	255.7	583	582	573	582	573	562	564	549	552	534	537	522	526	511	511	511	510	543	564	758
6421	10:23:27	09/09	6025.	41.	1.98	9.20	118.9	255.7	537	537	529	535	528	519	520	504	507	484	486	472	475	460	461	460	460	503	531	760
6421	10:25:54	09/09	5980.	41.	1.95	9.18	118.6	255.8	538	537	529	536	528	520	521	504	508	487	486	474	476	462	462	464	464	504	533	763
6421	10:27:17	09/09	6010.	41.	1.96	9.18	118.6	255.8	538	538	530	535	528	519	519	505	507	486	486	471	474	459	460	462	462	505	533	764
6421	10:28:40	09/09	6003.	41.	1.96	9.22	118.6	255.8	536	536	528	534	528	520	520	505	508	487	487	472	475	459	460	464	464	505	533	764
6421	10:30:51	09/09	5972.	41.	1.90	9.18	118.8	255.8	538	537	530	538	532	518	520	505	507	486	487	472	475	461	462	465	464	506	533	764
6421	10:35:03	09/09	6025.	44.	1.89	8.48	118.9	255.8	288	289	288	287	287	287	286	285	285	286	287	285	286	288	288	296	329	761
6431	11:13:02	09/09	6018.	41.	1.93	15.96	119.1	240.8	714	714	715	718	713	701	704	688	692	665	665	642	646	617	617	591	592	608	624	759
6431	11:14:55	09/09	5965.	41.	1.92	15.94	118.8	240.8	715	716	716	720	715	702	704	688	689	663	665	642	646	615	615	592	590	606	621	758
6431	11:16:20	09/09	6025.	41.	1.93	16.09	119.1	240.8	718	719	715	720	716	702	704	688	689	663	665	642	646	615	615	592	590	606	621	759
6431	11:17:28	09/09	6018.	41.	1.92	15.94	118.8	240.8	716	718	714	720	714	701	704	685	691	664	663	641	646	614	615	591	588	607	622	759
6431	11:19:21	09/09	5965.	41.	1.91	16.12	118.8	240.8	718	718	715	721	715	705	706	689	692	665	665	641	646	614	615	590	589	606	621	758
6431	11:20:29	09/09	6003.	41.	1.91	15.94	118.8	240.4	719	722	716	723	718	704	705	686	691	663	663	642	645	614	616	589	588	604	620	758
6431	11:24:26	09/09	5957.	41.	1.96	14.74	118.6	239.8	680	680	678	682	677	667	666	652	657	631	632	607	611	578	579	553	552	572	591	757
6431	11:26:20	09/09	5950.	41.	1.96	14.90	119.1	239.9	678	679	676	681	679	667	669	654	657	629	630	605	610	576	577	550	548	570	590	758
6431	11:28:15	09/09	5987.	41.	1.96	14.79	118.8	239.8	676	678	678	678	678	667	669	651	655	630	630	606	610	577	577	550	548	569	591	759
6431	11:30:10	09/09	5942.	41.	1.95	14.85	118.8	239.8	680	681	680	681	679	667	669	652	656	627	628	604	609	577	576	547	547	568	591	759
6431	11:31:33	09/09	6010.	41.	1.95	14.90	118.8	239.6	678	680	677	680	678	666	668	654	657	630	630	607	611	577	578	551	550	571	592	759
6431	11:37:22	09/09	5965.	41.	1.95	13.10	119.1	239.6	634	634	637	634	637	627	629	599	601	576	578	573	577	560	561	521	521	540	563	763

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
6431	11:39:01	09/09	6018.	41.	1.95	13.17	119.3	239.7	632	632	635	636	637	627	630	599	602	576	576	572	577	559	561	521	521	539	565	763
6431	11:40:26	09/09	6010.	41.	1.95	13.10	119.1	239.7	631	632	635	635	635	627	630	599	602	575	577	570	575	559	561	521	521	539	564	763
6431	11:41:33	09/09	5980.	41.	1.94	13.26	118.8	239.8	631	632	635	634	635	627	627	597	599	575	577	570	574	559	561	520	521	537	564	763
6431	11:42:57	09/09	5995.	41.	1.95	13.17	118.8	239.9	630	631	635	634	635	624	626	602	603	577	578	573	578	560	560	521	522	539	566	763
6431	11:45:36	09/09	6003.	41.	1.95	11.87	119.1	239.9	600	600	599	603	599	583	583	547	548	532	534	523	528	513	516	474	478	496	527	763
6431	11:47:46	09/09	6033.	44.	1.95	11.92	119.1	239.8	599	600	599	603	598	581	583	544	546	530	531	520	524	510	512	472	475	494	526	762
6431	11:48:54	09/09	5950.	44.	1.95	11.82	119.1	239.9	599	601	599	600	597	582	584	545	547	532	534	523	527	512	515	476	477	499	529	761
6431	11:49:31	09/09	6018.	44.	1.95	11.93	119.1	239.9	599	599	599	603	597	581	582	545	548	532	533	521	526	513	515	474	477	497	528	761
6431	11:50:53	09/09	6010.	41.	1.95	11.91	118.6	239.9	599	598	599	601	599	579	581	543	545	529	530	521	526	512	514	474	475	496	528	761
6431	11:55:54	09/09	6025.	44.	1.97	10.98	119.1	240.0	292	297	291	292	290	290	289	288	288	288	289	289	288	289	289	290	290	293	322	757
6441	13:51:07	09/09	6010.	44.	2.20	16.53	117.7	223.7	705	706	708	711	709	685	688	608	611	573	574	571	576	567	569	537	542	520	554	769
6441	13:52:15	09/09	5957.	41.	2.20	16.64	117.7	223.5	707	707	710	713	708	685	685	611	611	577	578	573	577	567	570	537	541	519	554	771
6441	13:53:39	09/09	5995.	41.	2.22	16.47	118.0	223.4	711	711	710	715	712	685	689	612	614	576	577	571	577	566	569	539	541	520	554	773
6441	13:55:17	09/09	6025.	44.	2.15	16.62	117.7	223.7	707	708	710	710	709	686	686	608	611	575	575	571	577	564	567	535	539	517	552	773
6441	13:56:25	09/09	6003.	44.	2.13	16.59	117.7	224.1	708	710	711	713	713	687	688	613	617	579	580	574	579	569	571	540	544	523	555	773
6441	13:57:49	09/09	5995.	44.	2.12	16.64	117.7	224.4	707	708	714	713	712	690	693	621	623	582	582	580	580	574	573	541	543	524	557	773
6441	14:01:00	09/09	6010.	44.	2.12	15.66	118.0	224.7	691	692	688	693	689	658	659	580	584	554	557	550	554	538	540	511	514	490	528	768
6441	14:02:55	09/09	6040.	41.	2.12	15.62	117.7	224.4	687	689	685	693	686	654	656	573	575	549	549	543	547	533	535	511	514	487	526	766
6441	14:04:04	09/09	6010.	44.	2.12	15.77	118.0	224.3	688	689	685	691	685	654	654	573	575	548	550	545	550	535	537	511	515	486	526	765
6441	14:06:45	09/09	6018.	41.	2.12	15.54	117.7	223.7	691	691	682	694	684	644	646	564	567	539	540	536	539	528	530	509	511	482	520	764
6441	14:08:07	09/09	6010.	44.	2.12	15.58	117.5	223.7	690	690	683	691	684	646	647	564	567	540	541	537	540	528	531	510	513	482	521	762
6441	14:10:48	09/09	6025.	41.	2.17	14.95	118.0	223.6	675	675	666	676	666	619	621	537	540	520	521	514	518	505	508	492	496	457	498	758
6441	14:12:11	09/09	5965.	41.	2.17	15.11	118.0	223.5	675	675	663	675	663	617	619	540	542	520	521	514	518	506	507	493	494	456	496	759
6441	14:13:51	09/09	6003.	44.	2.23	14.99	117.5	223.6	675	675	666	677	665	620	622	541	545	520	521	515	518	506	508	491	494	456	496	758
6441	14:15:29	09/09	6033.	44.	2.23	15.06	117.7	223.5	676	675	662	675	661	615	617	537	539	518	520	514	517	505	507	492	493	454	494	758
6441	14:17:22	09/09	5995.	44.	2.23	15.13	118.0	223.5	675	674	663	674	663	617	619	540	544	521	521	515	518	506	507	491	493	456	496	760
6441	14:19:00	09/09	6033.	44.	2.23	15.04	118.0	223.5	675	674	662	675	663	616	617	536	539	518	519	512	516	504	506	492	494	454	494	761
6531	15:53:06	09/09	6010.	44.	2.11	19.87	207.6	239.0	682	685	697	693	697	666	670	625	630	625	627	627	631	630	632	631	631	649	663	763
6531	15:54:46	09/09	6040.	47.	2.10	19.90	207.6	239.6	684	685	695	692	696	666	670	625	628	625	627	627	632	631	632	633	634	651	665	763
6531	15:56:25	09/09	5987.	47.	2.18	19.92	207.5	240.2	683	685	703	694	703	678	682	635	637	632	634	634	641	639	641	643	646	668	680	763
6531	15:58:03	09/09	6010.	44.	2.18	19.79	208.1	240.1	683	685	701	694	704	677	678	636	639	633	634	634	639	640	641	643	646	669	681	766
6531	15:59:42	09/09	6033.	44.	2.18	19.90	207.8	239.5	684	686	698	693	698	670	672	627	630	627	629	628	633	630	633	632	633	652	667	769
6531	16:01:05	09/09	6010.	47.	2.18	19.82	207.6	239.3	683	685	696	694	696	670	674	626	630	626	627	628	634	631	634	632	635	652	667	771
6531	16:02:45	09/09	6018.	44.	2.17	19.98	208.1	239.4	685	686	698	693	699	672	674	629	632	628	630	629	635	631	634	632	636	657	672	773
6531	16:06:12	09/09	6003.	44.	2.15	17.87	207.9	239.7	641	641	638	645	638	602	601	572	575	575	577	580	583	577	578	566	568	587	611	769
6531	16:07:52	09/09	6010.	47.	2.15	18.01	208.1	239.7	641	642	640	645	638	600	602	571	573	574	575	579	582	575	577	568	567	587	610	768
6531	16:09:46	09/09	5987.	47.	2.15	17.85	207.5	239.9	640	641	637	646	636	602	602	571	575	575	576	578	583	575	578	567	567	586	609	766
6531	16:10:54	09/09	6018.	44.	2.15	17.90	207.5	240.2	641	642	640	647	641	604	605	574	577	577	578	581	585	579	581	573	573	593	616	767
6531	16:12:16	09/09	5957.	44.	2.14	18.03	207.8	240.3	644	645	644	650	644	608	611	578	581	579	580	581	587	582	583	577	578	600	620	766
6531	16:17:02	09/09	5942.	41.	2.17	16.33	207.8	239.8	601	601	586	602	585	554	555	532	535	542	545	546	550	531	533	516	516	538	568	761
6531	16:18:26	09/09	6003.	47.	2.18	16.43	206.3	239.9	600	602	589	603	588	555	556	532	536	541	542	544	549	531	532	515	516	537	568	759
6531	16:19:34	09/09	6040.	44.	2.18	16.35	206.3	239.9	600	600	585	600	585	554	554	532	535	542	543	544	548	529	531	511	511	532	562	757
6531	16:20:58	09/09	6025.	41.	2.18	16.50	205.9	239.8	599	600	587	601	587	557	559	534	537	542	543	545	549	532	533	518	518	544	570	752

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
8431	14:24:06	31/07	8001.	39.	1.94	15.12	111.2	257.1	651	650	658	654	659	659	648	651	657	641	642	638	640	618	620	568	587	608	629	799
8431	14:25:13	31/07	8008.	41.	1.94	15.20	111.4	256.5	646	650	654	653	659	653	649	654	659	637	638	634	644	620	623	568	587	609	627	797
8431	14:26:06	31/07	7971.	39.	1.94	15.15	111.2	256.4	506	651	660	654	659	660	664	654	657	634	636	633	641	622	625	572	593	611	627	799
8431	14:29:58	31/07	8001.	39.	1.96	16.03	111.6	254.1	474	669	680	672	680	678	676	670	675	651	652	634	637	620	625	571	597	605	629	799
8431	14:31:20	31/07	7971.	41.	1.97	15.42	111.4	253.1	659	665	675	666	675	676	675	663	667	643	643	626	627	605	610	554	583	592	617	799
8431	14:33:12	31/07	7993.	41.	1.96	15.29	111.0	252.1	652	658	669	660	669	667	670	651	653	625	628	611	611	581	586	539	564	573	597	797
8431	14:34:49	31/07	7978.	44.	1.95	15.42	111.0	251.1	654	659	662	663	669	659	657	648	650	623	621	608	613	580	582	532	559	567	593	792
8431	14:40:29	31/07	7986.	39.	2.50	13.22	110.9	249.5	603	610	607	610	606	583	584	544	544	529	531	523	527	507	510	465	483	490	521	782
8431	14:43:34	31/07	8016.	39.	2.13	13.32	111.4	249.2	609	609	601	608	607	583	580	542	546	532	532	525	526	513	514	466	483	492	529	792
8431	14:46:11	31/07	8016.	41.	2.13	13.36	110.7	249.8	606	610	610	611	609	587	590	548	549	533	535	527	531	511	513	467	485	493	528	792
8431	14:48:18	31/07	8001.	39.	2.12	13.46	110.2	251.1	614	613	616	617	615	594	600	562	564	544	545	536	541	522	522	477	494	507	541	790
8431	14:49:58	31/07	7933.	39.	2.11	13.46	111.0	252.0	613	614	615	615	616	603	603	569	574	549	551	537	539	519	523	479	497	508	542	791
8431	14:50:49	31/07	7971.	39.	2.10	13.59	111.0	251.9	613	612	617	617	616	600	605	573	577	550	553	539	544	521	522	481	500	510	545	791
8431	14:52:25	31/07	7993.	39.	2.13	13.38	110.7	252.5	613	613	620	615	618	605	607	573	577	552	553	540	544	521	523	483	500	512	547	792
8431	15:20:46	31/07	7926.	39.	1.86	17.20	110.8	258.3	698	700	702	703	708	703	691	698	704	692	693	675	680	652	652	609	627	645	657	783
8431	15:23:37	31/07	8008.	39.	1.87	17.02	111.9	260.6	718	718	723	719	722	711	710	699	703	683	685	665	666	639	641	596	618	637	647	780
8431	15:25:44	31/07	8016.	39.	1.87	17.16	111.3	261.3	719	720	724	722	724	708	714	701	704	683	685	667	673	642	643	597	623	642	652	777
8431	15:27:36	31/07	7918.	39.	1.87	17.24	111.3	261.7	722	726	730	728	726	716	719	707	709	690	691	672	678	647	650	607	630	646	657	777
8431	15:28:42	31/07	8016.	39.	1.87	17.34	111.8	261.7	730	731	730	732	731	718	720	706	709	692	693	675	675	650	652	605	631	648	657	775
8431	15:33:20	31/07	7971.	39.	1.87	15.63	111.3	261.7	674	675	679	677	679	669	675	667	669	653	654	637	641	610	611	570	594	614	630	772
8431	15:34:28	31/07	8024.	39.	1.87	15.78	111.5	261.7	676	677	680	679	681	674	675	667	672	653	654	637	640	611	612	568	594	614	630	772
8431	15:36:05	31/07	8001.	39.	1.87	15.54	110.7	261.8	683	684	685	685	685	678	680	668	672	656	657	637	643	610	613	570	594	616	629	773
8431	15:37:41	31/07	8031.	39.	1.87	15.78	108.4	261.7	682	682	685	684	688	682	682	667	670	649	652	632	637	606	607	566	590	612	627	770
8431	15:38:49	31/07	7963.	39.	1.87	15.71	108.7	261.8	685	686	688	688	688	680	684	667	669	651	652	633	638	608	610	566	590	610	624	771
8431	15:44:42	31/07	7971.	41.	1.94	12.87	113.3	261.7	597	597	599	597	601	595	584	583	585	574	577	574	575	562	566	518	536	562	583	770
8431	15:45:33	31/07	8008.	41.	1.94	12.80	113.3	261.5	597	597	601	599	600	589	597	578	582	570	571	573	578	561	564	516	536	562	580	772
8431	15:47:10	31/07	7933.	39.	1.94	13.01	112.8	261.4	597	596	599	598	592	589	580	583	583	572	573	573	580	561	564	518	536	563	583	774
8431	15:48:33	31/07	8031.	39.	1.94	12.91	113.0	261.7	598	599	602	599	601	595	597	582	587	574	579	578	582	561	564	520	537	565	583	777
8431	15:49:39	31/07	7948.	41.	1.93	13.08	112.5	261.3	598	597	595	600	602	591	581	580	584	573	573	573	577	562	565	517	536	563	585	777
8431	15:53:33	31/07	8008.	39.	1.91	12.18	113.3	261.3	578	578	573	578	580	564	570	551	553	544	544	541	549	537	539	495	514	543	568	780
8431	15:54:55	31/07	7941.	39.	1.92	12.13	113.3	261.6	579	579	570	578	579	570	560	548	553	544	545	542	549	537	540	498	513	543	568	781
8431	15:56:17	31/07	7993.	39.	1.92	12.11	112.8	261.7	578	580	581	580	580	570	572	549	552	543	544	544	548	534	537	498	514	545	566	782
8431	15:57:54	31/07	8039.	41.	1.91	12.29	112.5	261.6	580	580	581	581	579	567	573	552	556	545	545	544	550	540	541	499	515	544	568	781
8431	15:59:21	31/07	7993.	41.	1.93	12.11	112.8	261.7	579	581	579	580	578	568	573	552	555	548	549	547	553	540	542	499	515	546	569	783
8431	16:01:34	31/07	8001.	44.	1.94	11.80	113.0	261.8	570	569	571	570	570	553	560	536	539	532	532	529	534	523	525	484	503	532	558	783
8431	16:07:14	31/07	7978.	41.	1.94	10.94	113.0	262.0	551	551	540	548	548	531	518	510	515	511	513	503	505	496	498	463	475	511	540	783
8431	16:09:51	31/07	7986.	39.	1.94	10.91	112.7	261.9	548	549	546	549	545	526	534	510	513	509	511	503	507	494	496	462	475	511	540	785
8431	16:11:57	31/07	7971.	41.	1.94	11.42	112.5	262.1	554	554	544	554	550	536	554	526	514	516	514	516	505	513	500	501	468	479	515	784
8431	16:14:03	31/07	7918.	41.	1.94	11.31	112.7	261.8	561	561	551	561	557	540	533	522	527	522	524	516	522	507	511	513	475	489	523	549	785
8431	16:15:39	31/07	7948.	39.	1.95	11.37	113.2	262.2	559	560	558	558	559	546	548	523	528	523	524	518	520	510	514	480	491	525	552	786
8431	16:16:31	31/07	7971.	44.	1.94	11.42	113.5	262.0	560	560	560	561	559	540	548	523	526	521	522	516	522	509	511	475	489	524	553	784
8431	16:21:54	31/07	8016.	36.	1.95	9.78	111.0	262.4	517	517	504	516	511	495	487	477	482	477	478	466	467	457	459	428	438	477	512	785
8431	16:23:30	31/07	7993.	41.	1.95	9.81	110.7	262.4	520	520	506	517	513	498	485	481	484	480	482	467	471	459	460	431	441	477	512	784
8431	16:24:36	31/07	8008.	39.	1.95	9.97	110.7	262.4	521	520	508	520	515	500	487	482	487	483	485	472	475	462	463	433	443	481	514	783
8331	14:49:41	14/08	7926.	39.	1.60	14.94	83.6	262.2	719	719	719	700	716	703	676	680	657	660	641	641	627	630	605	607	582	582	586	601	726
8331	14:53:48	14/08	7986.	39.	1.62	14.34	83.5	261.2	701	703	682	697	683	660	664	640	643	624	624	608	610	581	582	556	556	562	579	719
8331	14:55:56	14/08	7993.	39.	1.61	14.48	83.4	262.3	704	705	686	702	686	663	665	642	646	629	627	613	617	587	589	565	564	570	584	715
8331	14:58:18	14/08	8008.	39.	1.62	14.85	83.4	262.4	718	718	697	714	698	675	677	654	658	640	640	624	629	603	603	578	577	581	584	713
8331	14:59:55	14/08	7993.	39.	1.62	14.90	83.7	262.0	718	718	697	714	698	675	677	654	658	640	640	624	629	603	603	579	578	581	584	713
8331	15:01:32	14/08	8008.	39.	1.62	14.92	83.7	261.7	720	720	700	716	700	676	678	656	662	642	642	625	631	603	603	580	579	581	595	710
8331	15:28:46	14/08	8016.	39.	1.77	13.55	84.3	263.3	670	670	650	665	650	631	631	613	616	597	597	578	581	554	556	531	532	546	568	734
8331	15:29:54	14/08	7993.	39.	1.71	13.25	84.0	263.4	669	669	650	665	650	629	630	611	615	597	595	578	582	554	554	532	532	547	569	734
8331	15:35:32	14/08	7986.	39.	1.67	13.32	83.9	263.2	670	671	652	665	650	630	632	613	616	596	596	578	582	555	555	533	533	547	568	730
8331	15:37:23	14/08	8008.	39.	1.65	13.34	84.3	263.4	672	672	652	667	652	632	633	612	616	597	597	581	583	557	557	535	535	551	570	729
8331	15:39:00	14/08	8024.	39.	1.66	13.31	83.9	263.4	672	672	652	666	654	632	634	613	616	597	598	579	583	555	556	535	533	546	568	726
8331	15:40:52	14/08	7993.	39.	1.64	13.32	83.9	263.5	672	671	652	666	654	632	633	612	616	597	598	579	583	555	556	535	535	551	570	729
8331	15:41:58	14/08	7948.	39.	1.65	13.39	84.3	263.2	671	672	650	666	651	630	632	615	617	597	599	581	584	556	557	534	533	548	567	724
8331	15:43:19	14/08	7986.	39.	1.67	13.22	84.2	262.8	669	669	651	663	651	631	632	612	614	596	596	579	582	555	555	532	533	547	566	723
8331	16:03:17	14/08	7993.	39.	1.92	11.54	84.6	261.9	597	597	585	594	587	571	573	563	564	549	550	533	537	511	511	489	489	504	528	721
8331	16:04:38	14/08	7993.	39.	1.95	11.54	84.6	261.9	596	595	583	594	583	568	570	560	562	548	548	533	537	511	511	490	490	503	525	721
8331	16:06:30	14/08	7948.	41.	1.95	11.55	84.9	261.7	595	596	583	593	583	568	570	562	564	548	548	533	537	511	511	488	491	505	532	714
8331	16:08:08	14/08	8001.	39.	1.82	11.47	84.9	261.7	592	593	579	590	578	567	569	559	563	546	549	533	538	510	511	489	490	506	533	730
8331	16:10:30	14/08	7948.	39.	1.82	11.49	84.9	261.8	592	591	579	588	578	566	569	560	562	547	548	531	535	509	511	489	489	506	534	735
8331	16:22:41	14/08	8001.	39.	1.74	11.46	84.9	262.0	592	592	579	589	578	568	568	560	562	545	547	533	536	511	511	489	490	506	534	739
8331	16:24:18	14/08	7903.	39.	1.75	11.39	85.2	262.0	595	594	581	590	580	569	571	561	564	549	550	533	537	511	511	489	490	509	537	744
8331	16:33:27	14/08	7978.	39.	1.76	11.44	85.2	262.1	594	594	581	591	581	568	568	561	565	549	550	531	537	510	511	489	489	509	537	743
8331	16:42:06	14/08	7986.	39.	1.75	10.18	85.6	262.3	551	550	542	549	542	532	532	521	524	508	510	488	491	469	470	453	455	479	507	741
8331	16:43:58	14/08	7903.	39.	1.75	10.15	85.6	262.2	550	550	539	549	538	532	531	521	524	508	509	488	491	469	470	453	455	479	507	741
8331	16:45:49	14/08	7933.	39.	1.75	10.27	85.6	262.3	554	553	540	549	543	532	535	523	528	511	513	491	495	471	472	456	457	479	511	741
8331	16:47:26	14/08	7993.	39.	1.75	10.23	85.6	262.4	551	552	542	548	541	533	534	524	528	511	512	489	494	471	472	454	455	479	510	741
8341	17:19:13	14/08	8039.	39.	1.75	10.18	85.6	262.4	553	553	541	548	540	532	535	524	528	511	511	489	495	472	473	455	457	479	511	741
8341	17:21:35	14/08	7941.	39.	1.75	16.34	82.1	246.6	730	730	716	730	719	694	697	678	680	666	665	646	650	617	620	587	589	574	591	730
8341	17:22:41	14/08	8008.	39.	1.76	16.43	82.1	245.9	732	733	718	730	719	696	698	681	685	666	666	646	649	616	619	588	589	574	589	729
8341	17:24:02	14/08	7941.	39.	1.75	16.44	82.5	245.6	730	732	715	730	716	697	700	678	683	663	664	642	646	613	616	586	587	571	588	728
8341	17:25:40	14/08	8024.	39.	1.75	16.67	82.5	245.3	733	735	719	732	719	698	699	681	688	665	666	644	648	614	617	586	587	572	587	727
8341	17:30:02	14/08	7986.	39.	1.76	15.22	82.1	245.3	737	738	723	736	722	701	705	686	690	669	671	646	652	620	621	590	591	575	589	726
8341	17:33:39	14/08	8001.	39.	1.91	15.11	82.5	244.8	699	700	682	697	682	664	665	649	651	627	627	601	606	568	570	544	545	533	555	722
8341	17:34:46	14/08	7918.	39.	1.86	14.88	82.5	244.6	697	697	680	693	682	662	663	646	649	622	622	596	602	564	566	540	542	529	554	726
8341	17:36:07	14/08	7993.	39.	1.83	15.01	82.2	244.4	691	690	675	688	675	656	657	639	643	615	614	591	595	558	560	533	535	521	549	728
							82.2	244.5	693	693	675	689	675	653	654	639	642	616	616	592	595	558	560	534	536	523	550	728

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
8341	17:36:58	14/08	8016.	41.	1.83	14.97	82.2	244.4	693	693	675	689	676	656	658	640	644	615	617	591	595	558	560	535	537	524	549	729
8341	17:40:51	14/08	7941.	39.	1.82	13.89	82.2	244.3	660	661	644	656	643	627	630	610	613	584	583	556	560	524	526	504	506	482	517	728
8341	17:43:13	14/08	8001.	39.	1.83	13.99	82.2	244.2	660	660	644	657	645	624	625	607	609	581	580	553	556	523	524	503	505	480	516	726
8341	17:45:04	14/08	7910.	39.	1.83	14.03	82.2	244.1	662	662	644	659	645	629	629	610	614	584	584	556	561	525	528	505	508	485	520	724
8341	17:46:12	14/08	7986.	41.	1.83	14.10	82.2	244.1	663	663	646	659	648	628	629	613	614	586	587	558	563	528	530	507	510	487	520	724
8341	17:47:02	14/08	8024.	39.	1.80	14.10	82.2	243.9	663	664	649	661	649	627	631	614	617	586	585	558	562	528	530	507	511	486	520	723
8341	17:51:39	14/08	7986.	39.	1.83	13.29	81.8	244.1	642	642	628	640	628	612	615	591	596	562	563	535	539	509	511	492	496	456	496	719
8341	17:53:15	14/08	7986.	39.	1.83	13.34	82.2	244.1	645	645	629	640	630	614	615	593	595	565	566	537	541	511	512	493	495	459	498	718
8341	17:55:06	14/08	7918.	39.	1.82	13.34	82.2	244.0	644	644	630	642	629	614	615	595	597	568	567	538	543	511	512	494	497	459	497	715
8341	17:55:58	14/08	7993.	39.	1.83	13.43	81.8	244.0	642	642	627	639	627	613	614	594	597	566	565	538	542	511	512	495	497	458	496	714
8341	17:57:04	14/08	8008.	41.	1.84	13.39	82.2	244.1	644	644	629	640	629	611	614	592	596	565	566	538	541	510	512	494	496	457	495	714
8341	18:01:10	14/08	7926.	39.	1.84	14.55	82.2	244.7	619	619	609	616	610	593	595	570	571	537	539	512	515	488	490	478	480	433	473	711
8341	18:02:32	14/08	7926.	39.	1.94	12.62	82.2	244.7	619	619	607	617	607	591	594	569	571	537	537	511	514	489	491	479	481	434	473	711
8341	18:03:38	14/08	7948.	39.	1.94	12.60	82.2	244.8	620	619	605	616	605	593	595	570	572	538	538	511	515	488	490	480	480	433	473	713
8341	18:04:30	14/08	7910.	39.	1.94	12.60	82.5	245.0	619	618	607	615	608	592	593	568	571	540	541	511	515	487	490	479	480	431	474	714
8341	18:08:38	14/08	7993.	41.	1.96	12.48	82.2	245.2	312	314	311	310	309	309	308	307	307	307	309	307	308	307	307	309	309	219	219	713
8421	13:47:47	10/09	7993.	41.	1.74	15.78	117.9	276.5	678	678	678	679	678	666	670	657	662	652	654	644	649	637	637	634	634	646	654	757
8421	13:54:41	10/09	8024.	39.	1.73	15.82	117.9	276.5	674	676	676	680	676	666	668	658	662	654	655	647	650	639	638	636	635	647	656	756
8421	13:55:32	10/09	8046.	41.	1.73	15.71	117.9	276.9	677	678	676	679	676	667	668	659	661	652	653	646	649	636	637	634	631	646	654	756
8421	13:59:39	10/09	8001.	41.	1.73	15.74	117.9	276.4	675	678	677	678	677	669	670	659	662	652	653	646	650	637	638	634	634	645	652	757
8421	14:01:32	10/09	8008.	41.	1.73	15.57	117.7	276.0	676	678	678	680	678	669	671	658	662	652	654	643	648	638	636	634	631	646	652	755
8421	14:05:10	10/09	8054.	41.	1.73	13.72	117.9	276.8	631	631	629	631	629	620	622	610	613	604	603	592	595	584	584	582	579	601	614	753
8421	14:06:31	10/09	7978.	39.	1.73	13.78	118.1	277.7	631	631	630	632	630	622	622	611	613	604	604	594	598	585	585	585	583	604	617	753
8421	14:12:25	10/09	8031.	41.	1.80	13.60	118.1	276.0	631	630	627	631	627	620	620	608	611	602	602	592	596	581	582	580	578	601	612	756
8421	14:13:46	10/09	8024.	41.	1.81	13.60	118.1	276.0	631	631	629	632	629	621	622	610	613	602	603	592	595	581	582	581	579	601	614	758
8421	14:15:08	10/09	8008.	41.	1.82	13.73	117.9	276.5	631	631	630	631	628	620	621	610	614	601	602	591	594	583	583	581	580	601	614	759
8421	14:16:00	10/09	8024.	41.	1.80	13.73	117.9	276.8	630	630	628	631	627	619	621	610	613	602	603	593	596	582	584	583	580	601	615	759
8421	14:19:07	10/09	8001.	41.	1.76	12.09	117.8	277.2	590	590	587	589	587	580	581	567	570	560	560	548	551	539	538	540	539	566	585	760
8421	14:20:14	10/09	8046.	41.	1.76	12.04	117.8	277.3	588	589	586	589	584	578	578	569	572	557	558	549	552	537	539	537	537	568	584	759
8421	14:21:51	10/09	8001.	41.	1.77	12.04	117.8	277.1	587	589	586	589	585	579	579	568	570	558	558	548	551	537	539	538	538	567	584	759
8421	14:23:28	10/09	8031.	41.	1.76	12.12	117.9	276.9	589	589	585	589	583	578	579	569	570	556	558	547	550	536	537	536	536	566	583	759
8421	14:24:50	10/09	8001.	41.	1.76	11.97	117.9	276.8	587	589	584	588	584	578	578	568	571	558	557	546	550	536	538	537	536	567	583	758
8421	14:27:57	10/09	8001.	41.	1.77	10.29	118.1	276.7	543	543	539	543	539	535	535	523	526	507	508	496	499	485	486	487	486	524	547	757
8421	14:29:33	10/09	7993.	41.	1.77	10.40	117.9	276.7	543	543	541	542	540	534	534	522	525	506	506	495	498	484	485	487	485	524	546	755
8421	14:31:25	10/09	8016.	41.	1.78	10.34	117.9	276.7	543	543	540	543	541	532	534	523	525	507	506	494	498	483	483	486	484	523	546	755
8421	14:33:22	10/09	8024.	41.	1.78	10.46	118.1	276.8	541	541	540	542	539	533	536	524	525	506	507	493	496	483	484	486	485	523	547	753
8421	14:34:44	10/09	8008.	41.	1.78	10.34	118.1	276.8	543	543	541	543	539	533	534	523	526	506	507	496	498	485	485	487	486	524	547	753
8421	14:38:21	10/09	8039.	41.	1.76	9.61	117.8	276.9	518	518	517	518	518	512	514	500	502	484	483	472	473	460	460	464	463	505	529	752
8421	14:39:28	10/09	8016.	41.	1.76	9.62	117.6	276.9	518	517	518	517	517	512	512	500	503	483	483	471	474	461	461	464	464	505	529	751
8421	14:41:05	10/09	8031.	41.	1.76	9.61	117.8	276.8	516	517	516	516	516	512	514	500	503	483	483	471	474	461	461	465	464	507	530	750
8421	14:42:57	10/09	8016.	41.	1.76	9.51	117.9	276.7	513	513	513	513	512	511	511	501	505	485	485	474	477	463	463	466	465	506	532	749
8421	14:44:19	10/09	8008.	41.	1.76	9.59	117.6	276.7	511	513	516	515	516	511	513	501	504	485	485	473	475	462	463	466	465	506	530	749
8421	14:46:41	10/09	8008.	41.	1.76	8.86	118.1	276.7	488	488	491	489	489	487	487	479	480	466	469	457	460	449	450	453	452	495	524	749
8421	14:47:48	10/09	7986.	41.	1.75	8.77	117.8	276.5	486	486	488	486	488	485	487	479	482	466	466	455	459	448	448	452	452	497	524	749
8421	14:48:52	10/09	7993.	41.	1.76	8.74	117.9	276.6	488	487	488	487	486	485	487	477	481	466	468	457	460	448	449	453	452	497	524	749
8421	14:50:14	10/09	8024.	41.	1.74	8.75	118.3	276.4	488	487	488	487	487	485	486	478	481	466	466	456	459	447	448	452	452	496	523	749
8421	14:52:06	10/09	7986.	41.	1.75	8.06	118.3	276.4	472	473	472	472	471	472	472	464	467	448	449	437	439	429	429	435	436	460	512	749
8421	14:53:27	10/09	7986.	44.	1.75	8.05	117.6	276.4	310	312	308	308	307	307	306	306	305	305	307	306	307	305	306	308	308	428	495	746
8431	09:29:41	11/09	7963.	41.	1.74	17.43	121.2	259.8	682	682	688	685	688	681	685	675	680	672	674	662	666	643	643	630	628	641	652	764
8431	09:32:32	11/09	8008.	41.	1.75	17.51	117.1	260.1	686	688	692	691	693	688	691	681	685	677	677	663	666	643	646	628	627	638	648	762
8431	09:33:54	11/09	7993.	41.	1.75	17.25	116.6	260.4	687	690	691	691	693	688	689	680	685	676	676	664	667	643	644	629	627	638	649	761
8431	09:36:01	11/09	8039.	41.	1.75	17.37	120.2	260.7	685	685	688	689	689	685	687	678	683	674	675	661	667	645	646	630	629	640	651	759
8431	09:37:37	11/09	8016.	41.	1.77	17.25	120.2	260.7	682	685	690	689	691	683	685	678	679	675	674	663	667	646	645	630	630	641	651	759
8431	09:39:28	11/09	8001.	41.	1.78	17.44	120.2	260.5	681	685	687	690	690	687	691	679	682	674	675	662	667	645	646	631	630	640	651	758
8431	09:42:19	11/09	7971.	41.	1.78	15.96	120.4	260.4	656	656	658	659	658	654	655	646	649	637	638	628	632	609	612	597	596	613	630	758
8431	09:43:56	11/09	8046.	41.	1.78	15.99	120.2	260.4	657	657	659	662	661	654	654	640	643	633	636	625	630	608	610	594	594	612	627	759
8431	09:45:48	11/09	8024.	39.	1.77	15.96	120.2	260.2	658	657	660	660	660	653	656	640	644	634	635	625	631	608	611	596	595	613	628	759
8431	09:47:10	11/09	8016.	41.	1.76	16.05	120.0	260.3	657	658	659	660	660	654	654	640	643	633	636	625	630	608	610	594	594	612	627	759
8431	09:48:31	11/09	8031.	41.	1.76	16.11	120.0	260.2	655	657	659	660	657	652	656	641	645	635	636	625	630	608	610	595	594	612	627	758
8431	09:53:23	11/09	7933.	41.	1.76	14.40	120.2	260.3	624	624	619	626	618	607	606	587	588	576	578	573	578	563	566	544	545	569	591	752
8431	09:55:16	11/09	8031.	41.	1.74	14.35	120.0	260.4	622	622	619	624	619	606	608	584	587	574	575	570	575	562	564	544	545	567	590	750
8431	09:59:23	11/09	7941.	41.	1.75	14.27	120.2	260.4	622	622	619	623	619	606	609	587	590	576	579	572	577	562	565	544	546	569	589	746
8431	10:01:00	11/09	8046.	41.	1.76	14.35	120.4	260.7	623	623	620	625	620	606	607	586	590	576	579	571	576	563	565	545	546	568	589	745
8431	10:02:52	11/09	7993.	41.	1.76	14.31	120.0	260.7	622	622	618	624	620	607	609	590	592	578	580	574	578	563	565	546	547	569	589	743
8431	10:07:43	11/09	7963.	39.	1.84	12.98	120.0	260.6	583	583	575	582	576	560	561	537	538	527	528	521	525	521	523	499	502	525	552	742
8431	10:11:05	11/09	8046.	44.	1.84	12.90	120.4	260.6	582	583	574	582	574	558	560	536	539	528	529	520	524	520	521	498	500	525	550	743
8431	10:13:27	11/09	8024.	44.	1.84	13.05	120.0	260.7	581	581	575	582	575	560	560	537	540	527	528	521	525	521	523	503	502	529	554	745
8431	10:16:04	11/09	7986.	41.	1.84	12.91	120.4	260.7	585	585	575	585	575	562	563	540	543	532	533	523	528	523	524	501	503	528	554	745
8431	10:17:40	11/09	8008.	41.	1.83	12.88	120.2	260.7	583	583	575	582	575	560	560	536	538	527	529	522	526	519	522	501	503	528	550	745
8431	10:21:48	11/09	8001.	44.	1.83	11.76	120.2	260.7	545	547	539	545	539	521	524	502	504	493	495	488	490	477	478	458	463	483	514	742
8431	10:22:09	11/09	8039.	44.	1.88	11.68	120.4	260.6	543	543	535	541	536	516	519	497	500	490	490	485	488	475	477	458	463	482	513	742
8431	10:25:16	11/09	8016.	44.	1.88	11.76	120.2	260.7	546	547	538	545	538	525	526	502	504	493	495	487	489	476	477	457	461	482	512	742
8431	10:27:53	11/09	7971.	44.	1.88	11.66	120.2	260.7	547	546	538	545	538	525	526	502	504	494	495	487	490	479	479	458	461	484	514	743
8431	10:30:15	11/09	7978.	41.	1.90	11.65	120.2	260.3	544	544	537	543	535	519	520	499	502	493	493	485	489	475	476	458	461	482	512	745
8431	10:33:37	11/09	8031.	44.	1.91	11.05	120.2	260.5	317	322	310	313	309	308	308	307	307	307	308	307	307	307	308	309	309	314	339	745
8441	11:18:47	11/09	7993.	41.	1.89	18.74	117.6	245.7	720	722	713	724	714	690	693	647	651	614	617	614	612	614	610	605	607	612	626	765
8441	11:20:24	11/09	8039.	44.	1.89	18.85	117.3	245.5	719	720	714	724	714	686	688	642	646	608	610	607	607	607	603	599	601	605	621	764
8441	11:22:16	11/09	8016.	41.	1.90	18.74	117.6	245.3	723	722	715	726	714	688	690	644	648	612	614	608	611	609	606	599	601	603	617	762
8441	11:23:52	11/09	8031.	41.	1.92	18.69	117.6	245.2	721	721	713	724	713	686	688	641	645	608	610	603	604	603	603	597	600	603	619	761
8441	11:29:16	11/09	8024.	41.	1.91	18.69	117.4	245.0	724	724	714	724	714	683	685	639	641	607	609	601	605	603	603	597	599	600	617	757

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
8441	11:30:52	11/09	8001.	41.	1.92	18.69	117.6	245.0	724	724	715	727	716	686	690	640	643	610	610	604	608	604	604	597	600	600	617	754
8441	11:35:26	11/09	8001.	41.	1.99	17.30	117.8	245.0	676	677	660	675	661	625	629	574	576	553	555	550	556	554	556	550	554	560	583	751
8441	11:37:14	11/09	8046.	44.	1.95	17.24	117.6	245.0	676	676	660	675	660	627	629	574	578	553	554	550	555	552	555	547	551	556	579	752
8441	11:38:36	11/09	7956.	41.	1.95	17.11	117.6	244.9	678	678	661	678	660	625	629	575	578	555	556	550	557	554	557	549	553	560	582	751
8441	11:40:22	11/09	8024.	41.	1.97	17.11	118.1	245.2	676	678	659	674	659	623	625	571	574	552	554	548	554	552	554	547	551	558	580	751
8441	11:44:40	11/09	8039.	44.	1.97	15.30	117.9	245.5	620	620	598	618	599	552	553	508	511	506	507	505	511	509	511	498	500	501	532	747
8441	11:46:27	11/09	8024.	44.	1.97	15.20	117.9	245.5	622	622	603	620	602	556	558	511	513	507	510	507	513	510	511	499	501	503	533	746
8441	11:47:48	11/09	8031.	44.	1.97	15.24	117.9	245.7	621	621	598	619	597	553	552	509	511	505	506	503	508	507	508	497	499	502	532	745
8441	11:49:09	11/09	8001.	41.	1.97	15.22	117.8	245.7	623	623	600	619	599	555	555	511	513	506	507	504	510	508	509	499	500	505	533	744
8441	11:51:21	11/09	7986.	44.	1.97	14.31	117.4	245.7	596	595	567	591	567	519	519	487	488	487	489	485	490	486	487	473	476	469	501	741
8441	11:52:42	11/09	8016.	44.	1.97	14.23	118.1	245.7	593	593	565	589	564	514	516	485	487	486	487	485	489	485	486	473	475	468	500	739
8441	11:53:38	11/09	8039.	44.	1.96	14.37	117.9	245.7	590	591	564	587	563	513	515	483	487	486	488	485	490	484	486	471	474	466	499	738
8441	11:54:59	11/09	8008.	44.	2.19	14.36	117.9	245.7	594	595	566	590	566	517	519	487	489	487	489	486	491	486	487	473	477	469	500	737
8441	11:57:11	11/09	8016.	41.	2.12	13.73	117.6	245.6	577	577	547	574	547	500	502	476	478	477	478	475	479	473	475	460	463	451	485	742
8441	11:58:21	11/09	8046.	47.	2.14	13.84	117.8	245.6	578	577	546	573	547	499	499	475	477	476	477	473	478	472	473	459	462	449	483	745
8441	11:59:13	11/09	8046.	44.	2.14	13.68	117.4	245.6	575	576	545	571	544	497	498	475	477	476	477	473	478	472	473	459	462	449	483	745
8441	12:00:19	11/09	8001.	44.	2.07	13.89	117.9	245.6	576	578	547	573	548	500	501	474	477	476	477	475	479	472	474	458	460	445	481	745
8441	12:05:00	11/09	7941.	47.	-.02	12.96	117.6	245.5	315	319	311	313	309	308	308	306	307	307	309	307	309	307	308	308	308	312	336	743
8521	13:46:34	11/09	8016.	47.	1.91	18.23	209.7	270.7	630	630	662	644	665	675	677	674	678	672	674	669	676	675	676	673	672	678	682	789
8521	13:48:40	11/09	8008.	44.	1.91	18.22	209.3	270.8	630	632	663	643	665	675	679	676	680	672	674	667	674	675	676	673	673	679	681	788
8521	13:59:18	11/09	7941.	44.	1.78	17.97	209.5	275.3	642	646	671	654	673	681	683	685	690	686	687	675	681	675	675	676	674	675	681	775
8521	14:02:10	11/09	8016.	44.	1.79	17.97	209.5	275.6	643	644	670	655	672	681	683	686	688	688	688	675	681	673	673	673	672	673	672	771
8521	14:03:47	11/09	8031.	44.	1.79	18.12	209.6	276.0	645	646	672	656	672	682	685	686	690	688	687	675	682	674	674	675	673	675	672	769
8521	14:05:08	11/09	8016.	44.	1.85	18.13	209.4	276.0	643	646	673	657	673	685	684	686	689	688	687	674	681	675	674	675	673	673	670	767
8521	14:06:30	11/09	8039.	44.	1.85	18.01	209.4	276.1	646	646	671	655	673	683	685	686	688	685	685	675	681	674	674	675	672	675	671	768
8521	14:09:23	11/09	8031.	44.	1.83	16.07	209.3	276.2	610	611	634	620	634	643	646	646	649	643	643	631	640	634	634	635	634	640	642	769
8521	14:11:30	11/09	8046.	44.	1.84	16.24	209.8	276.2	610	612	635	621	636	642	646	646	649	643	644	632	638	633	634	635	634	640	642	769
8521	14:14:07	11/09	8008.	41.	1.84	16.21	209.4	276.2	611	613	634	621	635	643	646	646	649	643	645	632	639	634	634	635	634	640	642	768
8521	14:17:45	11/09	7986.	44.	1.83	16.07	209.2	275.9	610	611	634	620	635	642	644	646	649	642	643	631	638	634	633	636	632	638	642	767
8521	14:19:07	11/09	7978.	44.	1.82	16.07	209.5	276.0	612	612	635	620	637	645	646	646	649	644	644	631	637	634	634	635	634	638	641	767
8521	14:22:30	11/09	8016.	44.	1.83	14.40	209.6	277.2	578	579	599	586	600	607	608	604	608	601	602	590	596	592	593	597	595	607	613	767
8521	14:24:22	11/09	8024.	44.	1.84	14.40	209.5	277.2	579	579	599	586	600	607	609	605	608	602	604	591	596	591	593	597	595	607	613	766
8521	14:27:29	11/09	8016.	41.	1.85	14.31	209.8	277.0	580	580	600	587	599	605	607	605	609	600	602	591	596	592	592	596	595	607	613	765
8521	14:29:35	11/09	8031.	44.	1.85	14.40	209.6	276.5	577	578	598	586	599	604	606	605	608	598	601	588	594	592	593	597	594	606	614	765
8521	14:31:27	11/09	8031.	44.	1.85	14.42	209.9	276.4	577	578	599	585	599	604	608	603	608	599	599	588	594	591	591	595	594	606	613	765
8521	14:34:34	11/09	7971.	44.	1.85	11.47	209.2	276.4	522	523	537	528	536	531	533	521	523	513	515	512	516	511	512	511	510	542	558	763
8521	14:36:41	11/09	7971.	41.	1.85	11.48	209.6	276.4	521	521	533	526	533	526	528	517	520	509	511	510	514	509	509	508	508	543	558	761
8521	14:38:32	11/09	7993.	44.	1.85	11.43	209.3	276.4	519	520	533	526	533	526	528	517	520	509	511	511	515	508	509	507	508	542	556	758
8521	14:40:09	11/09	7986.	44.	1.85	11.30	209.6	276.4	521	522	535	528	535	529	532	520	523	511	513	511	516	510	511	510	509	541	555	757
8521	14:43:31	11/09	8001.	41.	1.83	9.93	209.2	276.4	488	488	494	493	494	489	490	481	483	471	472	470	473	463	464	467	466	509	527	752
8521	14:45:23	11/09	7993.	44.	1.85	9.94	209.2	276.4	488	488	492	492	492	486	487	479	483	470	471	467	472	460	464	464	466	506	524	750
8521	14:47:15	11/09	8039.	44.	1.88	10.00	209.2	276.4	485	486	491	490	490	483	484	477	479	468	469	464	467	456	457	461	462	506	523	748
8521	14:49:36	11/09	7971.	44.	1.88	10.06	209.5	276.2	488	488	493	490	493	484	486	478	481	469	471	466	470	459	460	462	462	505	523	748
8521	14:51:29	11/09	8031.	47.	1.88	9.31	209.5	276.3	469	469	472	474	472	466	466	460	462	450	452	443	448	437	438	442	442	489	507	747
8521	14:52:20	11/09	8046.	47.	1.89	9.28	208.7	276.4	469	469	471	472	471	464	465	460	462	448	450	442	446	434	435	440	440	486	505	746
8521	14:58:22	11/09	7986.	47.	1.89	8.64	209.5	276.4	449	449	451	452	450	443	443	428	431	427	428	420	424	417	418	425	425	475	494	742
8521	14:59:28	11/09	7993.	44.	1.90	8.66	209.4	276.4	451	450	452	454	451	444	446	434	437	432	433	424	427	418	419	426	424	475	494	741
8521	15:01:20	11/09	8039.	44.	1.92	8.46	209.3	276.4	441	441	443	449	442	432	433	419	421	413	414	409	413	408	410	418	417	469	490	740
8521	15:02:41	11/09	7986.	44.	1.92	8.39	209.5	276.4	443	442	443	444	442	436	437	421	423	419	420	413	416	412	413	419	419	470	490	740
8521	15:06:18	11/09	8001.	50.	1.92	8.47	209.1	276.5	304	305	306	304	305	304	304	302	303	305	306	303	305	301	301	303	303	466	483	744
8531	15:31:17	11/09	7926.	47.	1.90	20.12	209.2	260.5	650	650	657	657	658	640	641	625	629	644	648	652	661	665	667	675	676	683	688	744
8531	15:33:54	11/09	8008.	47.	1.91	20.12	209.4	260.6	649	650	657	656	657	640	642	625	629	646	649	654	661	665	667	675	675	682	686	743
8531	15:35:31	11/09	8016.	44.	1.91	20.15	209.0	260.5	646	649	656	655	654	637	639	622	625	642	644	650	659	662	663	672	674	678	683	743
8531	15:37:08	11/09	8046.	44.	1.94	20.14	209.6	260.6	646	648	653	654	654	636	638	622	625	642	645	650	657	662	665	669	671	676	680	744
8531	15:38:15	11/09	8016.	47.	1.90	20.37	209.1	260.6	649	650	658	659	659	642	643	626	630	646	647	652	659	664	666	673	674	678	682	744
8531	15:41:22	11/09	8016.	47.	1.91	18.35	209.3	260.5	607	609	602	612	602	583	584	575	578	600	603	603	609	603	604	599	600	608	622	738
8531	15:43:59	11/09	8046.	50.	1.91	18.27	209.3	260.5	609	609	603	611	603	581	582	575	578	601	603	603	608	600	601	596	596	603	617	734
8531	15:47:07	11/09	8001.	47.	1.90	18.43	209.5	260.5	607	607	600	609	600	579	581	572	576	601	603	603	608	601	602	599	597	604	617	729
8531	15:48:58	11/09	8031.	41.	1.91	18.41	209.2	260.5	609	609	603	612	603	582	584	575	578	598	599	602	607	603	604	601	601	608	620	727
8531	15:52:35	11/09	8031.	44.	2.11	16.60	209.1	260.5	574	574	561	575	561	541	543	541	544	558	560	553	557	545	545	542	542	553	571	733
8531	15:54:58	11/09	8008.	44.	2.10	16.72	209.6	260.5	574	575	562	575	561	544	544	543	546	561	563	556	560	548	549	546	544	557	576	736
8531	15:56:05	11/09	8046.	47.	2.12	16.70	209.3	260.6	574	574	560	575	560	542	543	542	545	559	560	553	557	545	545	542	542	554	573	738
8531	15:57:57	11/09	8001.	47.	2.16	16.79	209.1	260.6	576	575	563	575	564	545	548	545	548	561	563	555	560	547	548	545	544	557	576	741
8531	16:01:50	11/09	8016.	44.	2.02	15.26	209.4	260.6	551	551	534	549	534	520	520	520	522	523	524	515	519	506	507	503	503	519	543	741
8531	16:03:41	11/09	8016.	47.	2.05	15.21	209.6	260.7	549	549	534	547	532	518	520	521	522	521	522	512	516	504	504	499	499	516	540	738
8531	16:05:47	11/09	8054.	44.	2.02	15.23	209.5	260.6	549	550	532	549	532	518	519	520	523	521	522	514	517	504	505	500	500	515	539	736
8531	16:07:08	11/09	8008.	47.	2.01	15.39	209.5	260.6	547	549	532	547	532	518	520	519	521	523	524	514	517	505	505	502	500	518	540	734
8531	16:10:45	11/09	8016.	47.	2.08	14.09	209.4	260.5	526	527	509	524	509	495	497	492	494	493	494	487	490	476	477	470	470	487	513	731
8531	16:12:22	11/09	8039.	47.	2.07	13.97	209.2	260.7	529	529	510	528	510	495	497	492	495	492	493	485	489	476	477	470	469	487	512	731
8531	16:13:43	11/09	8024.	44.	2.08	13.93	209.0	260.6	526	528	509	525	508	495	495	491	494	491	492	483	486	473	473	467	466	484	510	730
8531	16:15:20	11/09	8001.	52.	2.09	13.97	209.2	260.5	526	526	509	524	508	495	496	492	494	492	493	486	489	477	477	470	470	487	514	730
8531	16:53:38	11/09	7993.	47.	2.06	14.94	209.2	260.4	546	545	530	544	530	515	516	514	517	517	518	509	513	500	500	497	497	516	540	745
8531	16:56:45	11/09	8024.	47.	2.06	15.06	209.6	260.6	544	544	528	543	528	514	515	515	518	518	520	510	515	502	502	498	497	515	539	742
8531	16:58:07	11/09	7986.	47.	2.08	14.94	209.1	260.7	543	542	528	542	528	515	516	516	518	516	517	507	511	497	498	494	493	511	536	742
8531	17:01:14	11/09	8046.	47.	2.06	13.99	209.2	260.7	526	526	507	523	506	493	495	491	494	494	494	486	488	476	476	469	468	488	515	740
8531	17:02:35	11/09	8008.	47.	2.25	13.99	209.5	260.7	526	527	506	524	506	493	495	490	494	493	494	486	489	476	476	469	469	489	516	738
8531	17:03:57	11/09	8046.	41.	2.24	14.09	210.1	260.7	524	526	508	523	507	494	495	491	494	491	492	483	487	473	473	467	466	487	514	742
8531	17:04:33	11/09	8001.	50.	2.22	14.06	209.6	260.7	526	527	506	522	506	492	494	488	492	490	491	483	486	473	474	468	468	489	515	743
8531	17:07:56	11/09	8031.	50.	2.13	13.52	209.1	260.7	518	518	500	516	500	487	489	480	483	479	480	472	475	458	458	453	451	473	502	745
8531	17:09:32	11/09	7941.	47.	2.13	13.32	208.9	260.6	520	520	500	518	500	486	488	480	483	480	481	472	475	460	460	455	453	476	505	745

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
8531	17:12:09	11/09	8008.	50.	2.13	13.36	209.4	260.6	519	520	503	519	503	488	490	481	483	479	480	472	475	460	460	455	454	476	505	745
8541	10:43:02	12/09	8046.	41.	2.29	25.42	206.2	244.7	696	697	661	696	662	614	616	602	606	633	634	640	645	641	640	630	627	625	635	755
8541	10:45:54	12/09	8024.	47.	2.29	25.45	206.4	244.8	694	695	665	696	665	618	620	605	608	636	636	642	646	643	643	631	629	627	638	755
8541	10:47:45	12/09	7993.	47.	2.29	25.23	206.3	244.8	698	698	663	698	665	614	616	602	606	634	634	642	648	648	646	637	635	634	644	756
8541	10:49:21	12/09	8024.	44.	2.30	25.26	206.7	244.8	697	699	667	698	666	617	619	605	609	638	640	646	651	647	646	638	634	632	641	757
8541	10:50:27	12/09	8061.	50.	2.29	25.42	206.0	244.8	696	696	663	696	663	616	618	604	608	634	634	640	645	641	640	629	625	625	635	757
8541	10:52:04	12/09	7933.	47.	2.29	25.37	206.3	244.8	697	698	667	698	667	616	618	601	604	632	632	642	647	646	646	635	631	630	640	758
8541	10:55:26	12/09	7948.	47.	2.29	23.71	206.6	244.9	666	667	622	662	623	582	585	581	584	610	610	611	614	606	605	592	589	588	601	754
8541	10:57:47	12/09	7986.	44.	2.31	23.59	206.8	244.9	666	667	622	662	622	584	585	580	582	610	610	612	615	608	607	594	592	590	603	754
8541	11:00:08	12/09	8001.	47.	2.33	23.70	206.8	245.0	667	666	624	662	625	585	586	582	586	612	613	613	617	605	604	589	586	587	601	754
8541	11:02:45	12/09	8039.	44.	2.32	23.54	206.8	245.0	665	665	621	658	621	582	583	578	581	609	609	612	616	608	606	593	589	588	602	754
8541	11:06:22	12/09	8031.	44.	2.33	23.82	206.9	244.9	663	665	622	660	623	583	585	580	583	608	609	610	613	605	604	590	587	587	600	754
8541	11:08:14	12/09	8039.	44.	2.32	23.68	206.6	245.0	664	663	622	660	622	584	586	581	585	611	613	613	617	606	605	591	587	587	600	754
8541	11:15:05	12/09	7993.	47.	2.39	22.46	206.2	244.9	641	641	596	633	596	566	567	565	568	588	589	584	587	576	574	562	558	558	573	752
8541	11:18:27	12/09	8054.	47.	2.33	22.64	206.6	244.8	635	637	594	630	595	565	567	566	569	589	590	587	590	579	578	564	560	558	573	752
8541	11:19:35	12/09	8008.	47.	2.33	22.73	207.0	244.8	642	643	600	636	600	572	575	571	575	595	592	585	588	577	575	561	558	557	572	750
8541	11:21:41	12/09	8061.	44.	2.32	22.55	206.5	245.0	638	639	596	632	597	568	570	567	570	589	589	584	587	577	575	561	558	556	571	749
8541	11:22:47	12/09	7963.	50.	2.35	22.49	206.4	244.8	641	641	599	633	598	569	570	567	571	589	590	585	588	578	576	563	560	558	574	749
8541	11:26:24	12/09	8001.	41.	2.37	20.96	206.5	245.0	611	612	566	602	567	547	549	550	553	564	564	558	560	550	547	529	526	526	544	750
8541	11:28:02	12/09	8016.	50.	2.37	21.09	206.9	245.0	610	610	568	601	569	549	549	552	554	562	562	555	556	546	544	528	523	524	544	751
8541	11:29:38	12/09	8069.	47.	2.37	21.11	206.7	245.0	609	609	567	599	567	549	549	552	554	560	560	551	553	541	538	523	519	519	538	750
8541	11:31:14	12/09	7986.	47.	2.37	21.00	206.4	245.0	615	615	574	606	574	555	556	558	561	565	564	556	558	548	545	530	527	525	543	751
8541	11:34:35	12/09	8001.	47.	2.37	20.16	206.5	245.0	599	599	561	591	561	547	548	548	551	549	549	540	542	530	527	509	503	505	525	750
8541	11:36:12	12/09	8008.	47.	2.37	20.24	206.7	245.0	599	600	562	589	561	544	546	545	548	549	548	540	541	530	527	510	503	505	525	750
8541	11:37:48	12/09	8046.	44.	2.36	20.25	207.0	245.0	597	596	560	587	559	545	546	546	549	548	548	539	541	530	527	508	503	503	524	750
8541	11:39:55	12/09	7986.	50.	2.37	20.34	206.4	245.0	597	597	559	588	560	543	544	545	548	547	546	538	539	530	527	510	505	506	527	749
8541	11:42:17	12/09	7993.	50.	2.36	19.12	206.2	245.0	575	575	537	564	537	526	527	528	530	533	532	525	527	511	506	477	471	480	503	749
8541	11:43:23	12/09	8031.	50.	2.36	19.13	206.5	245.0	580	581	543	570	543	531	532	531	532	529	528	521	522	510	505	475	469	477	500	749
8541	11:44:16	12/09	7941.	47.	2.36	19.16	206.2	245.0	580	580	544	570	544	532	533	532	534	530	528	521	522	510	505	478	471	479	503	748
8541	11:45:22	12/09	8016.	47.	2.36	19.00	206.4	244.9	580	581	544	569	543	531	533	531	532	531	530	523	523	511	506	477	471	478	502	748
8541	11:50:14	12/09	7978.	47.	2.40	18.45	207.0	244.9	570	570	533	560	533	525	525	525	527	522	521	513	514	496	490	459	452	465	489	747
8541	11:51:35	12/09	7986.	50.	2.40	18.39	206.9	245.0	571	571	538	560	538	526	528	522	524	521	519	511	512	496	490	457	450	464	489	748
8541	11:53:27	12/09	7993.	47.	2.37	18.35	206.5	245.0	569	569	536	558	536	526	527	523	525	521	519	511	511	494	488	455	447	461	487	749
8541	11:55:47	12/09	7986.	50.	2.37	18.36	207.0	244.8	570	570	536	558	535	526	527	521	523	520	520	511	512	494	489	454	448	461	488	752
8541	12:03:25	12/09	8008.	50.	2.36	17.90	206.1	244.8	313	314	312	312	310	309	309	308	309	310	310	308	308	304	303	563	566	559	584	771
8541	12:09:32	12/09	8031.	50.	2.36	17.90	206.1	245.0	309	310	311	309	310	308	309	307	308	310	311	560	565	587	587	592	588	568	588	774
8541	12:12:54	12/09	8039.	50.	2.37	17.87	206.1	245.0	309	309	311	309	309	308	308	307	308	309	310	575	580	575	574	573	570	554	578	772
8541	12:15:31	12/09	7978.	47.	2.19	17.74	206.2	245.0	308	309	310	308	309	308	308	307	308	309	310	571	574	565	563	556	551	548	571	770
8541	12:36:34	12/09	8016.	47.	2.17	17.84	206.6	245.0	307	308	310	308	309	307	308	307	308	564	563	553	555	542	537	510	502	517	540	748
8541	12:39:55	12/09	8039.	50.	2.18	17.80	206.0	245.1	308	308	310	308	309	308	308	307	309	557	556	549	550	538	535	505	497	511	535	745
8541	12:42:16	12/09	8061.	52.	2.18	17.78	206.0	245.2	308	308	311	308	309	308	308	307	309	562	561	551	553	536	530	499	491	509	532	744
8541	12:48:06	12/09	8016.	47.	2.21	17.89	206.2	245.0	306	308	310	308	309	308	308	307	308	560	559	549	551	533	528	498	490	509	532	742
8541	12:54:27	12/09	8024.	47.	2.20	17.87	206.3	244.9	307	308	310	308	309	308	308	307	309	557	556	548	549	535	531	500	494	509	533	741
8541	12:56:03	12/09	8039.	50.	2.21	17.89	206.0	245.1	306	308	310	308	309	308	308	307	309	559	558	551	551	537	532	501	494	510	534	741
8541	13:01:26	12/09	8039.	52.	2.22	17.78	205.9	245.2	308	308	310	308	309	308	308	307	309	560	559	550	552	535	531	501	494	510	533	742
8541	13:05:03	12/09	7993.	50.	2.21	16.61	206.1	245.1	306	307	309	307	308	307	307	306	307	553	552	549	551	526	519	487	477	499	525	743
8541	13:06:25	12/09	7941.	50.	2.21	16.68	206.3	245.1	307	307	309	307	308	307	307	306	307	554	554	548	550	521	512	484	472	497	521	744
8541	13:09:01	12/09	8008.	47.	2.20	16.62	206.2	245.2	307	307	309	307	308	307	307	306	308	555	554	548	549	520	514	479	471	496	523	743
8541	13:10:37	12/09	8024.	50.	2.21	16.60	206.3	245.2	307	307	309	307	308	307	308	306	308	556	556	553	555	528	520	489	478	501	527	744
8541	13:15:00	12/09	7993.	52.	2.19	15.94	205.9	245.2	307	307	309	307	308	307	307	306	307	560	559	551	554	509	494	471	459	494	521	744
8541	13:17:07	12/09	7993.	47.	2.18	15.94	205.8	244.9	307	307	309	307	308	307	307	306	307	562	561	554	555	501	492	467	455	491	519	744
8541	13:18:28	12/09	8061.	47.	2.17	16.04	205.7	245.2	307	307	309	307	308	307	307	306	307	562	562	553	554	499	489	467	455	493	521	744
8541	13:23:06	12/09	7963.	50.	2.18	15.84	206.1	244.8	307	307	309	307	308	307	307	306	307	560	560	552	555	504	495	471	459	494	521	744
8541	13:25:57	12/09	7978.	50.	2.18	15.60	206.1	245.1	307	307	309	307	308	307	307	305	306	306	306	304	303	299	299	515	516	492	523	746
8321	14:27:12	12/09	8016.	39.	1.71	13.42	83.1	275.9	681	682	663	678	663	641	642	620	625	613	612	603	609	597	597	598	597	614	629	772
8321	14:28:18	12/09	8008.	39.	1.71	13.51	83.5	276.0	682	682	664	678	663	640	643	620	622	613	614	603	610	597	597	597	595	613	628	772
8321	14:29:54	12/09	8016.	39.	1.72	13.53	83.1	275.9	680	681	663	677	663	641	642	622	623	612	612	603	608	597	597	597	595	613	627	770
8321	14:31:31	12/09	8008.	39.	1.73	13.51	83.1	275.9	682	682	665	678	663	642	646	622	625	611	613	603	609	597	598	596	596	613	629	770
8321	14:33:07	12/09	8054.	39.	1.73	13.44	83.1	275.9	680	681	662	678	665	642	644	621	623	610	612	602	608	597	597	596	594	612	627	770
8321	14:36:43	12/09	8039.	39.	1.72	12.14	83.1	276.0	642	642	622	638	623	606	607	586	590	577	578	569	574	561	561	560	560	583	601	769
8321	14:37:49	12/09	8016.	39.	1.72	12.14	83.1	275.9	640	642	621	637	623	603	606	588	591	579	580	570	574	563	563	561	560	585	602	768
8321	14:41:10	12/09	7956.	39.	1.70	12.14	83.5	275.9	643	642	623	640	625	603	605	587	590	578	578	570	575	562	563	561	561	582	601	766
8321	14:45:47	12/09	8046.	39.	1.70	12.25	83.5	276.0	642	642	622	638	623	606	607	587	591	578	578	570	573	561	560	558	558	581	599	763
8321	14:56:25	12/09	8008.	39.	1.70	10.50	83.5	275.7	587	587	570	583	570	554	554	540	542	531	531	519	524	511	511	508	507	537	558	756
8321	14:58:02	12/09	8001.	39.	1.71	10.63	83.5	276.0	585	587	572	583	571	554	555	541	542	533	532	521	526	512	512	511	510	538	560	754
8321	14:59:39	12/09	8031.	39.	1.71	10.61	83.5	276.0	586	587	570	582	572	555	556	539	543	531	533	521	524	510	511	509	509	538	560	754
8321	15:02:32	12/09	7993.	39.	1.83	10.61	83.1	276.0	585	587	570	581	570	553	554	540	544	530	531	521	524	511	512	509	509	536	560	757
8321	15:05:08	12/09	7956.	39.	1.84	10.59	83.5	276.0	587	587	571	583	570	554	556	541	543	531	532	521	526	512	512	511	511	541	563	761
8321	15:09:31	12/09	7993.	39.	1.81	9.82	83.5	276.1	565	565	548	561	549	534	535	521	523	511	514	502	506	493	493	492	493	525	549	763
8321	15:12:37	12/09	7971.	39.	1.88	9.88	83.5	276.2	564	564	549	560	548	533	534	520	523	512	512	503	506	492	493	494	493	526	552	766
8321	15:14:28	12/09	7993.	39.	1.85	9.99	83.5	276.1	563	562	549	558	549	533	534	520	523	510	512	501	504	491	490	491	491	526	552	774
8321	15:16:19	12/09	8039.	39.	1.85	9.92	83.1	276.1	563	562	549	558	547	532	533	520	523	511	512	500	505	492	492	492	491	526	551	777
8321	15:17:12	12/09	7971.	39.	1.85	9.82	83.5	275.9	562	561	548	557	547	532	533	520	522	511	512	501	505	491	492	492	491	526	552	779
8321	15:19:48	12/09	8008.	39.	1.83	8.83	83.1	276.1	528	528	514	525	515	503	505	492	494	482	482	471	474	461	461	461	461	503	532	779
8321	15:21:55	12/09	8039.	41.	1.81	8.86	83.1	276.1	528	529	514	524	513	503	503	491	494	480	480	470	473	460	460	460	460	503	532	782
8321	15:23:16	12/09	8008.	41.	1.83	8.86	83.1	276.2	530	530	515	525	515	504	503	492	495	481	482	470	473	460	460	460	460	499	531	782
8321	15:24:07	12/09	8008.	39.	1.84	8.83	83.5	276.2	528	528	515	524	513	503	503	492	494	481	482	471	475	460	460	460	462	503	532	782
8321	15:25:45	12/09	8024.	41.	1.83	8.51	83.1	276.3	512	514	501	510	501	490	492	480	482	469	469	457	460	447	447	448	449	490	522	783
8321	15:26:21	12/09	8001.	41.	1.83	8.47	83.1	276.4	512	513	502	509	501	490	490	482	483	469	469	457	460	447	447	448	449	490	522	783
8321	15:27:28	12/09	8054.	41.	1.83	8.40	83.1	276.4	512	512	501	508	500	491	491	481	483	468	470	457	460	448	447	449	449	492	522	783

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
8321	15:31:19	12/09	8008.	41.	1.81	7.99	83.1	276.3	307	308	307	306	306	306	305	304	304	305	306	304	306	305	305	307	307	318	351	782
8321	15:32:10	12/09	7993.	41.	1.81	8.09	83.1	276.4	305	306	307	305	305	305	303	304	304	304	305	304	306	304	305	307	307	316	347	781
8221	14:48:37	16/10	8016.	39.	1.62	11.13	46.9	275.5	718	719	675	707	674	634	634	591	596	567	567	560	564	556	555	556	554	575	591	754
8221	14:52:16	16/10	8031.	39.	1.40	11.26	48.2	275.8	710	710	667	699	667	626	627	587	589	565	567	558	562	554	554	553	553	570	587	743
8221	14:55:24	16/10	8016.	38.	1.39	11.20	48.3	277.2	714	713	672	703	670	629	631	590	592	567	568	560	564	554	554	555	554	572	587	733
8221	14:57:37	16/10	8008.	39.	1.40	11.09	49.7	276.7	706	704	662	693	663	623	625	589	589	566	569	557	560	555	554	554	551	568	583	727
8221	14:58:15	16/10	8008.	41.	1.88	11.23	49.8	276.4	706	704	662	693	662	625	627	587	587	565	564	558	561	553	553	552	550	567	582	726
8221	15:00:06	16/10	8024.	39.	1.87	11.20	49.7	276.9	703	702	660	691	661	622	623	586	587	564	564	557	560	552	554	552	551	567	583	738
8221	15:03:30	16/10	8039.	41.	1.49	10.53	49.5	276.7	680	680	640	670	639	602	601	569	572	550	549	543	545	537	537	536	536	556	575	751
8221	15:05:06	16/10	8008.	41.	1.49	10.66	49.7	276.6	679	679	637	669	637	602	603	566	569	549	549	542	546	539	537	537	537	555	575	748
8221	15:06:30	16/10	8001.	39.	1.49	10.49	49.5	276.4	680	678	637	667	638	604	603	569	570	549	549	542	547	537	537	536	535	553	573	745
8221	15:08:40	16/10	8001.	41.	1.48	10.69	49.7	276.4	680	680	637	668	639	601	604	568	568	550	550	541	544	537	538	537	535	555	572	741
8221	15:11:32	16/10	8039.	41.	1.48	9.88	49.4	277.2	646	644	607	634	605	573	574	541	544	528	528	521	524	515	516	514	512	536	555	736
8221	15:12:39	16/10	7963.	39.	1.64	9.77	49.3	277.5	647	646	607	636	607	572	573	543	545	528	529	521	524	517	517	519	516	537	555	736
8221	15:14:30	16/10	7978.	41.	1.64	9.84	49.6	276.8	646	646	605	635	608	572	574	541	543	529	528	521	524	516	517	516	516	537	556	739
8221	15:15:37	16/10	8031.	39.	1.63	9.88	49.7	275.7	646	644	606	634	604	572	573	541	543	527	528	521	523	515	515	515	513	536	554	741
8221	15:18:14	16/10	8024.	41.	1.62	9.05	49.6	276.2	600	599	563	589	562	535	535	511	511	500	501	493	496	488	488	486	486	511	533	744
8221	15:26:12	16/10	7963.	41.	1.61	8.85	49.5	276.4	600	599	564	588	564	536	536	510	511	500	502	494	497	487	487	488	487	513	534	748
8221	15:31:51	16/10	7993.	41.	1.57	8.90	49.4	276.7	601	600	564	590	564	535	537	511	513	500	502	495	497	489	488	489	488	513	536	745
8221	15:32:57	16/10	7956.	41.	1.56	9.01	49.4	276.8	601	600	565	591	566	537	537	510	512	500	501	495	498	489	489	488	488	515	537	745
8221	15:34:49	16/10	8024.	41.	1.56	8.27	49.4	276.6	571	571	538	562	538	512	513	490	493	482	484	472	479	471	471	471	470	496	521	743
8221	15:36:11	16/10	8016.	41.	1.56	8.35	49.3	276.5	573	571	539	562	538	514	515	490	494	483	483	477	478	471	472	471	469	494	520	741
8221	15:37:02	16/10	8016.	41.	1.56	8.36	49.3	276.5	571	570	537	561	536	510	511	490	492	483	482	476	479	469	469	470	468	494	519	741
8221	15:37:54	16/10	8031.	41.	1.56	8.25	49.4	276.4	573	570	538	561	536	511	512	490	493	483	483	476	479	472	470	469	470	495	518	741
8221	15:41:02	16/10	8024.	41.	1.66	7.52	49.4	276.9	532	532	503	524	501	482	483	464	467	460	460	454	456	447	448	446	445	473	499	739
8221	15:42:24	16/10	7978.	41.	1.63	7.54	49.2	276.4	532	531	502	521	502	482	482	465	467	459	460	453	455	447	448	444	445	473	499	740
8221	15:46:36	16/10	8024.	41.	1.59	7.59	49.3	275.1	308	312	308	308	307	306	306	305	305	305	307	305	307	305	306	307	306	314	338	740
8221	15:47:43	16/10	7941.	41.	1.58	7.45	48.9	275.7	307	307	307	306	305	305	303	304	305	305	306	304	305	306	306	306	313	334	739
8121	10:42:43	17/10	7956.	39.	1.60	8.44	28.4	276.0	724	722	654	703	651	593	595	540	544	504	503	493	496	490	490	496	494	527	548	774
8121	10:44:03	17/10	7948.	39.	1.60	8.36	28.5	275.7	722	719	651	702	651	594	594	537	539	505	506	493	496	491	492	496	494	527	549	774
8121	10:45:25	17/10	8054.	39.	1.60	8.50	28.6	275.1	720	722	652	703	652	596	597	538	540	502	503	493	496	490	490	495	496	525	549	774
8121	10:47:32	17/10	8016.	39.	1.60	8.44	28.5	275.6	722	718	651	701	650	594	595	537	541	503	503	493	495	489	489	496	495	526	547	774
8121	10:50:07	17/10	7933.	39.	1.60	7.99	28.6	275.8	691	689	622	671	622	569	569	520	521	488	487	478	481	476	477	483	482	514	537	773
8121	10:51:48	17/10	7948.	39.	1.59	8.06	28.4	276.1	691	689	625	672	623	571	571	519	521	488	486	481	483	477	477	483	481	513	537	773
8121	10:54:01	17/10	8024.	39.	1.59	8.01	28.6	275.6	690	688	625	670	624	568	570	518	520	487	488	479	483	476	476	483	482	515	537	773
8121	10:55:37	17/10	8031.	39.	1.58	8.08	28.3	275.3	688	686	621	669	620	566	566	515	517	487	487	480	483	476	477	482	481	511	536	772
8121	10:59:03	17/10	7956.	39.	1.58	7.16	28.4	275.0	639	636	577	619	577	528	528	486	488	463	464	458	461	455	454	461	460	494	518	769
8121	11:00:41	17/10	7926.	39.	1.58	7.33	28.5	275.5	636	634	574	618	574	528	528	484	487	464	465	456	460	454	455	461	460	492	519	769
8121	11:02:32	17/10	8016.	39.	1.58	7.31	28.4	275.7	637	635	575	618	575	529	531	485	488	462	463	458	460	455	455	461	461	494	518	767
8121	11:03:53	17/10	8031.	39.	1.58	7.19	28.5	275.8	637	634	574	617	573	526	526	484	486	463	464	457	460	455	455	461	459	494	518	766
8121	11:07:45	17/10	8016.	39.	1.56	6.87	28.5	275.5	607	605	548	586	546	505	505	466	468	451	451	445	448	444	443	448	448	481	508	764
8121	11:08:51	17/10	8031.	39.	1.56	6.79	28.7	275.3	605	604	548	587	546	504	504	466	469	449	450	444	447	443	443	448	447	481	507	763
8121	11:11:14	17/10	7948.	39.	1.56	6.76	28.4	274.8	603	601	545	584	544	503	504	465	467	449	450	443	446	442	441	447	445	480	505	760
8121	11:12:41	17/10	8024.	39.	1.56	6.76	28.7	274.8	605	602	547	587	547	501	501	468	469	448	448	445	448	442	442	448	447	480	505	760
8121	11:13:21	17/10	7948.	39.	1.56	6.46	28.4	274.5	594	593	535	575	534	495	495	458	460	443	443	438	441	436	437	440	438	472	500	759
8121	11:15:27	17/10	8039.	41.	1.56	6.59	28.4	274.2	309	311	307	308	306	305	305	304	304	304	305	304	306	304	305	306	306	313	336	757
8121	11:16:33	17/10	8031.	41.	1.57	6.44	28.5	274.2	307	307	307	306	305	304	304	302	303	304	305	304	305	303	304	306	305	312	334	753
8231	14:42:55	17/10	8046.	41.	1.63	11.87	49.4	260.0	715	713	667	700	667	627	629	589	593	572	573	560	565	548	547	526	524	526	548	743
8231	14:43:46	17/10	7993.	41.	1.63	11.80	49.6	260.2	714	713	666	703	666	625	625	591	594	574	574	562	565	549	549	527	527	528	551	744
8231	14:45:23	17/10	8039.	41.	1.63	11.79	49.6	260.6	715	714	667	703	666	626	629	591	593	571	574	564	566	550	549	529	528	532	554	746
8231	14:46:15	17/10	7956.	41.	1.62	11.75	49.4	260.5	718	715	667	704	668	629	629	592	594	572	573	563	565	550	549	531	529	533	555	747
8231	14:49:47	17/10	8024.	41.	1.63	10.85	49.4	260.7	673	672	629	659	627	592	593	559	561	545	546	534	537	518	517	494	495	502	528	749
8231	14:51:09	17/10	8031.	41.	1.65	10.80	49.7	260.9	670	670	625	657	625	589	592	558	559	542	547	535	537	518	517	497	496	503	531	752
8231	14:53:46	17/10	8016.	41.	1.65	10.78	49.2	261.0	672	669	627	657	626	590	590	560	560	545	546	534	538	520	518	497	496	501	528	749
8231	14:54:54	17/10	8039.	41.	1.65	10.76	49.5	261.3	675	672	627	660	627	590	592	560	563	544	544	536	539	520	519	498	498	505	530	754
8231	14:57:32	17/10	7993.	41.	1.68	10.09	49.3	260.6	641	640	598	627	597	564	566	537	540	526	527	514	517	498	495	473	472	481	511	755
8231	14:58:24	17/10	8016.	41.	1.68	10.19	49.5	260.4	640	637	596	626	595	564	565	539	540	525	524	514	516	497	495	472	470	480	508	756
8231	15:00:30	17/10	8024.	41.	1.71	10.10	49.3	260.0	640	638	595	625	595	564	563	539	540	526	525	513	515	494	494	468	469	477	508	759
8231	15:01:37	17/10	8008.	41.	1.69	10.07	49.4	259.7	638	636	594	624	594	564	564	536	539	525	526	512	515	493	494	468	467	475	506	759
8231	15:05:15	17/10	8046.	41.	1.70	9.65	49.4	260.9	617	614	576	603	574	543	544	522	523	509	511	497	500	477	477	453	454	465	496	763
8231	15:06:21	17/10	7963.	41.	1.70	9.56	49.5	260.7	614	614	575	602	574	544	546	521	524	510	511	497	500	477	478	454	453	467	498	763
8231	15:07:28	17/10	7993.	41.	1.70	9.56	49.4	260.7	614	613	575	602	576	546	546	520	522	510	509	496	499	477	476	451	451	465	497	765
8231	15:08:50	17/10	8016.	41.	1.67	9.67	49.4	260.7	614	613	575	602	575	544	544	520	521	510	509	496	500	477	477	453	452	466	496	765
8231	15:10:56	17/10	7978.	41.	1.67	9.34	49.2	260.7	597	597	561	587	559	532	533	513	513	499	500	487	489	466	465	441	441	454	487	765
8231	15:12:17	17/10	8024.	41.	1.67	9.33	49.3	260.7	600	598	561	588	560	531	533	511	512	498	499	485	488	465	465	442	441	455	488	765
8231	15:13:24	17/10	8008.	41.	1.67	9.26	49.4	260.3	598	597	559	585	559	530	532	510	512	500	500	486	488	465	464	442	441	453	485	765
8231	15:14:31	17/10	8031.	41.	1.67	9.22	49.4	259.9	599	597	558	586	557	531	532	510	513	499	499	485	488	465	464	442	441	453	485	765
8231	15:15:09	17/10	8008.	41.	1.67	8.84	49.3	259.6	592	590	552	579	552	527	527	506	507	493	493	479	482	457	457	430	431	444	478	764
8231	15:17:45	17/10	8016.	44.	1.62	8.85	49.3	259.6	309	311	308	308	307	307	306	305	305	306	306	305	306	307	305	306	307	313	336	759
8231	15:18:37	17/10	7993.	44.	1.62	8.87	49.3	259.7	307	308	307	306	306	306	305	304	304	305	306	305	306	304	305	307	306	313	335	756

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
9521	11:37:10	15/09	9042.	41.	1.55	16.10	210.6	285.7	599	601	625	609	627	637	639	637	640	636	635	627	632	623	623	624	622	623	627	750
9521	11:38:16	15/09	9049.	44.	1.62	16.00	210.1	285.3	599	601	627	610	627	636	639	638	640	637	639	627	631	622	624	625	624	622	626	748
9521	11:40:23	15/09	9019.	41.	1.62	16.10	210.2	286.0	599	600	626	610	627	636	639	636	640	637	638	627	634	622	624	624	622	622	627	747
9521	11:42:14	15/09	9034.	44.	1.61	15.98	210.7	286.1	601	603	626	611	627	637	639	638	640	635	638	627	632	623	623	623	623	623	626	746
9521	11:44:06	15/09	9019.	44.	1.62	16.08	210.2	286.0	599	603	628	611	627	637	639	638	641	637	638	628	634	624	623	624	623	623	625	745
9521	11:47:29	15/09	8996.	44.	1.62	14.25	210.6	285.6	572	572	595	580	594	602	603	599	603	598	600	591	595	588	590	589	587	593	601	745
9521	11:49:23	15/09	9049.	44.	1.67	14.40	210.2	285.5	571	572	594	581	594	602	603	599	602	597	599	588	594	587	588	588	587	592	600	743
9521	11:50:14	15/09	9034.	44.	1.67	14.42	210.6	285.3	571	572	594	579	594	602	603	599	602	597	599	588	594	587	588	588	587	593	600	743
9521	11:51:51	15/09	9079.	44.	1.67	14.27	210.1	285.4	571	571	595	581	594	602	605	599	601	597	599	588	594	587	587	587	587	592	600	743
9521	11:54:43	15/09	9049.	41.	1.69	13.24	210.0	285.3	551	553	574	560	575	580	583	575	579	572	574	564	570	564	566	564	564	572	583	743
9521	11:56:35	15/09	9011.	44.	1.69	13.35	210.5	285.5	550	553	575	561	575	579	582	575	578	573	574	564	570	564	565	563	564	573	583	743
9521	11:57:42	15/09	8989.	47.	1.68	13.21	210.3	285.5	554	554	575	562	574	579	582	575	578	573	575	564	569	563	565	563	563	572	582	744
9521	11:59:03	15/09	9042.	44.	1.69	13.19	210.0	285.5	553	554	574	561	573	579	582	575	578	571	573	563	568	564	565	563	563	573	583	745
9521	12:01:40	15/09	9064.	47.	1.71	11.79	210.8	285.5	527	527	545	534	547	544	548	538	543	534	537	528	532	528	530	529	528	546	569	745
9521	12:02:46	15/09	8959.	44.	1.71	11.85	210.9	285.5	528	528	546	534	546	543	547	537	542	535	538	528	533	529	530	529	528	546	569	745
9521	12:03:52	15/09	9034.	44.	1.74	11.84	210.3	285.3	527	527	545	532	546	544	548	538	544	535	537	527	532	528	530	529	528	545	560	745
9521	12:05:14	15/09	8974.	41.	1.71	11.80	210.9	285.4	526	527	545	533	546	543	546	537	542	534	537	527	532	528	529	528	529	544	559	745
9521	12:08:06	15/09	9027.	47.	1.71	10.47	209.9	285.5	502	503	515	509	516	511	513	504	508	499	501	492	497	495	496	494	493	519	537	745
9521	12:10:28	15/09	9034.	44.	1.71	10.36	210.0	285.5	502	502	515	510	515	511	515	503	508	499	500	492	497	494	495	495	494	517	537	745
9521	12:11:34	15/09	9049.	44.	1.73	10.39	209.9	285.6	502	502	515	510	516	511	515	503	509	499	500	492	495	495	496	494	494	519	537	745
9521	12:12:55	15/09	9019.	44.	1.73	10.36	210.6	285.6	502	502	515	509	516	511	514	504	509	500	500	492	496	495	495	495	493	520	537	745
9521	12:14:47	15/09	9034.	47.	1.73	9.11	209.8	285.7	475	476	482	480	482	476	479	467	471	462	464	459	463	460	461	459	458	492	513	745
9521	12:16:09	15/09	9027.	44.	1.73	9.11	210.9	285.7	475	474	480	478	480	474	477	466	470	460	461	458	461	458	459	458	458	491	512	745
9521	12:17:31	15/09	9034.	44.	1.73	9.18	210.0	285.8	475	474	480	479	480	474	478	464	469	459	460	457	461	458	459	458	458	492	512	745
9521	12:19:10	15/09	9042.	41.	1.71	9.13	210.7	285.9	475	475	481	479	481	474	477	464	470	459	460	456	460	458	459	458	457	490	511	744
9521	12:21:33	15/09	9042.	44.	1.73	8.67	210.4	285.8	463	463	467	466	466	458	461	448	453	443	444	441	445	443	444	443	443	479	501	743
9521	12:22:40	15/09	9027.	47.	1.73	8.61	210.1	285.8	463	463	468	466	467	459	463	448	452	443	445	442	446	443	443	443	443	479	502	742
9521	12:24:02	15/09	8981.	47.	1.71	8.67	210.2	285.7	462	461	466	465	466	458	461	448	452	442	445	442	446	442	443	443	443	479	501	741
9521	12:27:11	15/09	8966.	47.	1.71	7.90	210.2	285.6	450	450	451	453	450	440	442	428	432	424	426	423	428	425	425	427	426	465	489	739
9521	12:28:18	15/09	9034.	44.	1.71	7.93	209.9	285.7	449	449	449	451	450	439	442	428	432	423	425	423	427	423	425	426	426	464	488	738
9521	12:29:11	15/09	9004.	47.	1.71	7.92	209.9	285.4	449	449	449	452	449	438	441	427	430	423	425	424	427	423	424	426	425	464	488	737
9521	12:32:03	15/09	9027.	50.	1.71	7.37	209.9	285.5	312	314	314	313	313	313	312	311	311	311	312	309	311	307	308	311	312	442	463	736
9521	12:33:10	15/09	9027.	47.	1.71	7.43	210.1	285.5	312	312	314	312	312	312	312	310	311	311	311	309	310	307	307	309	308	440	462	736
9721	14:16:31	15/09	8989.	58.	2.82	19.90	621.9	286.0	614	621	626	627	629	631	633	643	648	716	715	670	670	611	598	571	548	554	547	763
9721	14:17:23	15/09	9019.	58.	2.83	20.01	620.7	286.1	615	622	627	627	630	632	634	643	648	713	712	667	665	609	595	570	547	553	547	763
9721	14:24:31	15/09	8966.	58.	2.82	19.88	620.8	286.0	617	623	629	629	631	634	635	646	651	719	719	676	675	617	603	575	550	555	549	760
9721	14:30:56	15/09	9019.	58.	2.87	19.95	620.6	285.9	617	623	627	629	630	634	635	646	650	718	714	671	669	611	597	570	546	553	547	760
9721	14:32:02	15/09	8966.	58.	2.86	19.82	625.1	286.1	617	622	627	627	630	634	635	646	650	712	708	662	660	605	591	569	544	552	546	760
9721	14:33:25	15/09	9011.	58.	2.87	19.99	634.3	286.1	615	622	628	627	630	634	635	646	650	715	713	666	664	607	594	569	544	552	546	760
9721	14:34:31	15/09	9011.	58.	2.87	19.80	626.9	286.1	617	622	628	627	630	634	635	646	651	716	714	667	665	608	594	570	544	553	546	761
9721	14:36:25	15/09	8959.	58.	2.87	19.88	623.0	286.1	616	622	627	627	630	632	634	646	651	722	722	675	675	615	602	574	550	555	549	761
9721	14:37:17	15/09	8996.	58.	2.87	19.88	622.7	286.0	616	622	627	628	629	634	634	646	651	716	714	665	664	606	593	569	544	553	546	761
9721	14:41:55	15/09	9019.	58.	2.87	19.31	623.5	286.1	608	613	619	617	620	629	631	635	640	663	657	613	608	570	555	547	522	539	536	762
9721	14:44:18	15/09	9042.	58.	2.87	19.14	625.2	285.9	608	614	619	618	620	629	630	637	642	667	660	614	608	568	552	545	519	537	534	761
9721	14:45:25	15/09	8989.	58.	2.85	19.14	628.8	285.9	608	613	619	617	620	627	630	638	643	675	669	621	617	575	559	549	523	540	536	760
9721	14:46:31	15/09	8989.	58.	2.84	19.20	623.5	285.7	607	614	619	617	621	629	630	638	642	669	663	617	612	572	557	549	525	540	537	760
9721	14:47:38	15/09	9011.	58.	2.85	19.36	624.6	285.9	608	613	618	617	620	627	630	638	643	676	669	620	615	573	558	549	523	540	536	760
9721	14:53:02	15/09	9011.	58.	2.85	18.59	627.5	285.6	597	603	610	605	613	621	623	635	640	597	590	552	544	524	506	520	494	523	522	757
9721	14:54:39	15/09	9034.	58.	2.85	18.51	625.9	285.9	596	603	611	606	614	621	623	635	640	599	590	552	544	524	506	520	496	524	523	757
9721	14:58:48	15/09	9004.	58.	2.85	18.52	627.5	285.9	595	602	609	605	612	620	622	639	644	604	595	555	547	525	508	519	494	522	521	755
9721	14:59:39	15/09	9019.	55.	2.85	18.56	622.1	285.9	596	601	610	604	612	620	623	640	646	594	586	549	539	521	503	518	492	522	521	754
9721	15:00:46	15/09	8996.	55.	2.85	18.59	619.0	285.9	594	602	610	605	611	620	622	634	639	605	597	560	553	530	513	523	498	524	523	753
9721	15:04:24	15/09	8959.	58.	2.87	17.79	642.6	285.6	584	589	599	593	601	612	614	675	680	552	542	512	500	498	474	505	477	512	511	752
9721	15:06:10	15/09	9011.	55.	2.87	17.75	631.9	285.9	583	589	595	592	597	612	614	690	698	584	571	532	517	506	483	507	478	513	511	752
9721	15:08:01	15/09	8974.	58.	2.87	17.85	625.0	285.9	584	589	597	592	599	613	617	685	691	565	556	521	510	503	481	507	480	513	512	752
9721	15:11:08	15/09	9011.	58.	2.87	17.81	633.1	285.9	582	589	596	591	598	612	614	685	693	568	556	521	506	499	476	503	474	510	510	752
9721	15:12:30	15/09	9042.	55.	2.87	17.76	639.3	285.9	582	587	599	591	601	612	614	679	682	544	532	503	489	488	465	498	470	508	509	752
9721	15:15:23	15/09	9004.	58.	2.87	17.83	618.5	285.9	585	590	599	593	601	611	614	670	675	556	546	513	500	496	473	503	474	511	511	752
9721	15:19:01	15/09	9034.	58.	2.93	17.32	621.2	285.9	574	579	593	583	594	606	609	662	662	509	497	476	461	471	446	487	458	501	503	751
9721	15:21:25	15/09	9004.	55.	2.93	17.22	634.9	285.9	575	580	593	584	595	608	610	661	660	507	496	477	464	473	450	490	463	503	505	753
9721	15:22:31	15/09	9011.	58.	2.93	17.26	627.9	285.9	575	580	593	583	595	604	607	658	658	513	501	480	466	475	450	490	462	503	505	754
9721	15:23:38	15/09	9011.	58.	2.93	17.15	627.7	285.9	574	579	593	583	595	609	612	665	664	508	496	477	462	473	449	490	462	503	505	755
9721	15:25:45	15/09	9004.	55.	2.93	16.77	619.5	285.9	568	573	589	578	591	623	625	642	639	472	457	454	436	461	434	485	455	500	501	758
9721	15:27:22	15/09	8951.	55.	2.89	16.95	623.7	285.9	569	573	588	578	590	615	618	654	652	485	471	461	444	466	438	486	457	500	502	759
9721	15:28:15	15/09	9011.	55.	2.89	16.93	617.9	285.9	567	574	588	578	590	611	614	657	656	490	477	465	448	466	440	485	456	500	502	759
9721	15:30:06	15/09	9004.	55.	2.91	16.90	623.0	285.8	569	574	588	578	591	609	612	656	654	491	477	465	449	466	440	486	457	500	502	759
9721	15:32:57	15/09	8974.	58.	2.91	16.24	628.0	285.9	523	326	321	322	320	321	320	321	318	315	314	315	313	314	483	458	499	502	760
9711	14:58:39	17/09	9072.	58.	2.57	19.27	608.2	294.3	583	589	609	599	612	614	616	619	623	652	654	666	675	675	677	642	634	597	590	762
9711	15:00:16	17/09	8944.	58.	2.55	19.41	611.1	294.2	584	590	609	599	612	614	616	619	623	652	654	666	675	675	677	642	634	597	590	764
9711	15:03:41	17/09	8974.	58.	2.44	19.27	623.1	294.1	582	589	608	598	610	613	614	618	621	654	654	665	675	672	675	639	630	594	587	764
9711	15:05:32	17/09	9027.	58.	2.44	19.21	608.7	294.2	582	588	607	597	610	613	614	618	622	654	654	666	675	672	675	639	630	594	588	764
9711	15:06:40	17/09	9011.	58.	2.44	19.28	619.9	294.2	583	588	607	597	610	613	614	618	622	652	654	666	675	672	675	639	630	594	587	759
9711	15:07:46	17/09	8898.	58.	2.48	19.21	619.0	294.2	583	589	607	599	610	613	614	618	621	654	654	666	675	672	675	639	630	594	587	757
9711	15:11:41	17/09	9049.	58.	2.52	18.26	613.5	294.3	570	577	591	584	594	595	596	599	603	636	637	649	658	649	650	611	600	571	567	755
9711	15:13:18	17/09	8966.	60.	2.49	18.22	607.8	294.2	571	577	591	584	594	594	596	599	602	636	637	649	658	649	650	611	603	573	569	751
9711	15:14:57	17/09	9042.	58.	2.49	18.10	623.1	294.3	571	577	591	584	594	594	596	599	603	636	637	649	658	649	650	611	600	571	567	749
9711	15:16:35	17/09	8936.	60.	2.48	18.21	615.9	294.2	570	577	591	584	594	594	596	599	603	635	638	647	657	649	650	612	602	573	569	747
9711	15:18:58	17/09	8913.	58.	2.48	18.20	624.4	294.2	571	576	591	584	594	594	596	599	603	636	637	648	658	649	650	611	601	571	567	745
9711	15:21:06	17/09	9011.	58.	2.47	18.23	617.6	294.2	571	577	591	584	594	594	596	599	602	636	638	648	657	649	651	613	603	573	567	744
9711	15:24:15	17/09	9019.	58.	2.49	16.83	612.8	294.3	554	559	569	565	571	570	571	576	580	614	616	625	635	618	618	581	570	548	546	739

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
9711	15:27:09	17/09	8928.	58.	2.61	16.88	608.2	294.3	551	559	570	565	571	571	573	577	580	612	614	624	634	619	620	584	573	551	547	741
9711	15:28:31	17/09	9034.	58.	2.61	16.75	613.3	294.3	563	558	570	564	572	572	573	575	579	611	613	623	632	619	620	585	575	552	549	743
9711	15:30:24	17/09	8928.	58.	2.61	16.70	614.9	294.3	550	558	569	564	571	571	573	576	580	611	614	623	633	618	620	585	575	552	549	745
9711	15:32:01	17/09	8936.	58.	2.61	16.81	623.2	294.1	554	559	569	564	571	571	573	577	580	611	614	623	633	619	619	583	573	551	549	748
9711	15:36:08	17/09	8891.	58.	2.62	15.12	616.2	294.3	530	535	541	540	544	543	544	549	552	587	588	594	602	581	580	550	538	527	528	752
9711	15:38:31	17/09	8883.	58.	2.61	15.06	606.5	293.8	530	534	542	539	544	542	544	549	553	585	588	594	602	582	581	551	539	528	529	755
9711	15:40:09	17/09	9049.	58.	2.62	15.12	610.0	294.2	530	535	541	539	543	542	544	548	553	586	590	594	602	580	578	548	536	525	528	757
9711	15:42:01	17/09	8981.	58.	2.57	15.16	629.2	294.2	529	535	542	540	544	543	544	549	553	588	590	594	603	580	579	549	537	526	526	757
9711	15:43:24	17/09	8928.	58.	2.57	15.18	614.2	294.2	530	535	542	540	544	542	543	549	553	587	590	594	603	580	579	549	537	526	529	757
9711	15:46:32	17/09	8951.	58.	2.57	14.25	612.7	294.1	516	521	525	524	527	527	528	534	538	575	578	577	582	558	555	529	516	511	516	754
9711	15:47:39	17/09	9004.	58.	2.57	14.26	621.8	294.1	516	521	525	525	527	526	528	534	538	574	577	576	583	559	556	530	517	511	516	753
9711	15:48:46	17/09	8981.	58.	2.56	14.14	612.8	294.2	516	521	525	524	527	526	528	532	537	572	575	576	583	559	556	530	517	511	516	753
9711	15:50:24	17/09	8974.	58.	2.56	14.31	610.6	293.9	516	520	525	524	527	526	527	533	538	572	575	575	583	559	556	530	517	511	516	753
9711	15:51:44	17/09	8951.	58.	2.56	14.25	624.0	294.2	516	520	525	524	527	526	527	533	538	572	575	575	583	560	557	531	519	512	516	752
9711	15:55:23	17/09	8944.	58.	2.57	13.28	612.1	294.2	500	505	509	509	511	510	512	518	523	558	561	555	560	536	532	510	498	496	503	749
9711	15:57:00	17/09	8996.	58.	2.57	13.44	622.6	294.2	500	505	509	509	511	511	512	519	524	560	563	555	560	535	531	510	497	496	502	750
9711	15:58:23	17/09	8981.	58.	2.59	13.46	626.8	294.2	500	505	509	508	510	510	512	518	523	558	561	555	560	536	532	510	498	496	503	749
9711	16:00:15	17/09	9004.	58.	2.58	13.32	607.9	294.3	501	505	509	508	510	510	511	518	523	559	561	556	561	536	532	511	498	496	503	749
9711	16:02:38	17/09	8989.	58.	2.58	13.36	614.1	294.3	500	505	509	508	510	510	512	518	523	558	561	555	560	536	532	511	498	497	504	748
9711	16:04:14	17/09	8951.	58.	2.58	13.37	606.3	294.3	499	505	509	508	510	510	511	518	524	559	562	554	560	534	531	510	497	495	502	748
9711	16:07:39	17/09	8951.	58.	2.63	12.42	615.4	294.0	487	491	494	494	496	496	499	507	512	545	547	536	539	516	511	494	481	484	493	749
9711	16:09:47	17/09	9004.	55.	2.66	12.53	610.0	294.3	487	491	494	494	495	496	498	505	512	545	547	536	539	516	511	494	481	484	492	751
9711	16:12:08	17/09	8989.	55.	2.63	12.54	608.7	294.3	487	491	495	494	495	496	498	505	511	544	546	539	540	516	513	495	483	485	494	752
9711	16:14:15	17/09	8959.	58.	2.63	12.46	613.8	294.3	487	491	494	494	495	496	498	505	511	544	546	536	541	517	513	497	483	487	495	754
9711	16:16:40	17/09	9019.	58.	2.64	12.49	616.0	294.3	486	491	495	494	496	496	499	505	511	544	546	536	540	517	512	496	483	486	495	755
9711	16:25:08	17/09	8996.	58.	2.66	11.60	619.3	294.3	467	474	477	477	479	481	483	496	504	522	522	507	508	488	482	473	460	470	481	757
9711	16:27:46	17/09	9011.	58.	2.66	11.69	619.3	294.3	469	473	477	477	479	481	483	496	504	522	521	507	507	488	482	473	460	470	481	756
9711	16:29:54	17/09	8981.	58.	2.66	11.58	622.9	294.3	470	474	477	477	479	480	483	496	504	522	521	507	507	488	482	472	460	469	481	756
9711	16:31:31	17/09	8989.	55.	2.66	11.51	622.0	294.4	469	473	477	476	479	481	483	496	504	523	522	509	509	489	484	474	461	471	482	756
9711	16:33:39	17/09	8966.	58.	2.64	10.84	622.6	294.5	457	460	464	463	466	469	472	487	494	503	501	488	488	472	466	460	447	460	473	756
9711	16:35:01	17/09	9004.	58.	2.63	10.72	624.3	294.4	456	460	464	463	466	469	474	491	499	500	498	484	483	468	461	457	444	458	471	754
9711	16:36:23	17/09	8966.	58.	2.63	10.73	628.8	294.2	455	460	464	462	466	468	472	488	496	501	499	486	485	470	463	458	445	459	472	753
9711	16:38:15	17/09	8891.	58.	2.62	10.71	632.8	294.2	456	460	464	463	466	468	472	488	496	501	499	486	485	470	463	459	445	459	471	752
9711	16:40:39	17/09	8959.	58.	2.63	10.09	637.1	294.3	446	450	454	453	457	463	468	487	494	482	477	467	465	454	446	446	432	449	462	750
9711	16:42:17	17/09	8959.	58.	2.63	10.09	632.3	294.3	446	450	454	453	457	463	468	487	494	482	477	467	465	454	446	446	432	449	462	750
9711	16:43:40	17/09	8959.	55.	2.63	10.15	629.7	294.3	446	449	455	453	457	462	467	485	492	483	478	468	466	454	447	446	433	449	462	748
9711	16:45:17	17/09	8921.	55.	2.63	10.09	636.8	294.3	446	449	454	452	456	462	466	485	492	482	479	468	466	455	447	446	433	449	462	747
9711	16:50:12	17/09	8981.	55.	2.63	9.61	623.4	294.3	437	441	448	444	451	463	468	483	485	462	457	446	447	431	434	421	439	454	745
9711	16:51:49	17/09	8966.	58.	2.63	9.68	627.4	294.3	437	441	447	444	450	459	465	481	485	466	461	450	441	434	435	423	440	455	745
9711	16:53:42	17/09	8966.	58.	2.63	9.72	629.6	294.1	437	441	447	444	449	460	465	481	485	465	460	452	449	441	433	436	423	441	455	745
9711	16:54:50	17/09	8921.	55.	2.62	9.58	640.8	294.2	438	442	448	444	451	462	468	483	485	463	458	450	440	439	432	434	421	439	454	744
9711	16:57:29	17/09	9011.	55.	2.63	9.06	622.0	294.3	429	433	445	438	450	470	473	466	464	440	434	432	426	424	415	422	409	430	446	743
9711	16:58:51	17/09	8966.	55.	2.63	9.06	639.2	294.3	429	432	443	437	447	465	469	467	467	444	439	435	431	426	418	424	411	432	447	743
9711	16:59:58	17/09	8913.	55.	2.64	9.06	638.7	294.3	430	433	445	437	449	469	472	465	464	441	435	432	427	424	416	422	409	430	446	742
9711	17:01:52	17/09	8913.	55.	2.64	9.00	637.7	294.3	429	432	442	437	446	462	467	467	467	445	439	435	431	427	419	425	411	432	447	741
9711	17:04:46	17/09	8906.	55.	2.64	8.53	621.2	294.3	423	426	444	431	448	463	465	447	445	427	422	420	416	415	406	415	403	424	441	741
9711	17:06:09	17/09	9049.	55.	2.63	8.63	628.2	294.3	423	427	447	433	451	463	464	445	443	426	419	420	414	414	405	414	401	424	440	740
9711	17:07:00	17/09	8906.	55.	2.63	8.57	621.5	294.3	422	426	441	431	445	462	464	449	448	430	424	422	418	416	408	416	403	425	441	739
9711	17:10:54	17/09	8944.	55.	2.63	7.99	639.5	294.2	426	429	452	438	455	441	438	419	415	404	396	402	394	400	390	403	390	415	433	738
9711	17:12:31	17/09	8936.	55.	2.63	8.03	644.5	294.2	421	425	451	433	455	447	446	426	423	412	405	408	402	404	395	407	392	416	433	736
9711	17:13:53	17/09	8968.	55.	2.63	8.04	626.6	294.3	424	428	453	437	455	443	442	422	419	408	401	405	397	402	392	405	394	418	434	736
9711	17:15:45	17/09	8936.	55.	2.63	7.99	638.4	294.3	422	426	451	434	455	446	445	425	422	411	405	408	402	404	395	407	394	418	434	735
9711	17:17:23	17/09	9034.	55.	2.63	7.74	630.8	294.3	422	426	443	437	444	429	426	410	405	398	389	396	388	395	385	399	386	412	430	736
9711	17:19:46	17/09	8921.	55.	2.59	7.73	638.0	294.3	424	427	443	437	444	428	426	409	406	400	393	398	392	397	388	402	389	414	432	749
9711	17:21:24	17/09	8904.	55.	2.63	7.64	627.1	294.3	424	426	443	437	445	428	426	409	406	400	393	398	392	397	388	402	389	414	432	745
9711	17:23:47	17/09	8913.	55.	2.59	7.65	632.6	294.2	424	427	443	437	444	428	426	409	406	400	393	397	390	396	386	401	388	414	432	742
9711	17:25:40	17/09	8974.	55.	2.59	7.67	623.1	294.3	423	426	443	436	446	431	428	411	408	401	393	398	391	396	387	400	388	413	432	739
9711	17:27:48	17/09	8966.	55.	2.59	7.35	624.2	294.3	424	427	429	434	430	413	411	397	393	392	384	391	384	391	381	396	384	409	427	736
9711	17:28:55	17/09	8959.	55.	2.60	7.33	618.8	294.3	423	426	428	434	428	411	408	395	390	390	380	389	381	389	379	395	382	408	426	735
9711	17:32:20	17/09	8936.	68.	2.59	7.33	626.8	294.1	311	311	312	311	311	309	310	307	307	307	308	307	308	306	306	308	307	391	425	731
9711	17:33:11	17/09	8913.	68.	2.59	7.33	610.5	294.1	310	310	312	311	311	309	310	307	307	307	308	307	308	306	306	308	307	391	425	730
9721	09:46:38	18/09	9042.	58.	2.81	19.94	631.2	286.4	617	623	629	629	631	634	637	648	654	718	714	671	660	610	591	566	542	549	544	753
9721	09:47:46	18/09	9019.	58.	2.82	20.14	624.2	286.1	617	623	629	628	631	635	637	649	653	715	712	665	654	606	587	564	541	548	544	754
9721	09:49:08	18/09	9049.	58.	2.81	19.96	618.6	286.4	617	623	629	628	630	634	636	648	654	715	712	666	658	608	591	566	543	549	544	755
9721	09:50:58	18/09	8959.	58.	2.81	20.07	617.6	286.3	617	623	630	628	631	635	638	647	652	712	708	665	652	606	586	564	540	547	543	756
9721	09:52:06	18/09	9102.	58.	2.81	20.14	639.0	286.4	614	623	629	629	631	635	637	647	652	713	708	667	654	608	588	562	539	547	544	756
9721	09:53:13	18/09	9027.	58.	2.81	20.01	625.0	286.4	617	623	630	629	631	636	638	646	651	706	703	666	656	610	593	569	546	551	546	757
9721	09:58:52	18/09	8996.	58.	2.80	18.76	633.6	286.4	600	606	612	610	615	622	625	636	640	638	630	591	578	552	532	532	509	528	527	754
9721	10:02:31	18/09	9011.	58.	2.81	19.01	624.5	286.8	597	604	609	608	611	617	619	634	640	673	666	623	612	578	558	547	524	535	532	754
9721	10:04:53	18/09	9064.	58.	2.80	18.83	616.5	286.8	599	605	610	609	612	618	620	636	641	682	675	625	612	573	554	540	516	531	530	755
9721	10:05:58	18/09	9004.	58.	2.80	18.91	626.8	286.5	599	606	610	610	612	617	619	639	645	689	682	631	620	579	560	547	522	535	532	754
9721	10:07:50	18/09	8996.	58.	2.80	18.83	634.4	286.4	600	608	612	610	614	621	624	638	643	652	645	605	592	564	544	539	516	531	529	755
9721	10:08:43	18/09	9057.	58.	2.78	18.96	622.9	286.4	601	608	614	611	617	623	626	636	641	632	625	584	568	545	523	526	503	526	525	754
9721	10:09:35	18/09	9004.	58.	2.79	18.87	635.3	286.4	600	607	613	610	615	622	625	638	643	644	637	600	585	561	540	538	514	531	528	753
9721	10:13:45	18/09	9019.	58.	2.80	18.15	622.6	286.4	587	594	600	596	603	616	619	677	685	587	576	537	526	513	493	512	486	515	514	750
9721	10:15:35	18/09	9011.	58.	2.79	18.09	626.2	286.4	588	594	599	596	602	614	620	675	685	595	584	541	529	513	493	512	486	515	514	752
9721	10:16:42	18/09	9019.	58.	2.79	18.15	632.0	286.2	586	593	601	596	603	615	619	667	675	589	579	539	528	511	492	511	483	513	513	748
9721	10:17:33	18/09	9057.	58.	2.79	18.19	631.8	286.4	588	595	603	598	605	614	616	641	646	590	581	545	536	517	500	513	489	515	514	749
9721	10:19:57	18/09	9004.	58.	2.79	18.03	618.7	286.4	590	595	603	599	606	614	617	642	646	591	583	549	541	523	505	519	494	519	518	745
9721	10:21:32	18/09	9042.	55.	2.79	18.13	626.5	286.2	588	595	602	598	605	614	617	650	657	588	578	538	528	511	491	510	484	514	514	745

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW (KW)	FLOW (KG/H)	T IN (C)	TC 1 (C)	TC 2 (C)	TC 3 (C)	TC 4 (C)	TC 6 (C)	TC 7 (C)	TC 8 (C)	TC 9 (C)	TC 10 (C)	TC 11 (C)	TC 12 (C)	TC 13 (C)	TC 14 (C)	TC 15 (C)	TC 16 (C)	TC 17 (C)	TC 18 (C)	TC 19 (C)	TC 20 (C)	T HOTP (C)
9721	10:23:25	18/09	8996.	58.	2.79	18.09	623.2	286.1	589	596	601	599	603	616	619	675	683	595	585	540	528	511	490	510	483	513	513	745
9721	10:27:32	18/09	9034.	58.	2.77	17.59	618.4	286.2	579	587	596	590	599	610	612	674	678	541	530	502	491	490	469	500	474	507	507	745
9721	10:28:44	18/09	9019.	58.	2.79	17.43	621.3	286.1	580	585	595	589	597	605	608	667	670	550	539	506	493	488	466	495	468	504	505	745
9721	10:29:51	18/09	9004.	58.	2.78	17.45	625.4	286.2	579	585	594	588	597	606	608	663	667	549	538	509	497	493	472	500	473	507	506	745
9721	10:31:13	18/09	9004.	58.	2.77	17.54	620.1	286.1	580	586	596	589	598	606	608	660	665	549	539	509	499	494	473	500	475	507	507	743
9721	10:32:35	18/09	9004.	58.	2.79	17.56	625.3	286.2	578	586	595	588	597	607	609	664	669	545	534	506	494	492	471	501	475	507	507	744
9721	10:35:27	18/09	9072.	58.	2.79	16.94	617.9	286.3	569	575	589	580	592	612	614	673	671	488	473	456	438	457	431	479	451	494	497	743
9721	10:36:33	18/09	8981.	55.	2.79	16.81	615.8	286.2	571	577	588	581	591	607	610	663	662	505	493	474	460	470	447	487	460	498	500	743
9721	10:37:39	18/09	9057.	58.	2.79	16.99	631.0	286.2	569	575	589	579	591	620	624	675	672	482	466	452	434	456	429	481	452	495	497	742
9721	10:38:32	18/09	8951.	58.	2.79	16.91	619.4	286.2	569	575	589	578	591	623	627	666	663	476	460	447	427	453	424	481	451	495	496	741
9721	10:39:39	18/09	9087.	55.	2.79	17.07	625.2	286.2	568	575	589	578	591	617	620	670	667	482	466	450	431	452	424	476	447	493	495	741
9721	10:42:17	18/09	9004.	68.	2.79	16.63	611.9	286.2	324	327	322	323	320	322	320	322	319	316	316	315	316	314	314	476	447	493	495	741
9541	11:31:55	18/09	9004.	47.	2.10	24.75	207.2	256.2	668	668	640	666	640	610	611	612	617	648	649	660	649	650	640	625	623	622	634	751
9541	11:34:18	18/09	9094.	47.	2.11	24.60	207.2	256.0	665	667	632	665	633	602	603	605	609	642	642	656	643	646	634	621	617	617	628	752
9541	11:36:11	18/09	9011.	47.	2.11	24.75	207.4	256.5	669	669	641	669	641	610	611	611	614	648	649	663	652	654	643	634	628	627	639	755
9541	11:38:50	18/09	8996.	47.	2.11	24.75	207.1	255.9	670	672	642	671	642	610	612	613	617	649	651	663	652	652	640	627	622	622	634	758
9541	11:43:00	18/09	8981.	47.	2.04	24.54	207.3	255.0	663	663	629	660	630	600	601	604	608	639	640	651	640	640	628	616	612	610	622	755
9541	11:44:53	18/09	8996.	44.	2.05	24.68	206.9	255.7	663	664	631	662	632	602	604	604	606	638	639	654	642	646	634	622	619	617	630	753
9541	11:46:14	18/09	9049.	50.	2.05	24.69	206.7	256.0	667	668	638	667	639	610	612	614	617	649	650	661	649	650	638	625	621	620	631	752
9541	11:49:38	18/09	8966.	44.	2.04	23.22	207.2	256.3	641	642	607	637	608	584	587	592	594	619	618	619	615	610	603	588	585	587	601	750
9541	11:50:44	18/09	9027.	44.	2.05	23.08	206.8	256.3	640	641	607	638	608	584	585	590	594	618	619	622	617	613	606	592	587	588	602	749
9541	11:52:37	18/09	9011.	47.	2.05	23.15	207.2	256.3	640	641	607	637	608	583	585	588	591	617	617	620	617	612	605	592	588	590	603	747
9541	11:53:41	18/09	9049.	47.	2.05	23.15	206.6	256.3	640	640	607	636	607	581	581	588	592	619	620	623	620	614	608	592	590	587	602	747
9541	11:54:47	18/09	9045.	47.	2.05	23.06	206.9	256.3	640	640	606	635	607	583	585	591	594	617	617	618	614	609	604	591	587	587	600	746
9541	11:57:39	18/09	9034.	47.	2.09	21.52	207.2	255.8	611	612	575	604	575	559	561	567	570	584	583	579	581	571	570	551	546	550	567	744
9541	11:59:15	18/09	9042.	47.	2.09	21.50	206.8	255.8	611	611	577	603	578	564	566	570	574	583	582	578	580	570	568	549	544	547	564	744
9541	12:00:23	18/09	8936.	41.	2.08	21.43	206.9	255.6	612	612	578	605	578	563	565	569	572	581	581	576	578	570	568	547	543	546	563	743
9541	12:02:00	18/09	9027.	44.	2.09	21.43	206.6	255.5	609	609	574	601	575	561	563	570	573	582	582	577	580	570	567	549	544	547	564	742
9541	12:04:39	18/09	9042.	50.	2.09	20.09	206.7	255.6	588	588	555	580	555	547	549	550	552	559	558	557	557	545	541	511	503	515	535	740
9541	12:06:01	18/09	9049.	47.	2.09	20.13	206.1	255.6	589	591	560	582	560	549	552	552	555	557	556	553	555	542	538	507	499	511	532	739
9541	12:06:53	18/09	8966.	47.	2.09	19.96	206.4	255.4	587	587	559	580	559	551	553	553	555	560	560	557	560	544	540	510	502	513	533	739
9541	12:08:00	18/09	9027.	47.	2.13	20.10	206.6	255.8	589	590	559	582	559	550	553	553	556	559	558	554	556	543	540	512	504	516	535	739
9541	12:10:53	18/09	9042.	50.	2.13	18.72	207.1	255.6	566	567	542	560	543	536	537	537	539	547	546	541	541	509	503	464	454	482	506	739
9541	12:12:13	18/09	9027.	47.	2.13	18.79	206.7	255.6	571	570	548	564	549	541	543	541	543	545	544	538	537	505	498	461	450	482	505	739
9541	12:13:20	18/09	9049.	41.	2.12	18.77	206.4	255.6	566	567	542	560	542	536	538	536	538	543	543	538	539	509	501	462	451	481	504	738
9541	12:14:27	18/09	9019.	50.	2.23	18.79	206.7	255.6	567	567	540	560	541	535	536	537	539	546	545	541	540	510	503	466	455	484	507	740
9541	12:16:36	18/09	9064.	50.	2.21	18.06	206.5	255.6	555	556	535	549	535	531	532	532	533	538	537	527	524	475	466	434	424	464	490	743
9541	12:19:11	18/09	9027.	50.	2.21	18.02	206.7	255.5	675	676	715	696	716	324	323	320	320	320	321	317	316	587	583	611	617	582	599	758
9441	14:19:26	18/09	9087.	44.	1.59	18.02	120.5	255.9	657	657	642	656	643	613	614	571	573	568	570	568	573	570	571	569	569	578	595	712
9441	14:20:32	18/09	9042.	44.	2.21	18.07	120.4	255.9	658	660	646	660	646	617	617	575	579	573	574	572	577	573	575	571	569	578	596	712
9441	14:22:09	18/09	9087.	41.	1.82	17.98	120.5	255.9	657	658	644	658	644	614	615	574	578	572	575	571	576	570	574	565	569	579	597	742
9441	14:23:32	18/09	9042.	41.	1.79	18.18	120.5	255.9	662	662	648	661	650	620	622	579	583	576	578	574	579	573	576	570	572	584	604	745
9441	14:24:53	18/09	8959.	41.	1.79	17.92	120.5	255.8	660	662	650	662	650	622	624	581	585	575	577	574	580	575	578	572	574	586	604	748
9441	14:27:45	18/09	9064.	41.	1.79	17.22	120.4	255.8	637	637	625	637	625	590	591	553	555	553	554	552	557	554	553	543	545	558	581	751
9441	14:29:22	18/09	9049.	44.	1.79	17.09	120.4	256.0	637	639	625	636	625	591	592	553	555	553	554	554	557	554	554	545	546	559	582	752
9441	14:30:43	18/09	9042.	44.	1.79	17.09	120.4	256.1	636	637	623	636	622	589	590	549	551	551	553	554	556	554	554	545	548	559	582	754
9441	14:32:06	18/09	9064.	44.	1.81	17.17	120.7	256.1	638	638	625	636	623	592	593	554	556	554	554	553	557	554	555	547	549	560	584	756
9441	14:33:42	18/09	9049.	44.	1.81	17.08	120.4	256.1	638	638	623	637	624	591	592	552	554	554	555	554	559	554	555	546	548	559	585	757
9441	14:36:05	18/09	9042.	41.	1.82	15.82	120.5	256.1	606	606	587	603	588	548	549	516	519	523	525	523	527	522	524	507	510	519	548	757
9441	14:37:27	18/09	9057.	41.	1.81	15.93	120.4	256.1	603	604	587	604	587	547	548	517	520	526	528	525	530	522	524	507	509	516	546	757
9441	14:39:21	18/09	8989.	44.	1.85	15.91	120.9	255.9	603	603	586	603	585	544	546	515	517	524	526	524	529	521	522	505	506	514	544	757
9441	14:42:58	18/09	9019.	41.	1.81	15.80	120.2	255.7	603	603	584	601	584	543	545	515	517	522	524	523	527	521	522	505	506	514	544	757
9441	14:44:36	18/09	9034.	44.	1.81	16.05	120.2	255.5	601	602	583	601	583	543	544	515	518	524	526	523	528	521	522	505	506	514	544	758
9441	14:51:59	18/09	8996.	44.	1.81	14.99	120.4	255.4	564	564	539	561	539	500	500	485	488	493	495	490	495	486	487	472	473	469	501	745
9441	14:53:22	18/09	9004.	41.	1.81	14.48	120.4	255.3	566	567	541	564	539	499	500	484	487	493	495	489	494	484	486	471	472	468	499	745
9441	14:54:15	18/09	9019.	44.	1.81	14.59	120.4	255.4	564	564	539	560	538	498	500	484	487	493	495	490	494	485	486	470	472	467	499	744
9441	14:56:19	18/09	9079.	47.	1.81	14.48	120.7	255.4	563	563	537	560	537	496	497	483	486	493	494	490	494	485	486	470	472	467	497	741
9441	15:00:15	18/09	9027.	44.	1.81	13.92	120.2	255.4	547	547	519	544	519	482	482	472	475	479	481	476	479	471	472	457	460	450	481	736
9441	15:01:22	18/09	9072.	41.	1.88	13.82	120.4	255.4	547	546	517	544	517	480	481	473	476	478	482	475	478	470	471	457	459	449	480	736
9441	15:02:30	18/09	9027.	44.	1.88	13.82	120.0	255.3	546	546	518	542	518	481	483	472	474	478	480	476	479	471	472	457	460	449	481	736
9441	15:04:05	18/09	9034.	44.	1.87	13.98	120.2	255.2	547	547	518	542	518	482	483	474	477	480	482	476	480	470	471	456	458	449	480	737
9441	15:07:27	18/09	9027.	44.	1.88	13.65	120.4	255.4	539	539	511	535	511	477	478	469	471	472	473	468	472	464	465	451	453	442	474	737
9441	15:08:47	18/09	8996.	39.	1.88	13.60	120.4	255.4	537	536	509	533	508	473	475	467	470	473	475	468	472	465	465	452	453	441	472	737
9441	15:10:24	18/09	9057.	41.	1.88	13.49	120.2	255.4	537	537	509	534	508	475	476	468	471	472	474	467	471	464	465	451	453	441	472	736
9441	15:13:45	18/09	9011.	44.	1.89	12.89	119.9	255.4	523	523	493	519	492	463	464	460	461	462	464	457	461	453	454	438	442	428	460	736
9441	15:14:51	18/09	9087.	44.	1.89	12.89	120.7	255.6	524	524	493	520	491	462	463	458	460	462	464	458	462	454	455	439	441	426	459	736
9441	15:17:58	18/09	9042.	47.	1.89	13.11	120.2	255.6	325	329	319	321	317	316	316	314	315	316	317	316	318	315	316	315	314	317	345	745

TABLE D.2 MINIMUM FILM BOILING TEMPERATURE DATA

RUN	TIME	DATE	P OUT (KPA)	P DROP (KPA)	HOTP POW (KW)	T/S POW. (KW)	FLOW (KG/H)	T IN (C)	T OUT (C)	MINF TEMP (C)	MINF POWER (KW)	MINF QUAL	T/C
3311	13:00:22	07/08/80	3031.	39.	1.57	5.66	81.6	223.1	233.4	395.9	5.13	.021	16
2311	15:57:59	07/08/80	2013.	39.	1.36	3.92	67.9	200.6	210.5	378.9	3.92	.018	16
2421	12:28:07	26/09/80	2028.	44.	1.42	7.07	118.3	190.2	209.6	396.2	6.52	-.019	16
2321	16:00:58	26/09/80	2036.	41.	1.38	6.24	79.6	190.1	210.0	389.3	5.74	-.013	17
2521	15:24:03	29/09/80	1998.	50.	1.57	7.52	208.6	190.5	209.3	377.6	7.52	-.029	16
2411	15:50:27	01/10/80	2013.	44.	1.37	4.25	117.0	200.3	209.2	350.4	3.98	-.002	16
2431	11:55:56	03/10/80	2006.	47.	1.63	11.38	118.8	171.2	209.2	466.2	11.10	-.053	17
2211	12:34:19	08/10/80	2036.	39.	1.32	3.81	48.8	201.3	209.6	386.3	3.81	.034	16
2221	15:50:29	08/10/80	2028.	39.	1.34	4.93	48.0	191.1	209.9	390.4	4.61	.010	17
2121	15:26:56	09/10/80	1938.	39.	1.32	4.01	26.1	189.6	210.0	388.7	3.66	.067	16
2111	10:19:11	10/10/80	2036.	39.	1.31	3.54	26.7	200.0	210.2	383.8	3.30	.077	16
4321	14:27:40	06/08/80	3997.	39.	1.73	6.74	80.3	231.0	249.6	419.9	6.63	.011	16
3321	16:06:20	06/08/80	3016.	41.	1.64	6.93	78.7	211.4	233.2	425.1	6.72	.004	16
4331	10:32:11	25/09/80	4072.	41.	1.73	11.80	83.3	210.2	250.4	441.1	11.36	-.042	17
4311	12:15:54	25/09/80	4034.	41.	1.54	5.80	80.2	240.0	250.5	405.8	5.44	.023	16
4421	14:50:44	25/09/80	4064.	44.	1.65	8.26	116.1	229.5	250.8	424.1	7.83	-.013	16
4411	16:15:45	25/09/80	4080.	44.	1.59	6.09	117.4	240.8	250.2	397.9	5.71	.008	16
4211	14:27:50	14/10/80	3997.	39.	1.61	5.72	48.0	240.4	249.3	418.1	5.31	.064	16
4111	11:29:36	15/10/80	3936.	39.	1.48	5.15	27.6	240.4	249.5	417.3	4.82	.117	16
4121	15:16:13	15/10/80	4019.	39.	1.57	5.59	26.8	230.3	249.8	424.7	5.25	.106	16
4221	12:17:26	16/10/80	4019.	41.	1.66	6.11	48.9	230.7	249.5	426.4	6.11	.044	16
6421	13:06:04	05/08/80	5980.	39.	1.87	8.77	121.5	255.2	275.6	428.6	8.25	-.011	16
6321	15:40:17	05/08/80	6018.	39.	1.72	7.67	82.6	256.0	276.1	432.6	7.07	.006	16
6331	21:02:55	14/08/80	5972.	39.	1.96	10.97	80.9	239.7	275.5	468.8	10.97	-.013	16
6341	22:26:19	14/08/80	5912.	39.	2.11	12.60	81.3	223.1	275.8	477.9	11.53	-.069	18
6521	17:44:30	08/09/80	6018.	41.	2.02	9.44	204.9	256.3	275.4	418.6	8.55	-.028	16
6421	10:30:51	09/09/80	5972.	41.	1.90	9.18	118.8	255.8	275.5	426.1	8.48	-.006	16
6431	11:50:53	09/09/80	6010.	41.	1.95	11.91	118.6	239.9	275.7	429.1	10.98	-.056	17
6441	14:19:00	09/09/80	6033.	44.	2.23	15.04	118.0	223.5	275.8	465.7	14.25	-.091	17
8331	16:49:02	14/08/80	7993.	39.	1.75	10.18	85.6	262.4	295.5	420.4	9.00	-.048	17
8341	18:04:30	14/08/80	7910.	39.	1.94	12.60	82.5	245.0	295.6	470.8	12.48	-.080	18
8431	14:52:25	31/07/80	7993.	39.	2.13	13.38	110.7	252.5	295.7	452.0	13.38	-.060	16
8431	16:24:36	31/07/80	8008.	39.	1.95	9.97	110.7	262.4	295.8	459.1	8.80	-.050	16
8421	14:52:06	10/09/80	7986.	41.	1.75	8.06	118.3	276.4	295.7	425.0	8.06	-.013	16
8431	10:30:15	11/09/80	7978.	41.	1.90	11.65	120.2	260.3	295.6	454.6	11.05	-.054	16
8441	12:00:19	11/09/80	8001.	44.	2.07	13.89	117.9	245.6	295.4	455.0	12.96	-.091	16
8521	15:02:41	11/09/80	7986.	44.	1.92	8.39	209.5	276.4	295.3	408.7	8.39	-.035	16
8531	16:15:20	11/09/80	8001.	52.	2.09	13.97	209.2	260.5	295.2	443.8	13.25	-.077	16
8531	17:12:09	11/09/80	8008.	50.	2.13	13.36	209.4	260.6	295.1	444.7	13.10	-.077	16
8541	11:55:47	12/09/80	7986.	50.	2.43	18.36	207.0	244.8	295.5	424.1	17.90	-.125	18
8541	13:23:06	12/09/80	7963.	50.	2.18	15.94	206.1	244.8	295.1	452.5	15.60	-.121	16
8321	15:27:28	12/09/80	8054.	41.	1.83	8.40	83.1	276.4	295.8	432.8	7.99	.011	16
8221	15:42:24	16/10/80	7978.	41.	1.63	7.54	49.2	276.4	295.1	439.4	7.59	.055	16
8121	11:13:21	17/10/80	7948.	39.	1.56	6.46	28.4	274.5	295.9	433.5	6.46	.117	16
8231	15:15:09	17/10/80	8008.	41.	1.67	8.84	49.3	259.6	295.5	426.1	8.80	-.011	17
9521	12:29:11	15/09/80	9004.	47.	1.71	7.92	209.9	285.4	303.8	406.1	7.37	-.042	16
9721	15:30:06	15/09/80	9004.	55.	2.91	16.90	623.0	285.8	300.4	405.5	16.24	-.049	16
9711	17:28:55	17/09/80	8959.	55.	2.60	7.33	618.8	294.3	300.5	371.9	7.33	-.022	16
9721	10:39:39	18/09/80	9087.	55.	2.79	17.07	625.2	286.2	301.0	397.4	16.63	-.050	16
9541	12:16:35	18/09/80	9064.	50.	2.21	18.06	206.5	255.6	304.1	457.5	18.06	-.121	16
9441	15:14:51	18/09/80	9087.	44.	1.89	12.89	120.7	255.6	304.5	448.7	12.89	-.104	16