



MARMARA UNIVERSITY

FACULTY OF ENGINEERING

Determination of Flow Boiling Regimes in Microscale Heat Exchangers Using Signal Processing Techniques

Tarık Yaman

GRADUATION PROJECT REPORT

Department of Mechanical Engineering

Supervisor

Assoc. Prof. Dr. Mehmed Rafet Özdemir

ISTANBUL, 2022



MARMARA UNIVERSITY



FACULTY OF ENGINEERING

**Determination of Flow Boiling Regimes in Microscale Heat
Exchangers Using Signal Processing Techniques**

M.TARIK YAMAN

June 30 2022,ISTANBUL

**SUBMITTED TO THE DEPARTMENT OF MECHANICAL ENGINEERING IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE**

OF BACHELOR OF SCIENCE AT MARMARA UNIVERSITY

The author hereby grant to Marmara University permission to reproduce and to distribute publicly paper and electronic copies of this document in whole or in part and declare that the prepared document does not in any way include copying of previous work on the subject or the use of ideas, concepts, words, or structures regarding the subject without appropriate acknowledgement of the source material.

Signature of Author

Department of Mechanical Engineering

Certified By

Project Supervisor, Department of Mechanical Engineering

Accepted By

Head of the Department of Mechanical Engineering

ACKNOWLEDGEMENT

First of all, I would like to thank our supervisors Assoc. Prof. Dr. Mehmed Rafet Özdemir and for the valuable guidance and advice on preparing this thesis and giving me moral and material support.

I would like to acknowledge the The Scientific and Technological Research Council of Turkey (TÜBİTAK) for granting me a funded scholarship during this project.

June,2022

M.TARIK YAMAN

A handwritten signature in black ink, appearing to read 'Yaman', written in a cursive style.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	3
TABLE OF CONTENTS	4
LIST OF TABLES	6
LIST OF FIGURES	7
ABSTRACT	8
INTRODUCTION	10
FLOW REGIMES	11
MATERIALS AND METHODS	15
PARSING DATA IN EXCEL FILES.....	20
Converting Watt to Wm ²	21
General Table	22
Focused Range of Datas	29
Statistical Value of Datas	37
RECEIVING THE FREQUENCIES OF THE DATA WITH THE FFT METHOD	42
Fast Fouier Transform.....	42
Some data and their FFT graph	42
Table for Outlet Temperature	45
Table for Inlet Temperature.....	52
Table for Dp.....	59
RESULT AND DISCUSSION	73
GRAPHS	73
TS1 G200 T_inlet	73
TS1 G200 T_outlet	74
TS1 G400 T_inlet	75
TS1 G400 T_outlet	76
TS1 G600 T_inlet	77
TS1 G600 T_outlet	78
TS1 G800 T_inlet	79

TS1 G800 T_outlet	80
TS2 G200 T_inlet	81
TS2 G200 T_outlet	82
TS2 G400 T_inlet	83
TS2 G400 T_outlet	84
TS2 G600 T_inlet	85
TS2 G600 T_outlet	86
TS2 G800 T_inlet	87
TS2 G800 T_outlet	88
TS3 G200 T_inlet	89
TS3 G200 T_outlet	90
TS3 G400 T_inlet	91
TS3 G400 T_outlet	92
TS3 G600 T_inlet	93
TS3 G600 T_outlet	94
TS3 G800 T_inlet	95
TS3 G800 T_outlet	96
TS4 G200 T_inlet	97
TS4 G200 T_outlet	98
TS4 G400 T_inlet	99
TS4 G400 T_outlet	100
TS4 G600 T_inlet	101
TS4 G600 T_outlet	102
TS4 G800 T_inlet	103
TS4 G800 T_outlet	104
DISCUSSION.....	105
REFERENCES	106
APPENDIX	107

LIST OF TABLES

Table 1 Dimensons of Test Sections _____	15
Table 2 Dimensons of Test Sections _____	21
Table 3 General Table for Datas_____	28
Table 4 Focused Range of Datas _____	36
Table 5 Statistical Value of Datas _____	41
Table 6 Min, Max, Mean and Frequency Values of Outlet Temperature Datas _____	51
Table 7 Min, Max, Mean and Frequency Values of Outlet Temperature Datas _____	58
Table 8 Min, Max, Mean and Frequency Values of Difference of Pressure _____	72

LIST OF FIGURES

Figure 1 Pool and flow boiling water curve _____	11
Figure 2 Flow Regimes in Microchannel _____	12
Figure 3 Inlet Temperature, Outlet Temperature and Pressure Difference Signals Before and During Boiling _____	13
Figure 4 Regime Map for TS1 _____	16
Figure 5 Regime Map for TS2 _____	16
Figure 6 Regime Map of TS3 _____	17
Figure 7 Regime Map of TS4 _____	17
Figure 8 Data for Test Section-1 at a mass flux of $400 \text{ kg}/(\text{m}^2)\text{s}$ at an inlet temperature of 88 C at a heat flux of $137.6 \text{ kW}/(\text{m}^2)$ _____	18
Figure 9 Data for Test Section-1 at a mass flux of $400 \text{ kg}/(\text{m}^2)\text{s}$ at an inlet temperature of 88 C at a heat flux of $182.7 \text{ kW}/(\text{m}^2)$ _____	19
Figure 10 Layout of Datas in Excel Files _____	20
Figure 11 Assembly of the Housing, Top Cover and Microchannel Test Section _____	21
Figure 12 Fast Fourier Transform graphs of TS1G600Q288 _____	43
Figure 13 Fast Fourier Transform graphs of TS2G200Q193 _____	43
Figure 14 Fast Fourier Transform graphs of TS4G200Q782 for only Difference of Pressure _____	44

ABSTRACT

As a result of the efforts to reduce the size of the electronic components as well as the performance improvement studies, many problems have emerged in the thermal management of these components. Improvements on reducing the size of electronic components and carrying out more processing per unit time have caused the components to produce very high amounts of heat flux.

On the other hand, homogeneous temperature distribution on electronic components is extremely important for the healthy operation of the chip. At this point, micro heat exchangers can produce efficient solutions with their small size and therefore their heat absorption per unit.

Flow boiling heat transfer method in micro-scale heat exchangers with its homogeneous temperature and higher heat flux draw rate has been suggested in many studies to solve this situation.

However, the flow-boiling heat transfer process at the micro scale is still not fully understood and the underlying physical mechanisms and the effect of various parameters on the heat transfer rate are not fully understood.

One of the main reasons for this is that the flow regimes that vary according to the heat flux, mass flux, inlet subcooling degree and geometric parameters during the boiling flow heat transfer are not fully understood. Because it is known that the flow regimes have a direct effect on the heat transfer coefficient and pressure drop values. On the other hand, at very high heat fluxes, a sudden transition to the critical heat flux may occur after the cyclic flow regime, which causes the channel to dry out completely and burn. This situation causes serious damage to the cooled device.

In this thesis, inlet and outlet temperature and pressure drop data during flow boiling in microchannels with different geometries in flat rectangular copper structure will be examined by signal processing methods. The processed data will be compared with the

flow regime images taken with the microscope integrated with the high speed camera and the relationship between them will be tried to be found.

In this way, the effects of heat flux, mass flux, inlet subcooling degree, channel length, channel aspect ratio on the flow regime will be evaluated as the effects on the characteristic features of the signals received from the sensors, such as wavelength, frequency and amplitude.

The aim of the thesis is to meet this need by associating the flow regimes, which must be observed synchronously with expensive equipment such as fast cameras and microscopes during the experiments, and which are decided by the eye without a clear measurement definition, with the characteristics such as frequency, amplitude and wavelength of the cleaned signal after filtering and smoothing the signals received from the sensors. transforming into a model.

The results will be discussed between the partners within the framework of physical rules and the conclusion will be reached. If the project is successful, the flow regime in the boiling heat transfer flow process in micro heat exchangers can be predicted with signal data, and therefore the heat transfer coefficient and pressure drop calculations and the physical mechanisms underlying the process can be examined more accurately and easily. On the other hand, the model to be created will be an early warning for the processes approaching the critical heat flux value.

Keywords: Microscale Heat Exchanger, Flow Boiling, Signal Processing

INTRODUCTION

In studies in the literature, it has been stated that the amount of heat flux that computer processors will produce until 2026 will vary between 2 and 4.5 MW/m², and this rate can reach around 50 MW/m² in the chips of insulated gate bipolar transistors [1].

These values are very high compared to the values we currently encounter in daily life. At this point, single-phase and boiling flow heat transfer methods in micro heat exchangers have been investigated in the literature as a solution proposal for the heat management of these miniaturized compact devices.

Although the single-phase heat transfer method seems to stand out because it is easier to control and its physical mechanism is more clearly understood, it is risky because the heat removal upper value limit is limited and it cannot provide a homogeneous temperature distribution on the device [2].

On the other hand, due to the phase change mechanism during the flow boiling heat transfer process, much higher heat values can be removed and a homogeneous temperature distribution on the device can be achieved.

As a result of heat transfer from the component that needs to be cooled to the fluid entering the heat exchanger at a temperature close to the boiling temperature (eg, 88 °C for water at 1 atm pressure), the boiling is reached in the fluid in the channel. The reason why the fluid enters the channel at a temperature close to the boiling temperature is that the fluid in the channel has a higher heat carrying capacity in boiling state. As a result of the boiling of the fluid, a two-phase (gas and liquid) flow is formed.

Two types of mechanisms are mentioned during the flow boiling process. These are called nucleated boiling and convective boiling, respectively, see Figure 1. Although these mechanisms have a direct effect on the heat transfer coefficient, the flow regime that occurs during this time directly affects these mechanisms and even allows them to be defined.

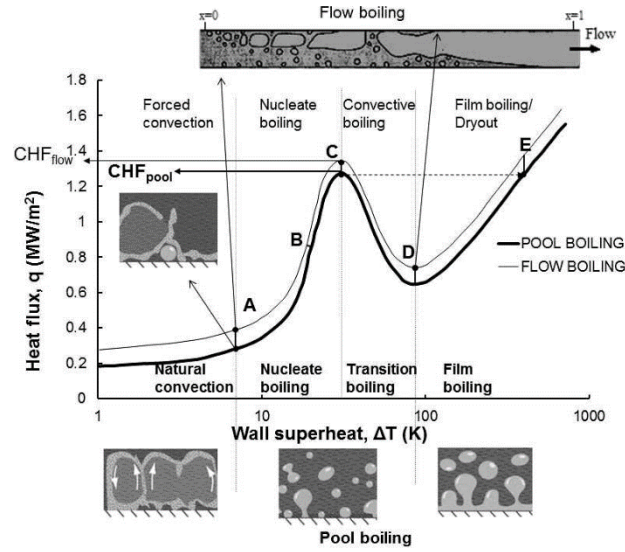


Figure 1 Pool and flow boiling water curve [3]

Flow Regimes

There are basically four types of boiling flow heat transfer flow regimes in micro heat exchangers. These are the bubbly, slug, churn and annular flow regimes, respectively. Although intermediate flow regimes have been defined by some researchers, basically these four flow regimes occur. In Figure 2, microscopic and graphical images of these four basic flow regimes are given. The regimes observed at the outlet of the channel are Bubbly, Slug, Churn and Annular, respectively, from the beginning of the boiling according to the increasing heat flux.

In bubbly flow, the bubbles are evenly dispersed and are individual. Bubbles do not interact with each other. Slug flow is flow that contains larger clusters of bubbles that coalesce as a result of increased interaction of bubbles with each other. Churn flow means turbulent flow. Slug is an irregular flow regime resulting from the bursting of large bubble clusters formed in the flow. Annular flow is a flow regime in which a continuous gas flow is surrounded by a thin film of liquid. In Figure 1, the points A, B, C, D and E on the graph are respectively; denotes bubbly, bubbly-slug, slug, churn and annular flow regimes. As can be seen in the figure, the heat absorption rate; An increase from bubbly flow to slug flow, decrease from slug flow to churn flow and an increase from churn flow to annular flow were observed.

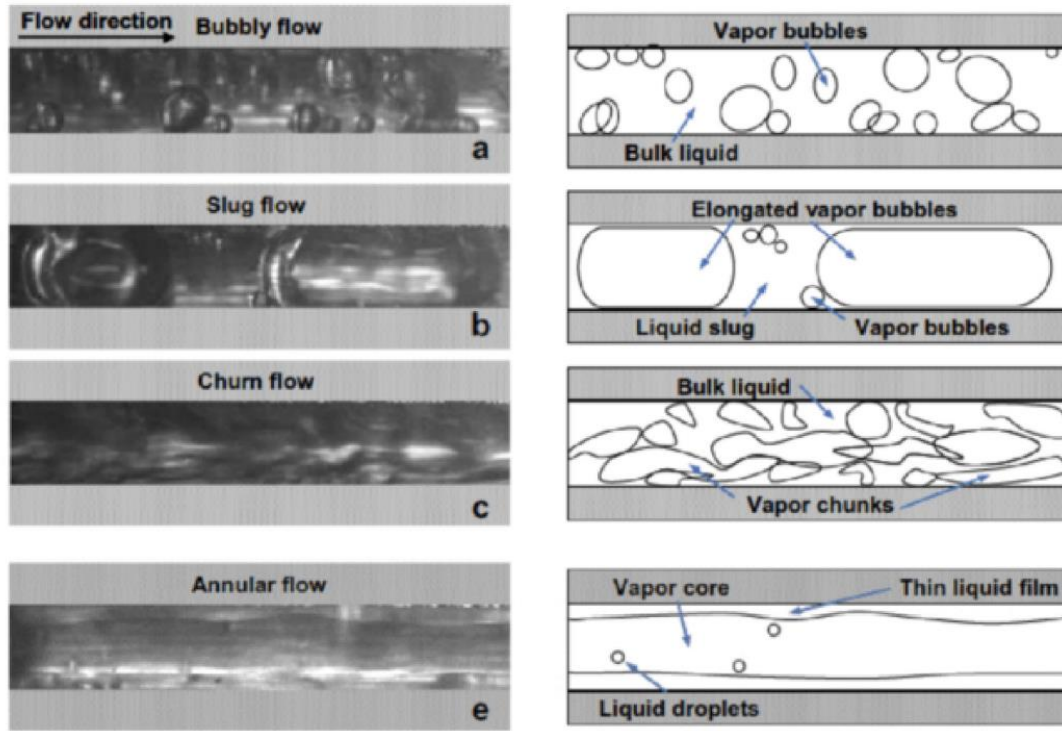


Figure 2 Flow Regimes in Microchannel [4]

As mentioned before and as seen in Figure 1, the boiling process starts with the observation of the first bubbles by increasing the heat flux in the heat exchanger where the fluid enters as a single-phase liquid. The most effective method of detecting the start of boiling here is to observe with a fast camera attached to a microscope. However, this method is extremely laborious because it needs to be done simultaneously. At the same time, it is very costly because it requires the use of a microscope and camera for observation. It has been stated in the studies in the literature that the onset of union can be understood by several different methods. One of these is that the signals of the thermocouple signals measuring the inlet and outlet temperature and the pressure sensors measuring the duct pressure drop fluctuate excessively at the time of boiling. Ozdemir et al. [5] demonstrated this in the process of boiling water flow in a copper rectangular microchannel, see Figure 3. Similar observations have been found in many other studies [6-8].

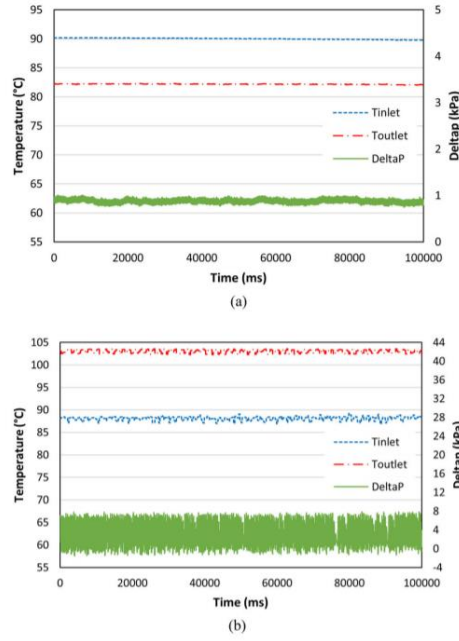


Figure 3 Inlet Temperature, Outlet Temperature and Pressure Difference Signals Before and During Boiling [5]

On the other hand, signal processing during boiling flow has been used for many other purposes [9-10]. Kaya et al. [10] performed flow boiling experiments at different mass and heat fluxes for two microtubes with different inside diameters. On the other hand, various restriction valve configurations were placed at the inlet.

The transition state of these inlet restriction tubes and tube diameter to the early critical heat flux and the transition to unstable boiling conditions were evaluated by processing and analyzing the temperature and pressure drop fluctuation signals.

Based on these studies, our research question is whether the boiling flow regimes, which occur during boiling at micro scale and are directly related to the heat transfer coefficient, can be characterized by data analysis method. To the best of our knowledge, such a relationship is not mentioned in the literature.

In this respect, the thesis is original and useful. Thanks to this thesis, it will be investigated whether the flow regimes can be determined by inserting the instantaneous data from the sensors into the signal processing processes, instead of an expensive method such as camera and microscope, which must be observed simultaneously during the process.

At the end of the project, that is, revealing the correlation between boiling flow regimes and signals and characterizing the data, our aim is to ensure that the fluid in the channel is instantly known in which regime it flows. Knowing which regime the fluid is in momentarily enables the instantaneous estimation of the heat capacity it can carry.

It is also known that; In bubbly and slug flow regimes, the heat carrying capacity is predominantly related to the heat flux while being transferred to the fluid, while in churn and annular flow it is predominantly related to the mass flux entering the channel. As a result of manipulation on the mass flux of the fluid, which is known in which regime it flows in the channel, it will be possible to obtain the optimum heat carrying capacity for the fluid. In addition to such innovations, for different situations, the mass flux of the fluid entering the channel can be made more predictable for a new situation. In this context, the aim of our project is; is to predict the 4 basic boiling flow regimes in microchannels with the model we will create by means of signals.

Our Goals

1. To analyze the effect of heat flux on the flow regime with the model to be created.
2. To analyze the effect of mass flux on the flow regime with the model to be created.
3. To analyze the effect of the inlet subcooling degree on the flow regime with the model to be created.
4. To analyze the effect of the channel heating length on the flow regime with the model to be created.
5. To analyze the effect of channel width height ratio on the flow regime with the model to be created.

MATERIALS AND METHODS

Boiling flow test data were taken momentarily at 1 kHz frequency for 4 different copper rectangular microchannels (Test Section) under different inlet subcooling degrees, heat flux and mass flux conditions.

Test section	Height, mm	Width, mm	Length, mm	Hydraulic Diameter, mm	Aspect ratio	Inlet/Outlet Plenums Diameter, mm
TS 1	0.39	1	62.0	0.56	2.56	2.0
TS 2	0.34	1.68	62.0	0.56	4.94	2.4
TS 3	0.84	0.42	62.0	0.56	0.5	1.9
TS 4	0.39	1	86.8	0.56	2.56	2.0

Table 1 Dimensons of Test Sections [11]

In these data, the fluid; The flow regime maps and data sequences were matched by observing the fluid in the channel with the help of an analog microscope, together with the data of the entrance temperature to the channel, the temperature of the exit from the channel, and the pressure difference between the entrance and the exit to the channel. (Figure 4, Figure 5, Figure 6, Figure 7)

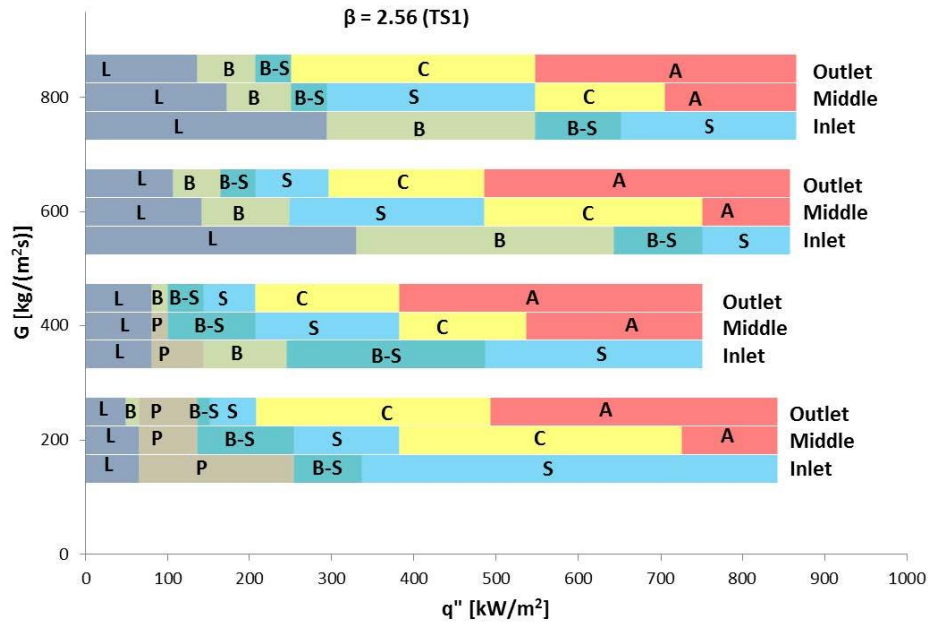


Figure 4 Regime Map for TS1 [11]

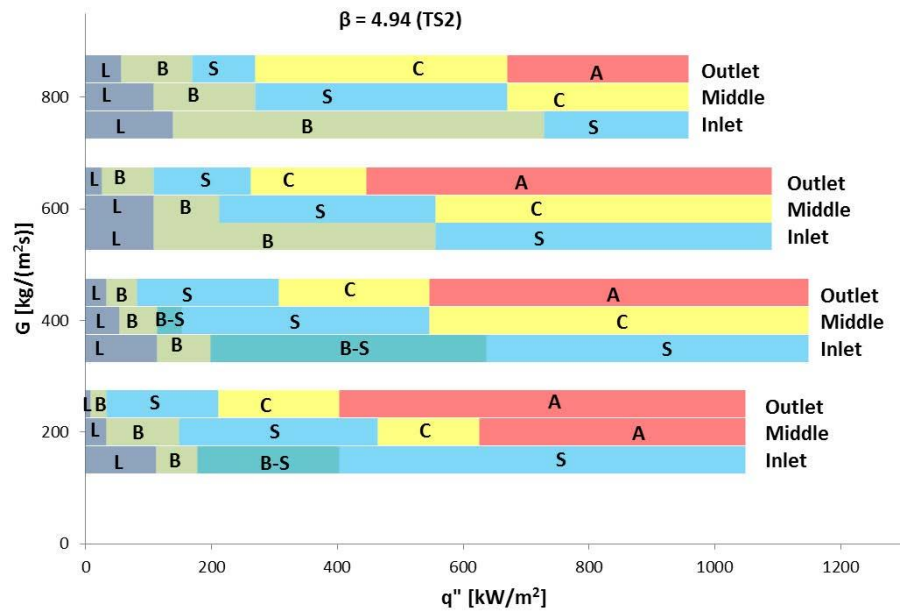


Figure 5 Regime Map for TS2 [11]

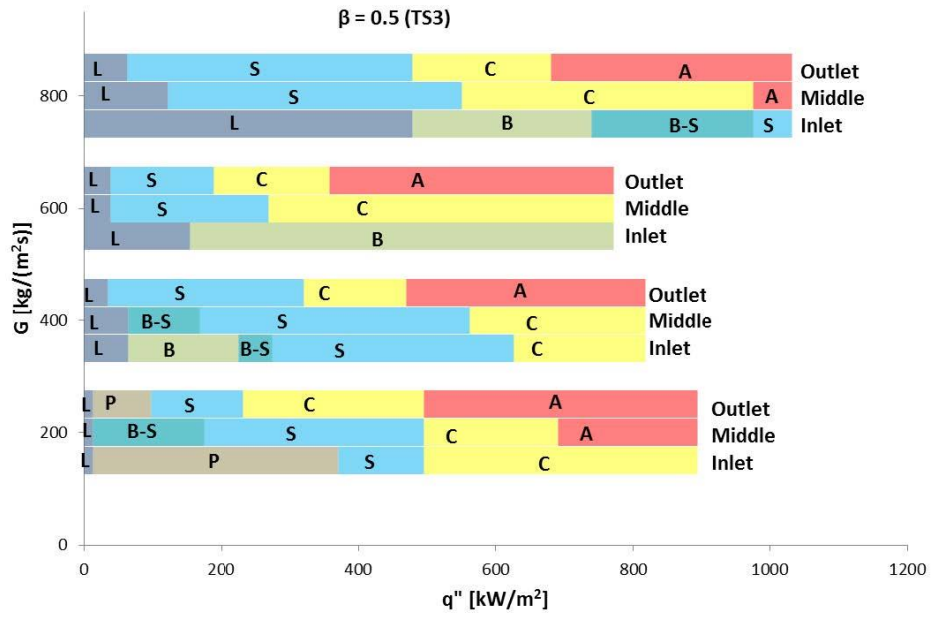


Figure 6 Regime Map of TS3 [11]

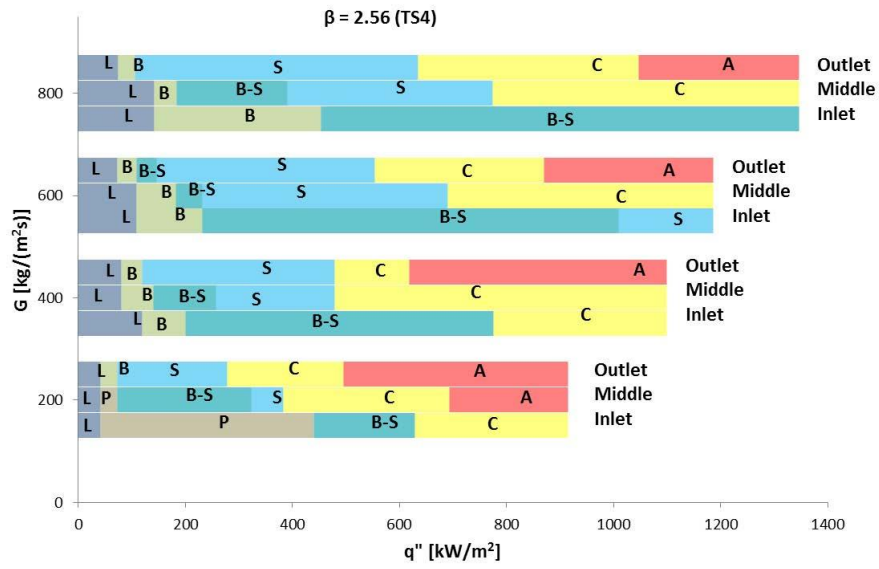


Figure 7 Regime Map of TS4 [11]

When these data are graphed, when the fluid with the same mass flux in the same channel is heated at different fluxes, the change in the flux causes the regimes to change or the characteristic (amplitude, frequency) properties of the data (especially in the graph of the inlet and outlet pressure difference data) to change, even if the fluid continues to flow in the same regime. is happening. Based on the examination of these graphs, it has been concluded that there is a connection between the flow regimes and the data taken instantaneously at 1 kHz frequency. Figure 8 and Figure 9 support this opinion.

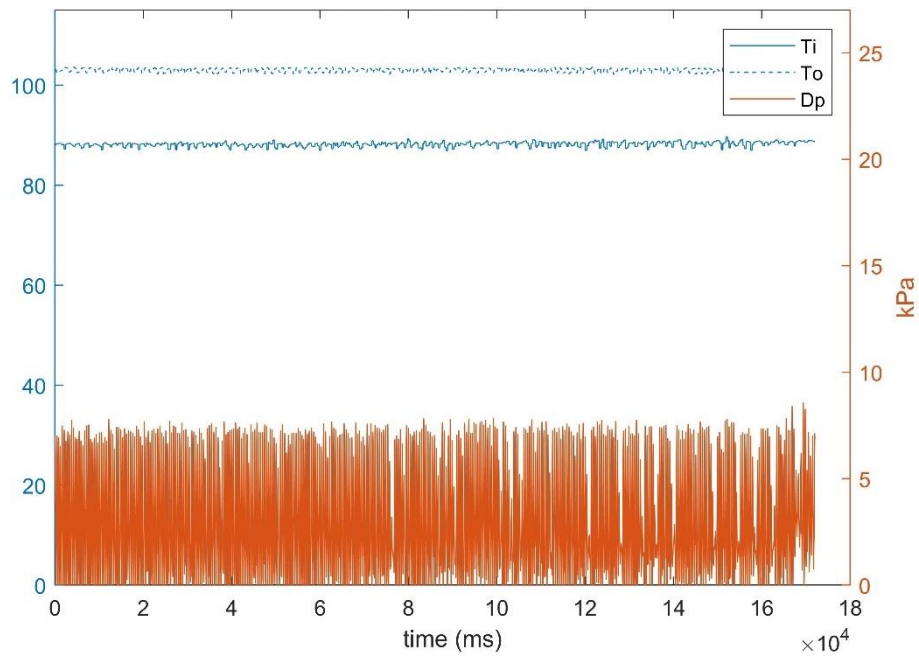


Figure 8 Data for Test Section-1 at a mass flux of $400 \text{ kg}/(\text{m}^2\text{s})$ at an inlet temperature of $88 \text{ }^\circ\text{C}$ at a heat flux of $137.6 \text{ kW}/(\text{m}^2)$

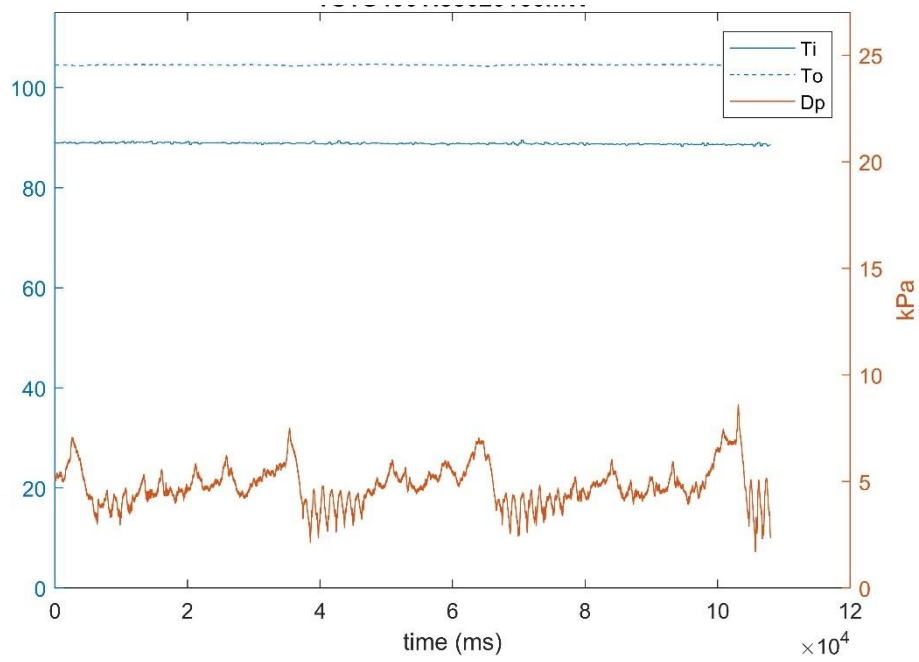


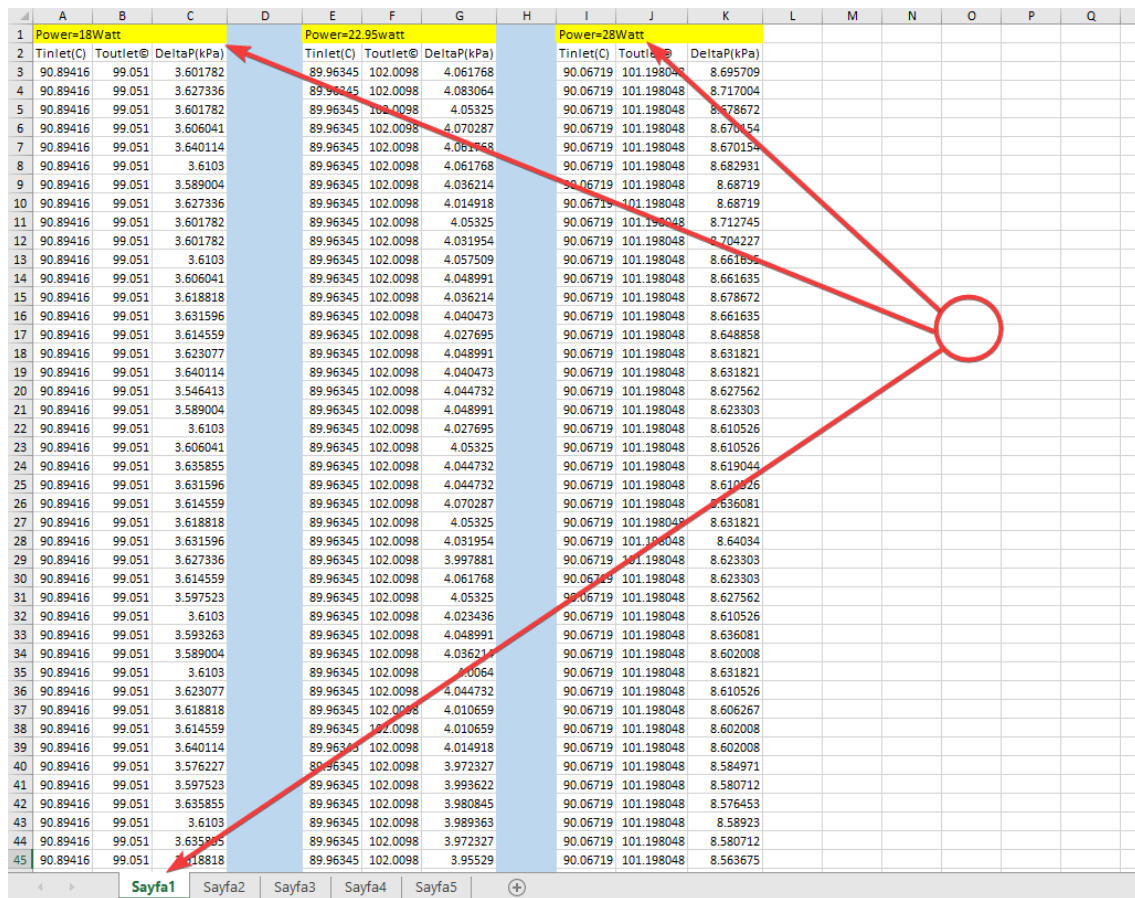
Figure 9 Data for Test Section-1 at a mass flux of $400 \text{ kg/(m}^2\text{s)}$ at an inlet temperature of $88 \text{ }^\circ\text{C}$ at a heat flux of $182.7 \text{ kW/(m}^2\text{)}$

In Figure 8 and 9, 137.6 and 182.7 kW/m^2 constant heat fluxes are given to the fluid entering the same microchannel at the same mass flux and inlet temperature along the channel. From the flow regime map; If attention is paid to which regimes occur at the inlets and outlets, the inlet temperature graph in Figure-8 is periodic boiling, the outlet temperature graph is slug regimes; The input graph in Figure 9 is in bubbly flow, and the output graph is in slug flow regime. These two graphs show the effects of differentiation of inlet and outlet flow regimes on pressure.

After obtaining data under different operating conditions for different microchannels, data processing will be carried out in two stages. These two stages are: parsing Data in Excel files in an orderly and usable way and obtaining characteristic values from the data.

Parsing Data in Excel Files

All the data in the Excel file were parsed with the help of Matlab software. It has been analyzed with a script that can parse all of a series of excel files covering the studies performed at 4 different mass fluxes for 4 Test Section. Figure 10 shows the layout of the excel files.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Power=18Watt				Power=22.95Watt				Power=28Watt								
2	Tinlet(C)	Toutlet(C)	DeltaP(kPa)		Tinlet(C)	Toutlet(C)	DeltaP(kPa)		Tinlet(C)	Toutlet(C)	DeltaP(kPa)						
3	90.89416	99.051	3.601782		89.96345	102.0098	4.061768		90.06719	101.198048	8.695709						
4	90.89416	99.051	3.627336		89.96345	102.0098	4.083064		90.06719	101.198048	8.717004						
5	90.89416	99.051	3.601782		89.96345	102.0098	4.05325		90.06719	101.198048	8.678672						
6	90.89416	99.051	3.606041		89.96345	102.0098	4.070287		90.06719	101.198048	8.670154						
7	90.89416	99.051	3.640114		89.96345	102.0098	4.061768		90.06719	101.198048	8.670154						
8	90.89416	99.051	3.6103		89.96345	102.0098	4.061768		90.06719	101.198048	8.682931						
9	90.89416	99.051	3.589004		89.96345	102.0098	4.036214		90.06719	101.198048	8.68719						
10	90.89416	99.051	3.627336		89.96345	102.0098	4.014918		90.06719	101.198048	8.68719						
11	90.89416	99.051	3.601782		89.96345	102.0098	4.05325		90.06719	101.198048	8.712745						
12	90.89416	99.051	3.601782		89.96345	102.0098	4.031954		90.06719	101.198048	8.704227						
13	90.89416	99.051	3.6103		89.96345	102.0098	4.057509		90.06719	101.198048	8.661635						
14	90.89416	99.051	3.606041		89.96345	102.0098	4.048991		90.06719	101.198048	8.661635						
15	90.89416	99.051	3.618818		89.96345	102.0098	4.036214		90.06719	101.198048	8.678672						
16	90.89416	99.051	3.631596		89.96345	102.0098	4.040473		90.06719	101.198048	8.661635						
17	90.89416	99.051	3.614559		89.96345	102.0098	4.027695		90.06719	101.198048	8.648858						
18	90.89416	99.051	3.623077		89.96345	102.0098	4.048991		90.06719	101.198048	8.631821						
19	90.89416	99.051	3.640114		89.96345	102.0098	4.040473		90.06719	101.198048	8.631821						
20	90.89416	99.051	3.546413		89.96345	102.0098	4.044732		90.06719	101.198048	8.627562						
21	90.89416	99.051	3.589004		89.96345	102.0098	4.048991		90.06719	101.198048	8.623303						
22	90.89416	99.051	3.6103		89.96345	102.0098	4.027695		90.06719	101.198048	8.610526						
23	90.89416	99.051	3.606041		89.96345	102.0098	4.05325		90.06719	101.198048	8.610526						
24	90.89416	99.051	3.635855		89.96345	102.0098	4.044732		90.06719	101.198048	8.619044						
25	90.89416	99.051	3.631596		89.96345	102.0098	4.044732		90.06719	101.198048	8.610526						
26	90.89416	99.051	3.614559		89.96345	102.0098	4.070287		90.06719	101.198048	8.636081						
27	90.89416	99.051	3.618818		89.96345	102.0098	4.05325		90.06719	101.198048	8.631821						
28	90.89416	99.051	3.631596		89.96345	102.0098	4.031954		90.06719	101.198048	8.64034						
29	90.89416	99.051	3.627336		89.96345	102.0098	3.997881		90.06719	101.198048	8.623303						
30	90.89416	99.051	3.614559		89.96345	102.0098	4.061768		90.06719	101.198048	8.623303						
31	90.89416	99.051	3.597523		89.96345	102.0098	4.05325		90.06719	101.198048	8.627562						
32	90.89416	99.051	3.6103		89.96345	102.0098	4.023436		90.06719	101.198048	8.610526						
33	90.89416	99.051	3.593263		89.96345	102.0098	4.048991		90.06719	101.198048	8.636081						
34	90.89416	99.051	3.589004		89.96345	102.0098	4.036214		90.06719	101.198048	8.602008						
35	90.89416	99.051	3.6103		89.96345	102.0098	4.00064		90.06719	101.198048	8.631821						
36	90.89416	99.051	3.623077		89.96345	102.0098	4.044732		90.06719	101.198048	8.610526						
37	90.89416	99.051	3.618818		89.96345	102.0098	4.010659		90.06719	101.198048	8.606267						
38	90.89416	99.051	3.614559		89.96345	102.0098	4.010659		90.06719	101.198048	8.602008						
39	90.89416	99.051	3.640114		89.96345	102.0098	4.014918		90.06719	101.198048	8.602008						
40	90.89416	99.051	3.576227		89.96345	102.0098	3.972327		90.06719	101.198048	8.584971						
41	90.89416	99.051	3.597523		89.96345	102.0098	3.993622		90.06719	101.198048	8.580712						
42	90.89416	99.051	3.635855		89.96345	102.0098	3.980845		90.06719	101.198048	8.576453						
43	90.89416	99.051	3.6103		89.96345	102.0098	3.989363		90.06719	101.198048	8.58923						
44	90.89416	99.051	3.635855		89.96345	102.0098	3.972327		90.06719	101.198048	8.580712						
45	90.89416	99.051	3.618818		89.96345	102.0098	3.95529		90.06719	101.198048	8.563675						

Figure 10 Layout of Datas in Excel Files

Converting *Watt* to $\frac{W}{m^2}$

Test section	Height, mm	Width, mm	Length, mm	Hydraulic Diameter, mm	Aspect ratio	Inlet/Outlet Plenums Diameter, mm
TS 1	0.39	1	62.0	0.56	2.56	2.0
TS 2	0.34	1.68	62.0	0.56	4.94	2.4
TS 3	0.84	0.42	62.0	0.56	0.5	1.9
TS 4	0.39	1	86.8	0.56	2.56	2.0

Table 2 Dimensons of Test Sections [11]

Heat flux values are obtained by calculating the inner surface area of each channel and dividing it by the given heat values.

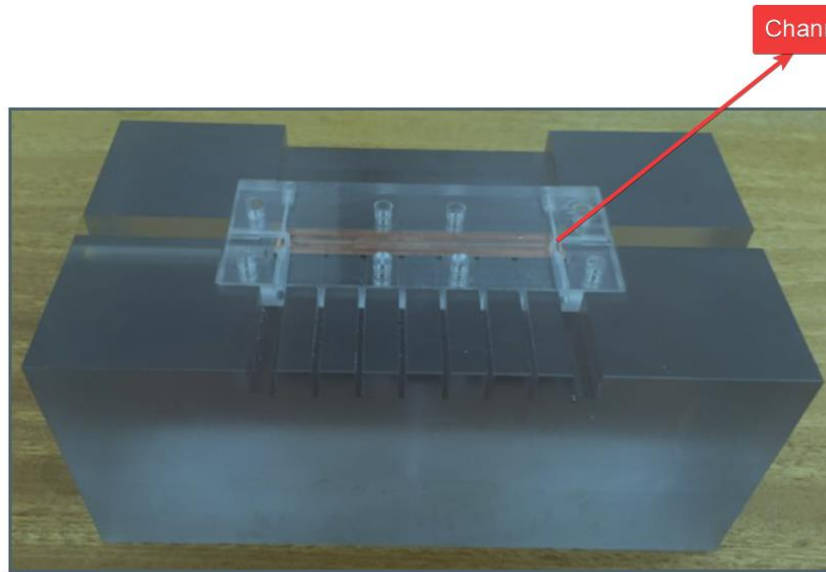


Figure 11 Assembly of the Housing, Top Cover and Microchannel Test Section

$$\text{Internal Area of Channel} = 2 * \text{Height} * \text{Length} + \text{Width} * \text{Lenght}$$

$$\text{Internal Area of } TS_1 = 110.4 \text{ mm}^2$$

$$\text{Internal Area of } TS_2 = 146.3 \text{ mm}^2$$

$$\text{Internal Area of } TS_3 = 130.2 \text{ mm}^2$$

$$\text{Internal Area of } TS_4 = 154.5 \text{ mm}^2$$

General Table

In total, 250 data series have been decomposition for 4 Test Sections. It includes which Test Section the data series belong to, which G value, which heat flux it is taken in, and the inlet and outlet regimes of the flow. The data was parsed in the Matlab environment and then transferred to the excel environment.

n	TS	G	T_inlet	Watt	Q	R_inlet	R_outlet
1	1	200	88	9,5	86	PERIODIC	PERIODIC
2	1	200	88	10,4	94	PERIODIC	PERIODIC
3	1	200	88	11,34	102	PERIODIC	PERIODIC
4	1	200	88	13,05	118	PERIODIC	PERIODIC
5	1	200	88	16	144	PERIODIC	BUBBLYSLUG
6	1	200	88	19,25	174	PERIODIC	SLUG
7	1	200	88	27,3	247	PERIODIC	CHURN
8	1	200	88	32,43	293	BUBBLYSLUG	CHURN
9	1	200	88	38,25	346	SLUG	CHURN
10	1	200	88	41,6	376	SLUG	CHURN
11	1	200	88	46,75	423	SLUG	CHURN
12	1	400	88	13,05	118	PERIODIC	BUBBLYSLUG
13	1	400	88	15,19	137	PERIODIC	BUBBLYSLUG
14	1	400	88	20,16	182	BUBBLY	SLUG
15	1	400	88	27,3	247	BUBBLYSLUG	CHURN
16	1	400	88	31,5	285	BUBBLYSLUG	CHURN
17	1	400	88	36,375	329	BUBBLYSLUG	CHURN
18	1	400	88	40,9425	370	BUBBLYSLUG	CHURN
19	1	400	88	46,75	423	BUBBLYSLUG	ANNULAR
20	1	400	88	52,2	472	BUBBLYSLUG	ANNULAR
21	1	400	88	58,425	529	SLUG	ANNULAR
22	1	600	88	13,05	118	LIQUID	BUBBLY
23	1	600	88	16	144	LIQUID	BUBBLY
24	1	600	88	19,8	179	LIQUID	BUBBLYSLUG
25	1	600	88	22,42	203	LIQUID	BUBBLYSLUG
26	1	600	88	27,3	247	LIQUID	SLUG
27	1	600	88	31,85	288	LIQUID	SLUG
28	1	600	88	37,24	337	BUBBLY	CHURN

29	1	600	88	40,9425	370	BUBBLY	CHURN
30	1	600	88	47,4525	429	BUBBLY	CHURN
31	1	600	88	52,2	472	BUBBLY	CHURN
32	1	600	88	58,425	529	BUBBLY	ANNULAR
33	1	800	88	16	144	LIQUID	BUBBLY
34	1	800	88	19,25	174	LIQUID	BUBBLY
35	1	800	88	23,4	211	LIQUID	BUBBLYSLUG
36	1	800	88	27,3	247	LIQUID	BUBBLYSLUG
37	1	800	88	32,2	291	LIQUID	CHURN
38	1	800	88	36,995	335	BUBBLY	CHURN
39	1	800	88	42,7875	387	BUBBLY	CHURN
40	1	800	88	47,4525	429	BUBBLY	CHURN
41	1	800	88	52,2	472	BUBBLY	CHURN
42	1	800	88	58,1175	526	BUBBLY	CHURN
43	1	800	88	65,325	591	BUBBLYSLUG	ANNULAR
44	1	800	88	71,74	649	BUBBLYSLUG	ANNULAR
45	2	200	88	8,165	55	LIQUID	SLUG
46	2	200	88	11,07	75	LIQUID	SLUG
47	2	200	88	13,65	93	LIQUID	SLUG
48	2	200	88	16,665	113	BUBBLY	SLUG
49	2	200	88	19,98	136	BUBBLY	SLUG
50	2	200	88	24,2	165	BUBBLY	SLUG
51	2	200	88	28,28	193	BUBBLYSLUG	SLUG
52	2	200	88	33,725	230	BUBBLYSLUG	CHURN
53	2	200	88	38,25	261	BUBBLYSLUG	CHURN
54	2	200	88	43,195	295	BUBBLYSLUG	CHURN
55	2	200	88	47,4525	324	BUBBLYSLUG	CHURN
56	2	200	88	52,9425	361	BUBBLYSLUG	CHURN
57	2	200	88	58,255	398	BUBBLYSLUG	CHURN
58	2	200	88	65,325	446	SLUG	ANNULAR
59	2	200	88	71,74	490	SLUG	ANNULAR
60	2	200	88	80,8375	552	SLUG	ANNULAR
61	2	200	88	88,54	605	SLUG	ANNULAR
62	2	200	88	96,5925	660	SLUG	ANNULAR
63	2	200	88	104,995	717	SLUG	ANNULAR
64	2	200	88	114,613	783	SLUG	ANNULAR
65	2	200	88	125,343	856	SLUG	ANNULAR
66	2	200	88	133,95	915	SLUG	ANNULAR
67	2	200	88	147,258	1006	SLUG	ANNULAR
68	2	400	88	13,5	92	LIQUID	SLUG

69	2	400	88	16,665	113	BUBBLY	SLUG
70	2	400	88	19,8	135	BUBBLY	SLUG
71	2	400	88	24	164	BUBBLY	SLUG
72	2	400	88	28,71	196	BUBBLY	SLUG
73	2	400	88	34,4375	235	BUBBLYSLUG	SLUG
74	2	400	88	41,34	282	BUBBLYSLUG	SLUG
75	2	400	88	47,88	327	BUBBLYSLUG	CHURN
76	2	400	88	53,395	364	BUBBLYSLUG	CHURN
77	2	400	88	57,645	394	BUBBLYSLUG	CHURN
78	2	400	88	67,65	462	BUBBLYSLUG	CHURN
79	2	400	88	80,8375	552	BUBBLYSLUG	ANNULAR
80	2	400	88	93,21	637	SLUG	ANNULAR
81	2	600	88	15,52	106	LIQUID	BUBBLY
82	2	600	88	19,62	134	BUBBLY	SLUG
83	2	600	88	24	164	BUBBLY	SLUG
84	2	600	88	27,95	191	BUBBLY	SLUG
85	2	600	88	32,43	221	BUBBLY	SLUG
86	2	600	88	36,75	251	BUBBLY	SLUG
87	2	600	88	43,46	297	BUBBLY	CHURN
88	2	600	88	50,8875	347	BUBBLY	CHURN
89	2	600	88	59,83	408	BUBBLY	CHURN
90	2	600	88	71,06	485	BUBBLY	ANNULAR
91	2	600	88	78,2925	535	BUBBLY	ANNULAR
92	2	600	88	94,5925	646	SLUG	ANNULAR
93	2	600	88	111,8	764	SLUG	ANNULAR
94	2	600	88	124,2	848	SLUG	ANNULAR
95	2	600	88	148,5	1015	SLUG	ANNULAR
96	2	800	88	19,8	135	LIQUID	BUBBLY
97	2	800	88	27,84	190	BUBBLY	SLUG
98	2	800	88	32,43	221	BUBBLY	SLUG
99	2	800	88	36,995	252	BUBBLY	SLUG
100	2	800	88	43,46	297	BUBBLY	CHURN
101	2	800	88	46,0525	314	BUBBLY	CHURN
102	2	800	88	51,91	354	BUBBLY	CHURN
103	2	800	88	58,255	398	BUBBLY	CHURN
104	2	800	88	64	437	BUBBLY	CHURN
105	2	800	88	70,875	484	BUBBLY	CHURN
106	2	800	88	78,2825	535	BUBBLY	CHURN
107	2	800	88	86,625	592	BUBBLY	CHURN
108	2	800	88	94,5925	646	BUBBLY	CHURN
109	2	800	88	101,4675	693	BUBBLY	ANNULAR

110	2	800	88	111,8	764	SLUG	ANNULAR
111	2	800	88	120,595	824	SLUG	ANNULAR
112	2	800	88	137,9975	943	SLUG	ANNULAR
113	3	200	88	8,05	61	PERIODIC	PERIODIC
114	3	200	88	10,935	83	PERIODIC	PERIODIC
115	3	200	88	14,03	107	PERIODIC	SLUG
116	3	200	88	20,35	156	PERIODIC	SLUG
117	3	200	88	24,705	189	PERIODIC	SLUG
118	3	200	88	29,04	223	PERIODIC	SLUG
119	3	200	88	34,8	267	PERIODIC	CHURN
120	3	200	88	42,4	325	PERIODIC	CHURN
121	3	200	88	47,6	365	PERIODIC	CHURN
122	3	200	88	54,6	419	SLUG	CHURN
123	3	200	88	60,795	466	SLUG	CHURN
124	3	200	88	66,99	514	CHURN	ANNULAR
125	3	200	88	77,39	594	CHURN	ANNULAR
126	3	200	88	88,3575	678	CHURN	ANNULAR
127	3	200	88	95,195	731	CHURN	ANNULAR
128	3	200	88	103,5375	795	CHURN	ANNULAR
129	3	200	88	111,5775	856	CHURN	ANNULAR
130	3	200	88	120,595	926	CHURN	ANNULAR
131	3	200	88	130,665	1003	CHURN	ANNULAR
132	3	400	88	10,4	79	BUBBLY	SLUG
133	3	400	88	13,8	105	BUBBLY	SLUG
134	3	400	88	16,5	126	BUBBLY	SLUG
135	3	400	88	20,35	156	BUBBLY	SLUG
136	3	400	88	24	184	BUBBLY	SLUG
137	3	400	88	28,4925	218	BUBBLY	SLUG
138	3	400	88	33,9625	260	BUBBLYSLUG	SLUG
139	3	400	88	41,7375	320	SLUG	SLUG
140	3	400	88	48,3075	371	SLUG	CHURN
141	3	400	88	54,4425	418	SLUG	CHURN
142	3	400	88	58,9	452	SLUG	CHURN
143	3	400	88	66,4825	510	SLUG	ANNULAR
144	3	400	88	74,365	571	SLUG	ANNULAR
145	3	400	88	86,625	665	CHURN	ANNULAR
146	3	400	88	95,195	731	CHURN	ANNULAR
147	3	400	88	102,91	790	CHURN	ANNULAR
148	3	400	88	114,84	882	CHURN	ANNULAR
149	3	400	88	120,595	926	CHURN	ANNULAR

150	3	600	88	14,415	110	LIQUID	SLUG
151	3	600	88	17,085	131	LIQUID	SLUG
152	3	600	88	21,375	164	BUBBLY	SLUG
153	3	600	88	26,145	200	BUBBLY	CHURN
154	3	600	88	32,2	247	BUBBLY	CHURN
155	3	600	88	36,75	282	BUBBLY	CHURN
156	3	600	88	42,665	327	BUBBLY	CHURN
157	3	600	88	47,6	365	BUBBLY	ANNULAR
158	3	600	88	53,69	412	BUBBLY	ANNULAR
159	3	600	88	59,52	457	BUBBLY	ANNULAR
160	3	600	88	66,4825	510	BUBBLY	ANNULAR
161	3	600	88	77,1975	592	BUBBLY	ANNULAR
162	3	600	88	86,625	665	BUBBLY	ANNULAR
163	3	600	88	97,3875	747	BUBBLY	ANNULAR
164	3	600	88	104,3625	801	BUBBLY	ANNULAR
165	3	600	88	114,6125	880	BUBBLY	ANNULAR
166	3	800	88	16,665	127	LIQUID	SLUG
167	3	800	88	20,2575	155	LIQUID	SLUG
168	3	800	88	24	184	LIQUID	SLUG
169	3	800	88	28,165	216	LIQUID	SLUG
170	3	800	88	35,04	269	LIQUID	SLUG
171	3	800	88	42,665	327	LIQUID	SLUG
172	3	800	88	48,8725	375	LIQUID	SLUG
173	3	800	88	55,9625	429	LIQUID	SLUG
174	3	800	88	65,65	504	BUBBLY	CHURN
175	3	800	88	75,6	580	BUBBLY	CHURN
176	3	800	88	85,3025	655	BUBBLY	CHURN
177	3	800	88	93,21	715	BUBBLY	ANNULAR
178	3	800	88	102,5	787	BUBBLYSLUG	ANNULAR
179	3	800	88	110,5	848	BUBBLYSLUG	ANNULAR
180	3	800	88	122,1675	938	BUBBLYSLUG	ANNULAR
181	3	800	88	130,425	1001	SLUG	ANNULAR
182	3	800	88	141,855	1089	SLUG	ANNULAR
183	3	800	88	149,49	1148	SLUG	ANNULAR
184	4	200	88	10,37	67	PERIODIC	BUBBLY
185	4	200	88	13,825	89	PERIODIC	SLUG
186	4	200	88	18,655	120	PERIODIC	SLUG
187	4	200	88	22,5	145	PERIODIC	SLUG
188	4	200	88	28,305	183	PERIODIC	SLUG
189	4	200	88	33,855	219	PERIODIC	SLUG
190	4	200	88	40,87	264	PERIODIC	SLUG

191	4	200	88	47,52	307	PERIODIC	CHURN
192	4	200	88	54,67	353	PERIODIC	CHURN
193	4	200	88	61,91	400	PERIODIC	CHURN
194	4	200	88	71,28	461	BUBBLYSLUG	CHURN
195	4	200	88	80,41	520	BUBBLYSLUG	ANNULAR
196	4	200	88	89,1425	576	BUBBLYSLUG	ANNULAR
197	4	200	88	100,36	649	CHURN	ANNULAR
198	4	200	88	110,635	716	CHURN	ANNULAR
199	4	200	88	120,84	782	CHURN	ANNULAR
200	4	200	88	137,25	888	CHURN	ANNULAR
201	4	200	88	157,2	1017	CHURN	ANNULAR
202	4	400	88	18,63	120	BUBBLY	SLUG
203	4	400	88	23,69	153	BUBBLY	SLUG
204	4	400	88	29,6125	191	BUBBLY	SLUG
205	4	400	88	32,9725	213	BUBBLYSLUG	SLUG
206	4	400	88	42,47	274	BUBBLYSLUG	SLUG
207	4	400	88	51,375	332	BUBBLYSLUG	SLUG
208	4	400	88	59,57	385	BUBBLYSLUG	SLUG
209	4	400	88	70,4375	455	BUBBLYSLUG	SLUG
210	4	400	88	78,2	506	BUBBLYSLUG	CHURN
211	4	400	88	86,3675	559	BUBBLYSLUG	CHURN
212	4	400	88	97,8875	633	BUBBLYSLUG	ANNULAR
213	4	400	88	108,54	702	BUBBLYSLUG	ANNULAR
214	4	400	88	119,7425	775	BUBBLYSLUG	ANNULAR
215	4	400	88	133,2425	862	CHURN	ANNULAR
216	4	400	88	147,3725	953	CHURN	ANNULAR
217	4	600	88	14,2	91	LIQUID	BUBBLY
218	4	600	88	17,5775	113	BUBBLY	BUBBLYSLUG
219	4	600	88	22,75	147	BUBBLY	SLUG
220	4	600	88	28,28	183	BUBBLY	SLUG
221	4	600	88	34,13	220	BUBBLY	SLUG
222	4	600	88	39,6	256	BUBBLYSLUG	SLUG
223	4	600	88	47,52	307	BUBBLYSLUG	SLUG
224	4	600	88	53,2	344	BUBBLYSLUG	SLUG
225	4	600	88	61,91	400	BUBBLYSLUG	SLUG
226	4	600	88	71,72	464	BUBBLYSLUG	SLUG
227	4	600	88	79,09	511	BUBBLYSLUG	SLUG
228	4	600	88	88,69	574	BUBBLYSLUG	CHURN
229	4	600	88	98,365	636	BUBBLYSLUG	CHURN
230	4	600	88	108,54	702	BUBBLYSLUG	CHURN
231	4	600	88	119,7425	775	BUBBLYSLUG	CHURN

232	4	600	88	134,3575	869	BUBBLYSLUG	ANNULAR
233	4	600	88	147,955	957	BUBBLYSLUG	ANNULAR
234	4	600	88	159,7725	1034	SLUG	ANNULAR
235	4	800	88	18	116	LIQUID	SLUG
236	4	800	88	22,95	148	BUBBLY	SLUG
237	4	800	88	28	181	BUBBLY	SLUG
238	4	800	88	33,55	217	BUBBLY	SLUG
239	4	800	88	39,9	258	BUBBLY	SLUG
240	4	800	88	46,8	302	BUBBLY	SLUG
241	4	800	88	54,6375	353	BUBBLY	SLUG
242	4	800	88	64,6425	418	BUBBLY	SLUG
243	4	800	88	72,535	469	BUBBLYSLUG	SLUG
244	4	800	88	82,65	534	BUBBLYSLUG	SLUG
245	4	800	88	96,8625	626	BUBBLYSLUG	SLUG
246	4	800	88	111,1425	719	BUBBLYSLUG	CHURN
247	4	800	88	120,7975	781	BUBBLYSLUG	CHURN
248	4	800	88	133,1525	861	BUBBLYSLUG	CHURN
249	4	800	88	144,9525	938	BUBBLYSLUG	CHURN
250	4	800	88	160,9875	1041	BUBBLYSLUG	CHURN

Table 3 General Table for Datas

When the graphs of the data sets are examined one by one, some inconsistencies were observed in the graphs of the consecutive tests. In order to avoid statistical errors caused by these inconsistencies, the most appropriate and continuous range was determined by comparing the graphs before and after any graph.

The reference values in determining these ranges are Inlet Temperature, Pressure Difference and Outlet Temperature.

The focus range was determined by examining the graphs. These focus ranges can be seen in the table below.

Focused Range of Datas

TS	G	Q	T_inlet	First Element Number	Last Element Number	Seconds	INLET	OUTLET
1	200	86	88	6000	58000	52	PERIODIC	PERIODIC
1	200	94	88	11000	160000	149	PERIODIC	PERIODIC
1	200	102	88	80000	150000	70	PERIODIC	PERIODIC
1	200	118	88	120000	180000	60	PERIODIC	PERIODIC
1	200	144	88	180000	235000	55	PERIODIC	BUBBLY-SLUG
1	200	174	88	35000	85000	50	PERIODIC	SLUG
1	200	247	88	40000	90000	50	PERIODIC	CHURN
1	200	293	88	85000	150000	65	BUBBLYSLUG	CHURN
1	200	346	88	105000	155000	50	SLUG	CHURN
1	200	376	88	100000	127000	27	SLUG	CHURN
1	200	423	88	140000	200000	60	SLUG	CHURN
1	400	118	88	30000	80000	50	PERIODIC	BUBBLY-SLUG
1	400	137	88	1	50000	49,999	PERIODIC	BUBBLY-SLUG
1	400	182	88	6400	104700	98,3	BUBBLY	SLUG
1	400	247	88	105000	135000	30	BUBBLYSLUG	CHURN
1	400	285	88	100000	200000	100	BUBBLYSLUG	CHURN
1	400	329	88	100000	160000	60	BUBBLYSLUG	CHURN
1	400	370	88	90000	150000	60	BUBBLYSLUG	CHURN
1	400	423	88	1	35000	34,999	BUBBLYSLUG	ANNULAR
1	400	472	88	20000	70000	50	BUBBLYSLUG	ANNULAR
1	400	529	88	50000	100000	50	SLUG	ANNULAR

1	600	118	88	75000	100000	25	LIQUID	BUBBLY
1	600	144	88	45400	55000	9,6	LIQUID	BUBBLY
1	600	179	88	143000	190000	47	LIQUID	BUBBLY
1	600	203	88	101000	156000	55	LIQUID	BUBBLY-SLUG
1	600	247	88	18000	68000	50	LIQUID	SLUG
1	600	288	88	17000	63000	46	LIQUID	SLUG
1	600	337	88	90000	130000	40	BUBBLY	CHURN
1	600	370	88	10000	50000	40	BUBBLY	CHURN
1	600	429	88	4500	34000	29,5	BUBBLY	CHURN
1	600	472	88	60000	93000	33	BUBBLY	CHURN
1	600	529	88	24000	46000	22	BUBBLY	ANNULAR
1	800	144	88	9000	24000	15	LIQUID	BUBBLY
1	800	174	88	60000	96000	36	LIQUID	BUBBLY
1	800	211	88	73000	110000	37	LIQUID	BUBBLY-SLUG
1	800	247	88	26800	80000	53,2	LIQUID	BUBBLY-SLUG
1	800	291	88	30000	60000	30	LIQUID	CHURN
1	800	335	88	55000	80000	25	BUBBLY	CHURN
1	800	387	88	3000	30000	27	BUBBLY	CHURN
1	800	429	88	17000	42000	25	BUBBLY	CHURN
1	800	472	88	25000	37000	12	BUBBLY	CHURN
1	800	526	88	20000	46000	26	BUBBLY	CHURN
1	800	591	88	23000	44000	21	BUBBLY-SLUG	ANNULAR
1	800	649	88	15000	35000	20	BUBBLY-SLUG	ANNULAR
2	200	55	88	160000	200000	40	LIQUID	SLUG
2	200	75	88	18000	60000	42	LIQUID	SLUG
2	200	93	88	106000	135000	29	LIQUID	SLUG
2	200	113	88	120000	140000	20	BUBBLY	SLUG
2	200	136	88	137000	208000	71	BUBBLY	SLUG
2	200	165	88	38000	100000	62	BUBBLY	SLUG
2	200	193	88	55000	115000	60	BUBBLYSLUG	SLUG
2	200	230	88	65000	120000	55	BUBBLYSLUG	CHURN
2	200	261	88	97000	144350	47,35	BUBBLYSLUG	CHURN
2	200	295	88	109000	156000	47	BUBBLYSLUG	CHURN
2	200	324	88	198000	235780	37,78	BUBBLYSLUG	CHURN

2	200	361	88	120000	168000	48	BUBBLYSLUG	CHURN
2	200	398	88	147000	195000	48	BUBBLYSLUG	CHURN
2	200	446	88	210000	255000	45	SLUG	ANNULAR
2	200	490	88	314000	366000	52	SLUG	ANNULAR
2	200	552	88	140000	180000	40	SLUG	ANNULAR
2	200	605	88	145000	200000	55	SLUG	ANNULAR
2	200	660	88	220000	260000	40	SLUG	ANNULAR
2	200	717	88	206000	243100	37,1	SLUG	ANNULAR
2	200	783	88	90000	135000	45	SLUG	ANNULAR
2	200	856	88	3000	65000	62	SLUG	ANNULAR
2	200	915	88	120000	165000	45	SLUG	ANNULAR
2	200	1006	88	120000	175000	55	SLUG	ANNULAR
2	400	92	88	240000	290000	50	LIQUID	SLUG
2	400	113	88	150000	210000	60	BUBBLY	SLUG
2	400	135	88	210000	250000	40	BUBBLY	SLUG
2	400	164	88	106000	175000	69	BUBBLY	SLUG
2	400	196	88	88700	165200	76,5	BUBBLY	SLUG
2	400	235	88	135000	185000	50	BUBBLYSLUG	SLUG
2	400	282	88	160000	200000	40	BUBBLYSLUG	SLUG
2	400	327	88	325000	385000	60	BUBBLYSLUG	CHURN
2	400	364	88	200000	250000	50	BUBBLYSLUG	CHURN
2	400	394	88	180000	230000	50	BUBBLYSLUG	CHURN
2	400	462	88	175000	215000	40	BUBBLYSLUG	CHURN
2	400	552	88	195000	240000	45	BUBBLYSLUG	ANNULAR
2	400	637	88	250000	300000	50	SLUG	ANNULAR
2	600	106	88	150000	180000	30	LIQUID	BUBBLY
2	600	134	88	230000	265000	35	BUBBLY	SLUG
2	600	164	88	155000	185000	30	BUBBLY	SLUG
2	600	191	88	90000	173000	83	BUBBLY	SLUG
2	600	221	88	204000	255000	51	BUBBLY	SLUG
2	600	251	88	150000	220000	70	BUBBLY	SLUG
2	600	297	88	240000	284100	44,1	BUBBLY	CHURN
2	600	347	88	200000	255000	55	BUBBLY	CHURN
2	600	408	88	215000	270000	55	BUBBLY	CHURN
2	600	485	88	234000	291000	57	BUBBLY	ANNULAR
2	600	535	88	185000	245000	60	BUBBLY	ANNULAR
2	600	646	88	200	50000	49,8	SLUG	ANNULAR
2	600	764	88	100000	140000	40	SLUG	ANNULAR

2	600	848	88	65000	100000	35	SLUG	ANNULAR
2	600	1015	88	110000	145000	35	SLUG	ANNULAR
2	800	135	88	1	18000	17,999	LIQUID	BUBBLY
2	800	190	88	1	40000	39,999	BUBBLY	SLUG
2	800	221	88	258000	287000	29	BUBBLY	SLUG
2	800	252	88	205000	257000	52	BUBBLY	SLUG
2	800	297	88	60000	120000	60	BUBBLY	CHURN
2	800	314	88	4000	64000	60	BUBBLY	CHURN
2	800	354	88	213000	255000	42	BUBBLY	CHURN
2	800	398	88	3000	87000	84	BUBBLY	CHURN
2	800	437	88	208000	246000	38	BUBBLY	CHURN
2	800	484	88	105000	158000	53	BUBBLY	CHURN
2	800	535	88	160000	210000	50	BUBBLY	CHURN
2	800	592	88	190000	260000	70	BUBBLY	CHURN
2	800	646	88	200000	255000	55	BUBBLY	CHURN
2	800	693	88	180000	240000	60	BUBBLY	ANNULAR
2	800	764	88	218000	275000	57	SLUG	ANNULAR
2	800	824	88	37000	100000	63	SLUG	ANNULAR
2	800	943	88	130000	190000	60	SLUG	ANNULAR
3	200	61	88	185000	255000	70	PERIODIC	PERIODIC
3	200	83	88	60000	70000	10	PERIODIC	PERIODIC
3	200	107	88	123000	190000	67	PERIODIC	SLUG
3	200	156	88	110000	1880000	1770	PERIODIC	SLUG
3	200	189	88	244000	300000	56	PERIODIC	SLUG
3	200	223	88	233000	285000	52	PERIODIC	SLUG
3	200	267	88	275000	330000	55	PERIODIC	CHURN
3	200	325	88	184000	240000	56	PERIODIC	CHURN
3	200	365	88	3780	67400	63,62	PERIODIC	CHURN
3	200	419	88	116000	170000	54	SLUG	CHURN
3	200	466	88	218000	250000	32	SLUG	CHURN
3	200	514	88	240000	295000	55	CHURN	ANNULAR
3	200	594	88	178000	232000	54	CHURN	ANNULAR
3	200	678	88	200	47800	47,6	CHURN	ANNULAR
3	200	731	88	2300	59380	57,08	CHURN	ANNULAR
3	200	795	88	1000	65000	64	CHURN	ANNULAR
3	200	856	88	33000	66000	33	CHURN	ANNULAR
3	200	926	88	70000	90000	20	CHURN	ANNULAR
3	200	1003	88	80000	98000	18	CHURN	ANNULAR

3	400	79	88	65000	125000	60	BUBBLY	SLUG
3	400	105	88	200000	250000	50	BUBBLY	SLUG
3	400	126	88	188000	270000	82	BUBBLY	SLUG
3	400	156	88	186500	230800	44,3	BUBBLY	SLUG
3	400	184	88	2300	92450	90,15	BUBBLY	SLUG
3	400	218	88	3686	132301	128,615	BUBBLY	SLUG
3	400	260	88	350000	400000	50	BUBBLYSLUG	SLUG
3	400	320	88	304000	340000	36	SLUG	SLUG
3	400	371	88	130000	180000	50	SLUG	CHURN
3	400	418	88	240000	280000	40	SLUG	CHURN
3	400	452	88	288000	350000	62	SLUG	CHURN
3	400	510	88	100000	170000	70	SLUG	ANNULAR
3	400	571	88	115000	170000	55	SLUG	ANNULAR
3	400	665	88	60000	100000	40	CHURN	ANNULAR
3	400	731	88	160000	210000	50	CHURN	ANNULAR
3	400	790	88	102000	160000	58	CHURN	ANNULAR
3	400	882	88	135000	200000	65	CHURN	ANNULAR
3	400	926	88	190000	250000	60	CHURN	ANNULAR
3	600	110	88	270000	340000	70	LIQUID	SLUG
3	600	131	88	185000	218000	33	LIQUID	SLUG
3	600	164	88	11900	100000	88,1	BUBBLY	SLUG
3	600	200	88	3760	83723	79,963	BUBBLY	CHURN
3	600	247	88	1	300000	299,999	BUBBLY	CHURN
3	600	282	88	100000	150000	50	BUBBLY	CHURN
3	600	327	88	186000	246400	60,4	BUBBLY	CHURN
3	600	365	88	300000	355000	55	BUBBLY	ANNULAR
3	600	412	88	70000	125000	55	BUBBLY	ANNULAR
3	600	457	88	190000	230000	40	BUBBLY	ANNULAR
3	600	510	88	120000	160000	40	BUBBLY	ANNULAR
3	600	592	88	230000	270000	40	BUBBLY	ANNULAR
3	600	665	88	78000	100000	22	BUBBLY	ANNULAR
3	600	747	88	60000	100000	40	BUBBLY	ANNULAR
3	600	801	88	300000	750000	450	BUBBLY	ANNULAR
3	600	880	88	1	17600	17,599	BUBBLY	ANNULAR
3	800	127	88	1	20000	19,999	LIQUID	SLUG
3	800	155	88	100000	125000	25	LIQUID	SLUG
3	800	184	88	1	53000	52,999	LIQUID	SLUG

3	800	216	88	19000	93000	74	LIQUID	SLUG
3	800	269	88	160000	200000	40	LIQUID	SLUG
3	800	327	88	21000	75000	54	LIQUID	SLUG
3	800	375	88	250000	290000	40	LIQUID	SLUG
3	800	429	88	230000	276000	46	LIQUID	SLUG
3	800	504	88	290000	330000	40	BUBBLY	CHURN
3	800	580	88	275000	325000	50	BUBBLY	CHURN
3	800	655	88	273000	316000	43	BUBBLY	CHURN
3	800	715	88	207000	230000	23	BUBBLY	ANNULAR
3	800	787	88	300000	335000	35	BUBBLYSLUG	ANNULAR
3	800	848	88	160000	210000	50	BUBBLYSLUG	ANNULAR
3	800	938	88	1	50000	49,999	BUBBLYSLUG	ANNULAR
3	800	1001	88	140000	190000	50	SLUG	ANNULAR
3	800	1089	88	50000	90000	40	SLUG	ANNULAR
3	800	1148	88	1	60000	59,999	SLUG	ANNULAR
4	200	67	88	19000	32000	13	PERIODIC	BUBBLY
4	200	89	88	20000	70000	50	PERIODIC	SLUG
4	200	120	88	45000	140000	95	PERIODIC	SLUG
4	200	145	88	60000	130000	70	PERIODIC	SLUG
4	200	183	88	45000	140000	95	PERIODIC	SLUG
4	200	219	88	84000	140000	56	PERIODIC	SLUG
4	200	264	88	40000	100000	60	PERIODIC	SLUG
4	200	307	88	50000	90000	40	PERIODIC	CHURN
4	200	353	88	67000	105000	38	PERIODIC	CHURN
4	200	400	88	85000	150000	65	PERIODIC	CHURN
4	200	461	88	60000	120000	60	BUBBLYSLUG	CHURN
4	200	520	88	70000	120000	50	BUBBLYSLUG	ANNULAR
4	200	576	88	2000	28000	26	BUBBLYSLUG	ANNULAR
4	200	649	88	1	24000	23,999	CHURN	ANNULAR
4	200	716	88	1	16000	15,999	CHURN	ANNULAR
4	200	782	88	1	35000	34,999	CHURN	ANNULAR
4	200	888	88	1	38000	37,999	CHURN	ANNULAR
4	200	1017	88	45000	75000	30	CHURN	ANNULAR
4	400	120	88	70000	120000	50	BUBBLY	SLUG
4	400	153	88	63000	145000	82	BUBBLY	SLUG
4	400	191	88	60000	170000	110	BUBBLY	SLUG
4	400	213	88	98000	140000	42	BUBBLYSLUG	SLUG
4	400	274	88	132000	167000	35	BUBBLYSLUG	SLUG

4	400	332	88	72000	120000	48	BUBBLYSLUG	SLUG
4	400	385	88	127000	180000	53	BUBBLYSLUG	SLUG
4	400	455	88	120000	160000	40	BUBBLYSLUG	SLUG
4	400	506	88	33000	55000	22	BUBBLYSLUG	CHURN
4	400	559	88	45000	80000	35	BUBBLYSLUG	CHURN
4	400	633	88	220000	300000	80	BUBBLYSLUG	ANNULAR
4	400	702	88	55000	96000	41	BUBBLYSLUG	ANNULAR
4	400	775	88	84000	135000	51	BUBBLYSLUG	ANNULAR
4	400	862	88	125000	160000	35	CHURN	ANNULAR
4	400	953	88	13000	37600	24,6	CHURN	ANNULAR
4	600	91	88	130000	180000	50	LIQUID	BUBBLY
4	600	113	88	84000	140000	56	BUBBLY	BUBBLYSLUG
4	600	147	88	30000	60000	30	BUBBLY	SLUG
4	600	183	88	208000	270000	62	BUBBLY	SLUG
4	600	220	88	100000	160000	60	BUBBLY	SLUG
4	600	256	88	170000	280000	110	BUBBLYSLUG	SLUG
4	600	307	88	20000	90000	70	BUBBLYSLUG	SLUG
4	600	344	88	90000	146000	56	BUBBLYSLUG	SLUG
4	600	400	88	120000	180000	60	BUBBLYSLUG	SLUG
4	600	464	88	220000	290000	70	BUBBLYSLUG	SLUG
4	600	511	88	207000	256000	49	BUBBLYSLUG	SLUG
4	600	574	88	200000	266000	66	BUBBLYSLUG	CHURN
4	600	636	88	15000	90000	75	BUBBLYSLUG	CHURN
4	600	702	88	150000	205000	55	BUBBLYSLUG	CHURN
4	600	775	88	273000	342000	69	BUBBLYSLUG	CHURN
4	600	869	88	190000	260000	70	BUBBLYSLUG	ANNULAR
4	600	957	88	3000	64000	61	BUBBLYSLUG	ANNULAR
4	600	1034	88	110000	170000	60	SLUG	ANNULAR
4	800	116	88	130000	210000	80	LIQUID	SLUG
4	800	148	88	156000	200000	44	BUBBLY	SLUG
4	800	181	88	37000	103000	66	BUBBLY	SLUG
4	800	217	88	150000	220000	70	BUBBLY	SLUG
4	800	258	88	205000	270000	65	BUBBLY	SLUG
4	800	302	88	166000	230000	64	BUBBLY	SLUG
4	800	353	88	190000	260000	70	BUBBLY	SLUG
4	800	418	88	150000	230000	80	BUBBLY	SLUG
4	800	469	88	200000	250000	50	BUBBLYSLUG	SLUG
4	800	534	88	4000	63000	59	BUBBLYSLUG	SLUG

4	800	626	88	160000	250000	90	BUBBLYSLUG	SLUG
4	800	719	88	175000	240000	65	BUBBLYSLUG	CHURN
4	800	781	88	64000	100000	36	BUBBLYSLUG	CHURN
4	800	861	88	37000	74000	37	BUBBLYSLUG	CHURN
4	800	938	88	26000	58000	32	BUBBLYSLUG	CHURN
4	800	1041	88	4000	35000	31	BUBBLYSLUG	CHURN

Table 4 Focused Range of Datas

After the intervals are determined, for each data set, some statistical values in the determined intervals are given in Table 4. These values are the difference of the standard deviation, mean, maximum and minimum values.

Statistical Value of Datas

n	TS	G	T_inlet	nTS_X_G_XXX	Watt	Q	R_inlet	R_outlet	Std_Inlet	Std_Outlet	Std_Dp	Mean_ti	Max_ti	Min_ti	Diff_ti	Mean_to	Max_to	Min_to	Diff_to	Mean_dp	Max_dp	Min_dp	Diff_dp
1	1	200	88	1	9,5	86	PERIODIC	PERIODIC	0,2504653	0,4124369	0,5206967	87,73765	88,8016	87,07981	1,721798	101,5185	102,0446	99,20642	2,838213	0,5097336	6,276519	-0,107927	6,384446
2	1	200	88	2	10,4	94	PERIODIC	PERIODIC	1,14391	0,4845223	0,7309273	88,06242	99,17878	86,92887	12,24991	101,4776	102,1068	99,0214	3,085376	0,7868917	6,331888	-1,044937	7,376825
3	1	200	88	3	11,34	102	PERIODIC	PERIODIC	2,242223	0,4519131	1,91903	91,45624	98,49277	88,69824	9,794528	101,8471	102,3669	101,0724	1,294439	1,339828	5,752646	-1,223821	6,976467
4	1	200	88	4	13,05	118	PERIODIC	PERIODIC	4,560431	0,3807573	2,243063	93,66071	100,6601	87,49462	13,16551	102,4755	102,955	101,8091	1,145955	1,590681	6,523549	-1,764731	8,28828
5	1	200	88	5	16	144	PERIODIC	BUBBLYSLUG	2,28587	0,1084669	0,705105	88,32856	98,87587	85,63102	13,24485	103,6502	103,7785	103,2127	0,565797	2,158785	3,844552	0,509648	3,334904
6	1	200	88	6	19,25	174	PERIODIC	SLUG	2,599506	0,1148428	1,028133	89,20797	99,9862	85,97142	14,01478	103,8892	104,1193	103,5199	0,599345	3,285788	6,055044	0,509648	5,545396
7	1	200	88	7	27,3	247	PERIODIC	CHURN	1,185576	0,09522509	1,236026	89,42617	93,96056	86,55541	7,405155	104,5313	104,7291	104,2801	0,448957	5,723576	8,627562	2,707363	5,920199
8	1	200	88	8	32,43	293	BUBBLYSLUG	CHURN	1,945721	0,5451102	1,369486	90,95579	98,09128	88,06387	10,02742	100,2155	101,1898	98,65818	2,53157	7,576782	10,78694	4,526014	6,26093
9	1	200	88	9	38,25	346	SLUG	CHURN	1,868357	0,1119363	0,3061672	92,87289	98,70989	90,56569	8,144202	100,1315	100,365	99,5155	0,849548	10,60276	12,1669	9,577735	2,589554
10	1	200	88	10	41,6	376	SLUG	CHURN	1,97838	0,07115794	0,219603	91,57771	97,39278	88,91761	8,475171	100,0434	100,1873	99,81264	0,374665	10,6882	11,4897	9,977708	1,511993
11	1	200	88	11	46,75	423	SLUG	CHURN	1,950801	0,06697375	0,2206375	91,16659	97,22974	88,2497	8,980039	100,1684	100,4112	99,98362	0,427539	13,04036	13,79815	12,25635	1,541807
12	1	400	88	1	13,05	118	PERIODIC	BUBBLYSLUG	0,6684789	0,4228021	0,9847926	88,40687	89,5965	85,45333	4,143171	102,8578	103,2406	101,1786	2,062047	1,494911	8,235722	-0,955495	9,191217
13	1	400	88	2	15,19	137	PERIODIC	BUBBLYSLUG	0,4013376	0,3982438	2,712054	88,07066	89,03359	87,02491	2,008681	103,0408	103,5786	102,2827	1,295943	3,031438	7,814067	-1,517701	9,331768
14	1	400	88	3	20,16	182	BUBBLY	SLUG	0,1681774	0,092115	0,8965247	88,83848	89,5155	88,30658	1,208921	104,5424	104,6975	104,1916	0,505824	4,795519	8,614785	2,115343	6,499442
15	1	400	88	4	27,3	247	BUBBLYSLUG	CHURN	0,1701855	0,6216608	1,386557	89,16933	89,76841	88,09303	1,675382	100,5149	101,898	99,31735	2,58064	8,843598	11,9071	5,083961	6,823136
16	1	400	88	5	31,5	285	BUBBLYSLUG	CHURN	0,1359888	0,6902432	1,746761	88,83148	89,10164	88,34724	0,754399	100,5542	101,5658	99,24092	2,324837	10,68012	14,25814	7,8524	6,405739
17	1	400	88	6	36,375	329	BUBBLYSLUG	CHURN	0,07474755	0,09621119	0,2240128	89,31141	89,63717	89,13853	0,498639	100,0883	100,2943	99,80366	0,490659	13,22966	13,93019	12,54597	1,384219
18	1	400	88	7	40,9425	370	BUBBLYSLUG	CHURN	0,08735881	0,1160269	0,2883496	88,64041	88,89751	88,35047	0,547041	100,0322	100,333	99,70915	0,623837	15,38391	16,30252	14,55628	1,746245
19	1	400	88	8	46,75	423	BUBBLYSLUG	ANNULAR	0,1394255	0,0780267	0,2133968	88,89425	89,2695	88,60808	0,661424	100,3651	100,6028	100,1843	0,418516	16,85117	17,58452	15,82976	1,754763
20	1	400	88	9	52,2	472	BUBBLYSLUG	ANNULAR	0,2406768	0,06682983	0,1956304	89,08126	89,70418	88,64612	1,058061	100,4487	100,6401	100,3031	0,337011	20,36179	21,02164	19,41595	1,605693
21	1	400	88	10	58,425	529	SLUG	ANNULAR	0,2958618	0,05529054	0,1759805	89,36778	90,10642	89,00233	1,104093	100,5092	100,7031	100,3574	0,345625	24,323	24,98264	23,56009	1,422551
22	1	600	88	1	13,05	118	LIQUID	BUBBLY	0,0357486	0,01092913	0,0376699	88,8999	88,9765	88,83705	0,139449	101,4087	101,4326	101,3856	0,047025	2,250456	2,358114	2,12812	0,229994
23	1	600	88	2	16	144	LIQUID	BUBBLY	0,03220384	0,1126474	0,5250373	88,74084	88,79538	88,66616	0,12922	103,365	103,4933	103,1379	0,355414	2,825063	4,142692	1,800167	2,342525
24	1	600	88	3	19,8	179	LIQUID	BUBBLYSLUG	0,1721879	0,3050957	5,083189	89,12488	89,49107	88,53118	0,959883	103,7134	104,3451	103,1987	1,146378	4,768726	12,90373	-4,307436	17,21117
25	1	600	88	4	22,42	203	LIQUID	BUBBLYSLUG	0,07775288	0,1015038	1,039798	89,20941	89,37415	89,009	0,365154	105,0067	105,1253	104,7638	0,361556	7,233483	9,875489	5,428951	4,446538
26	1	600	88	5	27,3	247	LIQUID	SLUG	0,06516682	0,1062726	1,453718	89,3411	89,46945	89,09709	0,372366	105,7353	105,8968	105,5138	0,382989	9,818688	13,48724	7,166679	6,320557
27	1	600	88	6	31,85	288	LIQUID	SLUG	0,08597704	0,5925301	1,367198	88,95416	89,12088	88,65919	0,461692	100,2922	101,3247	99,25753	2,067171	12,29692	15,16534	9,837157	5,328178
28	1	600	88	7	37,24	337	BUBBLY	CHURN	0,06605401	0,06901972	0,2238271	89,41473	89,53082	89,27166	0,259153	99,86451	100,0535	99,73692	0,316571	16,44961	17,15861	15,74032	1,418292
29	1	600	88	8	40,9425	370	BUBBLY	CHURN	0,04291122	0,1061136	0,3085425	89,41476	89,49123	89,3059	0,185324	99,76544	100,0182	99,51985	0,498335	18,03	18,89634	17,1288	1,76754
30	1	600	88	9	47,4525	429	BUBBLY	CHURN	0,05026148	0,1078398	0,3050557	89,46015	89,55697	89,30043	0,256548	99,95852	100,3015	99,71415	0,587323	22,12448	23,01918	21,0472	1,971978
31	1	600	88	10	52,2	472	BUBBLY	CHURN	0,07255809	0,08210121	0,2580874	89,01377	89,16729	88,78703	0,380266	100,266	100,5368	100,0008	0,535908	24,95965	25,99205	23,97322	2,018829
32	1	600	88	11	58,425	529	BUBBLY	ANNULAR	0,05522053	0,05264918	0,2331484	89,38498	89,49006	89,26952	0,220543	100,2887	100,4194	100,1759	0,243549	28,48369	29,33121	27,71274	1,61847
33	1	800	88	1	16	144	LIQUID	BUBBLY	0,02973209	0,02887812	0,03401776	88,67469	88,72756	88,61825	0,109318	101,4073	101,4555	101,3534	0,1021	3,128202	3,231237	3,026798	0,204439
34	1	800	88	2	19,25	174	LIQUID	BUBBLY	0,04440672	0,01670455	0,03742981	88,4861	88,57674	88,40668	0,170062	104,166	104,2051	104,1214	0,083739	3,475811	3,593263	3,359011	0,234252
35	1	800	88	3	23,4	211	LIQUID	BUBBLYSLUG	0,03368063	0,007210258	0,05961942	88,50029	88,60874	88,43538	0,173366	105,6066	105,6255	105,5925	0,032988	5,805244	6,02523	5,58228	0,44295
36	1	800	88	4	27,3	247	LIQUID	BUBBLYSLUG	0,05267985	0,05910907	0,6121447	88,49621	88,65653	88,39916	0,257369	106,3531	106,431	106,0905	0,340579	8,209391	11,00416	6,689656	4,314504
37	1	800	88	5	32,2	291	LIQUID	CHURN	0,04186519	0,0953561	1,375657	88,8823	88,96009	88,76197	0,198123	107,446	107,5857	107,2653	0,320349	12,33654	15,40811	10,13955	5,26855
38	1	800	88	6	36,995	335	BUBBLY	CHURN	0,05067375	0,05395886	0,1735917	88,60761	88,71387	88,50189	0,211975	100,0578	100,2061	99,9228	0,283316	16,51921	17,26083	15,99161	1,269222
39	1	800	88	7	42,7875	387	BUBBLY	CHURN	0,0412972	0,09304407	0,2064749	88,40769	88,49841	88,31421	0,184195	100,2719	100,4611	100,0784	0,382759	19,54054	20,2337	18,90059	1,333109
40	1	800	88	8	47,4525	429	BUBBLY	CHURN	0,02956043	0,1131944	0,2536945	88,42653	88,49276	88,33478	0,157985	100,445	100,6805	100,2218	0,458686	22,29456	23,16825	21,59237	1,575879
41	1	800	88	9	52,2	472	BUBBLY	CHURN	0,02476494	0,1058233	0,2613921	88,5982	88,64643	88,54513	0,101308	100,8047	101,013	100,6215	0,391457	25,64115	26,54148	24,96134	1,580138
42	1	800	88	10	58,1175	526	BUBBLY	CHURN	0,03411538	0,1163953	0,2554527	88,45989	88,5348	88,36123	0,17357	100,8066	101,0476	100,4998	0,54777	29,04964	29,82953	28,14717	1,682357
43	1	800	88	11	65,325	591	BUBBLYSLUG	ANNULAR	0,05292168	0,0723923	0,183044	88,73232	88,8462	88,56166	0,284539	100,7738	100,9498	100,6452	0,304601	34,29067	34,91493	33,55627	1,358663
44	1	800	88	12	71,74	649	BUBBLYSLUG	ANNULAR	0,029136	0,05476317	0,1724434	88,63544	88,70377	88,56678	0,136985	100,9138	101,1011	100,8108	0,290329	39,05	39,57442	38,35205	1,22237
45	2	200	88	1	8,165	55	LIQUID	SLUG	0,01807449	0,04799688	0,03491122	91,16107	91,20542	91,10738	0,098032	96,13561	96,25324	96,03099	0,222251	0,8578106	0,953708	0,762047	0,191661
46	2	200	88	2	11,07	75	LIQUID</																

57	2	200	88	13	58,255	398	BUBBLYSLUG	CHURN	0,1437217	0,07378435	0,1874738	90,34111	90,59403	89,93926	0,654768	101,7598	101,9724	101,5877	0,384705	9,617769	10,34936	9,063104	1,286259
58	2	200	88	14	65,325	446	SLUG	ANNULAR	0,1079518	0,05856758	0,1716987	90,06829	90,30203	89,68381	0,618216	101,6408	101,7917	101,4847	0,306934	11,47376	12,03598	10,9499	1,086079
59	2	200	88	15	71,74	490	SLUG	ANNULAR	0,1369043	0,04883957	0,1722363	90,72378	90,99581	90,34091	0,6549	101,7252	101,8454	101,5136	0,331797	12,98186	13,65871	12,47467	1,18404
60	2	200	88	16	80,8375	552	SLUG	ANNULAR	0,06569723	0,07179481	0,1809643	91,21635	91,43693	91,03908	0,397851	101,7161	101,902	101,565	0,33696	15,20067	15,87772	14,58294	1,294777
61	2	200	88	17	88,54	605	SLUG	ANNULAR	0,1315728	0,05927573	0,1823572	90,26993	90,52426	89,9624	0,561866	101,9193	102,0592	101,787	0,272118	17,02701	17,641	16,27808	1,362923
62	2	200	88	18	96,5925	660	SLUG	ANNULAR	0,05816312	0,05903595	0,2344685	89,70015	89,8385	89,52523	0,31327	102,2385	102,3891	102,0933	0,295788	18,88242	19,53632	18,04562	1,490697
63	2	200	88	19	104,995	717	SLUG	ANNULAR	0,07410019	0,05172098	0,1722673	89,31518	89,4944	89,14469	0,349714	102,2469	102,3741	102,1222	0,251869	21,29541	21,83625	20,60962	1,22663
64	2	200	88	20	114,613	783	SLUG	ANNULAR	0,1364561	0,05946223	0,1567372	89,96631	90,22114	89,70369	0,51745	102,1942	102,3767	102,0635	0,313198	24,24856	24,91134	23,61231	1,299035
65	2	200	88	21	125,343	856	SLUG	ANNULAR	0,06444086	0,05868907	0,2015473	89,24654	89,3995	89,10441	0,295085	102,5236	102,6466	102,3772	0,269373	27,14235	27,82459	26,47444	1,350145
66	2	200	88	22	133,95	915	SLUG	ANNULAR	0,09595923	0,04938879	0,1730429	89,80067	90,02841	89,58705	0,441367	102,6059	102,766	102,4849	0,281099	29,77007	30,29063	29,09807	1,192557
67	2	200	88	23	147,258	1006	SLUG	ANNULAR	0,1118066	0,03841206	0,1909341	90,12548	90,34002	89,859	0,48102	103,2845	103,4025	103,1819	0,220624	33,54493	34,1494	32,82481	1,32459
68	2	400	88	1	13,5	92	LIQUID	SLUG	0,127544	0,1032349	0,03415422	89,48269	89,79461	89,31427	0,480332	97,38054	97,63653	97,20886	0,427668	1,506572	1,601097	1,413695	0,187402
69	2	400	88	2	16,665	113	BUBBLY	SLUG	0,1612551	1,11716	0,7287463	91,25911	91,5065	90,56309	0,943414	100,4883	102,5821	97,13229	5,449834	1,780296	4,139542	0,238173	3,901369
70	2	400	88	3	19,8	135	BUBBLY	SLUG	0,3157516	1,998856	1,354097	89,03736	89,57284	87,89325	1,679586	99,69285	102,6557	96,49016	6,165575	2,041329	5,263955	-0,072744	5,336699
71	2	400	88	4	24	164	BUBBLY	SLUG	0,3158456	0,443877	0,8491554	91,07536	91,60618	90,0632	1,54298	101,9416	102,4417	100,6826	1,759008	3,459865	6,409662	2,095157	4,314505
72	2	400	88	5	28,71	196	BUBBLY	SLUG	0,5284935	0,5025803	1,078604	91,01781	91,80782	89,4083	2,399522	101,6578	102,4561	100,4146	2,04152	4,995812	7,964247	3,032167	4,93208
73	2	400	88	6	34,4375	235	BUBBLYSLUG	SLUG	0,1185091	0,07598584	0,2260899	91,21182	91,41086	90,88467	0,526189	101,1498	101,3686	100,9864	0,382151	6,604134	7,350931	5,911343	1,439588
74	2	400	88	7	41,34	282	BUBBLYSLUG	SLUG	0,1680162	0,1082876	0,2718549	89,40806	89,72312	89,11643	0,606687	101,2157	101,4568	100,9496	0,507173	8,001144	9,03329	7,142234	1,891056
75	2	400	88	8	47,88	327	BUBBLYSLUG	CHURN	0,3251827	0,102356	0,2781048	90,70647	91,21524	90,08073	1,134514	101,5998	101,9019	101,3868	0,515084	9,974227	10,90305	9,071622	1,831428
76	2	400	88	9	53,395	364	BUBBLYSLUG	CHURN	0,1433386	0,09057562	0,2057421	88,9889	88,35141	88,72159	0,629817	101,6448	101,8504	101,3895	0,460952	11,10579	11,9508	10,46436	1,486439
77	2	400	88	10	57,645	394	BUBBLYSLUG	CHURN	0,1334486	0,06468924	0,1483409	90,89754	91,14601	90,57971	0,566306	101,8027	101,9566	101,6355	0,321023	12,85034	13,37761	12,28301	1,094598
78	2	400	88	11	67,65	462	BUBBLYSLUG	CHURN	0,2138493	0,04892976	0,138164	90,20895	90,60131	89,78865	0,812669	101,8132	101,9657	101,7167	0,248998	15,35637	15,92031	14,88534	1,03497
79	2	400	88	12	80,8375	552	BUBBLYSLUG	ANNULAR	0,2299417	0,05807358	0,1146116	89,54008	90,01239	89,16929	0,843104	101,9109	102,0665	101,7694	0,297032	18,43005	18,9017	18,06692	0,83479
80	2	400	88	13	93,21	637	SLUG	ANNULAR	0,2802466	0,09221399	0,2488591	89,98706	90,52048	89,51725	1,003232	102,2787	102,4775	102,047	0,430533	21,31552	22,17698	20,56277	1,614212
81	2	600	88	1	15,52	106	LIQUID	BUBBLY	0,1022844	0,09949047	0,05248429	91,35586	91,51996	91,15705	0,362917	98,57905	98,7677	98,34935	0,418347	1,803439	1,975901	1,647947	0,327954
82	2	600	88	2	19,62	134	BUBBLY	SLUG	0,2363136	0,3950471	0,1881801	90,77919	91,19958	90,31119	0,888399	100,4665	101,6297	99,57839	2,05126	2,414433	3,061981	1,890718	1,171263
83	2	600	88	3	24	164	BUBBLY	SLUG	0,04395854	0,5147428	0,2558626	88,9381	89,05197	88,86604	0,185926	101,0554	101,8216	99,70624	2,115401	2,835378	3,969177	1,912014	2,057163
84	2	600	88	4	27,95	191	BUBBLY	SLUG	0,1565202	0,4782589	1,111258	91,45211	91,66876	90,78356	0,885206	101,4927	102,1768	100,2622	1,914604	5,13859	7,904619	3,398453	4,506166
85	2	600	88	5	32,43	221	BUBBLY	SLUG	0,3126407	0,4602529	1,040596	90,53456	91,06244	89,87511	1,187333	101,0127	102,0937	100,5435	1,550213	6,27446	7,883323	3,705111	4,178212
86	2	600	88	6	36,75	251	BUBBLY	SLUG	0,492679	0,0748816	0,3636568	89,75113	90,74021	89,03432	1,705896	100,807	101,0022	100,6239	0,378301	7,310799	8,466825	6,281888	2,184937
87	2	600	88	7	43,46	297	BUBBLY	CHURN	0,2896193	0,1057496	0,3596426	89,40614	89,99292	88,93697	1,055948	100,9636	101,2331	100,7101	0,522961	9,428026	10,55,		

120	3	200	88	8	42,4	325	PERIODIC	CHURN	0,3281135	0,07823809	0,2011688	90,72158	91,6895	90,15495	1,534548	100,945	101,174	100,6999	0,474141	9,820503	10,42649	8,75265	1,673841
121	3	200	88	9	47,6	365	PERIODIC	CHURN	0,4409048	0,05410567	0,1915338	93,24481	94,31508	91,82627	2,488815	100,0071	100,1425	99,85095	0,291531	11,91713	12,68383	11,17184	1,511993
122	3	200	88	10	54,6	419	SLUG	CHURN	0,1435488	0,04414317	0,1770784	90,41973	90,71635	90,10808	0,608273	100,2232	100,357	100,0722	0,284833	14,40941	15,15839	13,79973	1,358664
123	3	200	88	11	60,795	466	SLUG	CHURN	0,1240536	0,03848096	0,1986306	90,66158	91,05292	90,43751	0,615405	100,3063	100,4023	100,2065	0,195832	16,56917	17,27944	15,88244	1,396996
124	3	200	88	12	66,99	514	CHURN	ANNULAR	0,1085089	0,03760731	0,1866857	91,07774	91,54095	90,87928	0,661675	100,4052	100,5014	100,2817	0,219711	19,21745	20,05639	18,56996	1,486438
125	3	200	88	13	77,39	594	CHURN	ANNULAR	0,1584283	0,04451879	0,3770015	90,34615	90,60374	89,84827	0,755465	100,8019	100,8992	100,7016	0,197549	23,42758	24,49015	22,28392	2,206231
126	3	200	88	14	88,3575	678	CHURN	ANNULAR	0,1598566	0,04303666	0,4159089	90,92981	91,21379	90,3552	0,858597	100,8006	100,9005	100,6773	0,223266	27,53338	28,79188	26,41954	2,372337
127	3	200	88	15	95,195	731	CHURN	ANNULAR	0,213574	0,041352	0,4902645	90,5429	90,88317	89,52881	1,354355	101,1048	101,2322	101,0068	0,225393	31,33224	32,91045	29,72462	3,18583
128	3	200	88	16	103,5375	795	CHURN	ANNULAR	0,2136761	0,04963299	0,5006921	91,02532	91,38804	90,14888	1,23916	101,1501	101,2692	100,9889	0,280252	35,57616	36,9907	33,52803	3,462673
129	3	200	88	17	111,5775	856	CHURN	ANNULAR	0,2475166	0,05511805	0,5467343	91,14369	91,51265	90,4034	1,109251	101,2296	101,3607	101,0921	0,268611	39,64768	41,37761	37,50606	3,871549
130	3	200	88	18	120,595	926	CHURN	ANNULAR	0,2232076	0,03908988	0,6150647	90,68408	91,26111	90,19961	1,061498	102,0854	102,1639	102,0107	0,153264	43,3279	45,27045	41,43723	3,833216
131	3	200	88	19	130,665	1003	CHURN	ANNULAR	0,2904134	0,0619948	0,6636189	91,19375	91,82254	90,48134	1,3412	102,0676	102,1823	101,8993	0,283009	48,41479	50,47085	46,40338	4,067467
132	3	400	88	1	10,4	79	BUBBLY	SLUG	0,02370978	0,05402651	0,04086699	91,02064	91,07939	90,94125	0,138146	98,16901	98,30315	97,99628	0,306872	2,014001	2,121175	1,882663	0,238512
133	3	400	88	2	13,8	105	BUBBLY	SLUG	0,04798756	0,02957169	0,0522214	90,9853	91,09642	90,84483	0,251592	101,9276	102,0019	101,8383	0,163587	2,694609	2,832451	2,513016	0,319435
134	3	400	88	3	16,5	126	BUBBLY	SLUG	0,1558607	0,07023716	0,1737952	90,58815	90,89417	90,2882	0,605965	101,925	102,0995	101,6981	0,401394	3,354646	3,735388	2,866524	0,868864
135	3	400	88	4	20,35	156	BUBBLY	SLUG	0,1087745	0,4865432	1,328391	91,02001	91,20697	90,73165	0,475323	101,7807	102,5459	100,1596	2,386326	4,19135	9,165787	2,265986	6,899801
136	3	400	88	5	24	184	BUBBLY	SLUG	0,1842017	0,6078968	1,679406	90,68733	91,0953	90,29288	0,802421	101,6525	102,8415	99,72961	3,111886	5,074786	9,719474	1,835813	7,883661
137	3	400	88	6	28,4925	218	BUBBLY	SLUG	0,1344688	0,5054612	1,556834	90,5002	90,89874	90,24471	0,654034	101,0415	102,7996	100,3838	2,415751	6,745351	9,05079	1,529155	7,521635
138	3	400	88	7	33,9625	260	BUBBLYSLUG	SLUG	0,1169642	0,08898721	0,1919447	90,7453	90,9791	90,47704	0,502063	100,7672	100,9971	100,5768	0,420278	9,100878	9,664105	8,386365	1,27774
139	3	400	88	8	41,7375	320	SLUG	SLUG	0,08392058	0,09456294	0,1697906	90,55374	90,71437	90,39189	0,322478	101,0916	101,3361	100,8794	0,456731	12,34971	12,88827	11,74682	1,141448
140	3	400	88	9	48,3075	371	SLUG	CHURN	0,07645617	0,06511727	0,1049535	91,1806	91,33468	90,96854	0,366144	101,3083	101,4737	101,1413	0,332422	14,93259	15,29468	14,54507	0,749608
141	3	400	88	10	54,4425	418	SLUG	CHURN	0,08962825	0,06065695	0,1028184	91,1119	91,30098	90,92313	0,377848	101,2805	101,5022	101,0994	0,402734	17,13278	17,50091	16,66186	0,839049
142	3	400	88	11	58,9	452	SLUG	CHURN	0,1829695	0,05043029	0,1149162	90,72052	91,10106	90,40706	0,693996	101,2257	101,3744	101,0724	0,301929	19,02758	19,47289	18,5444	0,928491
143	3	400	88	12	66,4825	510	SLUG	ANNULAR	0,1521543	0,04975584	0,1409895	91,13976	91,37166	90,81565	0,556007	101,3897	101,5511	101,272	0,279048	21,7718	22,30096	21,23192	1,069042
144	3	400	88	13	74,365	571	SLUG	ANNULAR	0,1041621	0,06612435	0,1664789	91,07574	91,26356	90,85744	0,406124	101,6694	101,8194	101,4917	0,327761	25,35821	26,26621	24,71163	1,554584
145	3	400	88	14	86,625	665	CHURN	ANNULAR	0,03617155	0,0636677	0,1857674	89,67265	89,80964	89,60657	0,203076	101,9975	102,1454	101,853	0,292416	30,75749	31,67957	29,89073	1,788835
146	3	400	88	15	95,195	731	CHURN	ANNULAR	0,1410645	0,0576949	0,1974521	90,18006	90,42665	89,91872	0,507928	101,8416	102,0042	101,7136	0,290579	34,71072	35,81092	33,93691	1,874017
147	3	400	88	16	102,91	790	CHURN	ANNULAR	0,1652653	0,07246303	0,2771346	89,70264	90,11013	89,47859	0,631541	102,0175	102,194	101,8457	0,34831	38,47217	39,9508	37,40384	2,54696
148	3	400	88	17	114,84	882	CHURN	ANNULAR	0,1761363	0,08992232	0,4460359	90,57117	90,84949	90,07504	0,774447	102,2052	102,4168	101,9949	0,421935	45,09998	46,96558	43,69883	3,266751
149	3	400	88	18	120,595	926	CHURN	ANNULAR	0,05233705	0,1016654	0,5055314	90,89112	90,98459	90,65028	0,334309	102,7699	103,0567	102,557	0,499659	47,52183	49,52958	46,03709	3,492486
150																							

184	4	200	88	1	10,37	67	PERIODIC	BUBBLY	0,01795522	0,03587657	0,02979461	89,66797	89,70436	89,63247	0,071885	96,48506	96,5716	96,41239	0,159208	0,8599609	0,952599	0,760937	0,191662
185	4	200	88	2	13,825	89	PERIODIC	SLUG	0,3720826	1,850976	0,980819	90,09368	91,82911	89,80722	2,021887	101,6327	102,6586	94,41084	8,247781	1,025782	8,776632	-2,518598	11,29523
186	4	200	88	3	18,655	120	PERIODIC	SLUG	2,396449	0,5377646	0,9073645	92,01419	101,8436	89,62025	12,22335	102,3061	102,8694	100,6931	2,176285	1,942338	4,027695	-0,576432	4,604127
187	4	200	88	4	22,5	145	PERIODIC	SLUG	0,7360007	0,3830061	1,179026	91,12095	93,38138	89,89297	3,488408	102,2361	102,9245	101,1705	1,754035	3,773713	6,868539	0,999449	5,86909
188	4	200	88	5	28,305	183	PERIODIC	SLUG	0,9790542	0,4050279	1,255027	91,52652	94,5021	89,87753	4,624569	101,849	102,8219	100,6671	2,154774	5,224168	8,133503	2,111084	6,022419
189	4	200	88	6	33,855	219	PERIODIC	SLUG	0,7840413	0,1101682	0,3698433	90,25626	92,72104	88,87039	3,850656	101,2609	101,4674	100,8056	0,661825	7,70568	8,827742	6,693915	2,133827
190	4	200	88	7	40,87	264	PERIODIC	SLUG	0,7510622	0,2427878	0,6935907	89,96417	92,00158	88,29647	3,705109	101,2714	102,0143	100,2097	1,804596	9,679288	11,62599	6,561881	5,064113
191	4	200	88	8	47,52	307	PERIODIC	CHURN	0,8275215	0,1300433	0,5176016	90,2993	92,925	88,59749	4,327512	101,4981	101,7593	100,9507	0,808589	12,01604	14,29221	10,14382	4,148397
192	4	200	88	9	54,67	353	PERIODIC	CHURN	0,8004992	0,06759207	0,4058526	92,00227	93,58846	89,70825	3,880212	100,5855	100,7061	100,346	0,36011	15,89344	17,54193	14,7522	2,789733
193	4	200	88	10	61,91	400	PERIODIC	CHURN	0,9032996	0,05270571	0,4711305	90,06917	92,40188	87,78184	4,620041	101,0262	101,168	100,9077	0,260226	18,99705	20,51055	17,63989	2,870656
194	4	200	88	11	71,28	461	BUBBLYSLUG	CHURN	0,4519268	0,0487656	0,5897729	89,63418	90,93142	88,82256	2,108863	100,8871	101,0033	100,7631	0,240167	25,05823	26,68203	23,16399	3,518044
195	4	200	88	12	80,41	520	BUBBLYSLUG	ANNULAR	0,2126238	0,04069057	0,620315	89,82647	90,49287	89,25444	1,23843	101,0611	101,1747	100,9673	0,207416	30,15804	31,96335	28,35161	3,611744
196	4	200	88	13	89,1425	576	BUBBLYSLUG	ANNULAR	0,4781928	0,04925879	0,9872729	91,25304	92,5435	90,18904	2,354457	100,9693	101,0986	100,8836	0,214943	36,79661	39,36147	34,47624	4,885223
197	4	200	88	14	100,36	649	CHURN	ANNULAR	1,444951	0,04354219	1,811953	96,14451	103,3196	93,65461	9,664979	101,6013	101,6973	101,515	0,182267	45,74548	49,57912	42,32156	7,257555
198	4	200	88	15	110,635	716	CHURN	ANNULAR	1,093419	0,08593834	1,980484	96,03898	99,12394	93,35321	5,770732	101,8877	102,0058	101,622	0,383805	54,15079	58,63828	50,90796	7,730315
199	4	200	88	16	120,84	782	CHURN	ANNULAR	1,701643	0,04655267	2,321894	98,64901	103,2284	95,72905	7,499302	101,8255	101,9286	101,7088	0,219746	60,60691	65,37195	56,64927	8,722689
200	4	200	88	17	137,25	888	CHURN	ANNULAR	1,679982	0,05287157	2,539719	97,78958	102,9572	94,65518	8,301988	102,7102	102,8422	102,5862	0,255966	73,59107	79,08633	69,09443	9,991902
201	4	200	88	18	157,2	1017	CHURN	ANNULAR	1,852291	0,02908694	2,305897	97,0146	102,147	92,51896	9,62809	102,8139	102,901	102,7609	0,140041	86,50209	93,53753	80,99868	12,53885
202	4	400	88	1	18,63	120	BUBBLY	SLUG	0,04409605	0,08314429	0,01664686	90,74942	90,8136	90,6402	0,173404	97,07748	97,22902	96,84935	0,379661	1,890821	1,940718	1,78313	0,157588
203	4	400	88	2	23,69	153	BUBBLY	SLUG	0,1347733	0,3911862	0,7431762	89,34346	89,68561	89,14538	0,540234	102,3938	103,0612	101,3148	1,746366	6,511253	8,376273	4,760267	3,616006
204	4	400	88	3	29,6125	191	BUBBLY	SLUG	0,3044555	0,4464405	1,253389	90,65576	91,20821	89,87527	1,332944	101,1057	102,2605	99,8498	2,410723	9,215666	11,67284	5,73135	5,941494
205	4	400	88	4	32,9725	213	BUBBLYSLUG	SLUG	0,2646991	0,1631395	0,5460471	89,5797	90,10865	88,94634	1,162318	100,3203	100,9044	99,93077	0,973585	10,16326	11,89006	8,699968	3,190092
206	4	400	88	5	42,47	274	BUBBLYSLUG	SLUG	0,1998802	0,2045786	0,8494387	89,16771	89,57693	88,78602	0,790907	100,4061	101,0345	99,84143	1,19312	12,69143	15,33144	10,17789	5,153553
207	4	400	88	6	51,375	332	BUBBLYSLUG	SLUG	0,1409457	0,1126488	0,44224	90,04592	90,38134	89,72278	0,658562	99,5141	99,88125	99,23584	0,645407	20,32704	22,1205	19,05392	3,066576
208	4	400	88	7	59,57	385	BUBBLYSLUG	SLUG	0,1631967	0,1884616	0,7180399	90,05546	90,46361	89,68722	0,776395	98,60583	99,03076	98,11208	0,918683	24,56864	26,96739	22,66993	4,297464
209	4	400	88	8	70,4375	455	BUBBLYSLUG	SLUG	0,1592916	0,06454098	0,3386584	90,01798	90,38556	89,65788	0,72768	101,3705	101,5847	101,223	0,361699	29,81486	31,13708	28,59012	2,546961
210	4	400	88	9	78,2	506	BUBBLYSLUG	CHURN	0,08187033	0,0654693	0,5338819	91,03003	91,16117	90,71636	0,444813	101,2097	101,3221	101,0632	0,258903	35,181	36,52488	33,67979	2,845099
211	4	400	88	10	86,3675	559	BUBBLYSLUG	CHURN	0,06452161	0,06745965	0,6936095	89,72795	89,8709	89,51921	0,351691	101,3639	101,5147	101,2348	0,279852	40,0165	41,96805	38,10076	3,86729
212	4	400	88	11	97,8875	633	BUBBLYSLUG	ANNULAR	0,1125245	0,06486791	0,8227235	91,01475	91,22402	90,48037	0,743651	101,6085	101,7859	101,473	0,312873	47,42791	49,48967	43,74411	5,745564
213	4	400	88	12	108,54	702	BUBBLYSLUG	ANNULAR	0,2166493	0,06444996	1,098141	89,68033	90,23174	89,13597	1,095768	102,8437	103,0119	102,7005	0,311454	53,79919	56,76	50,86537	5,894632
214	4	400	88	13	119,7425	775	BUBBLYSLUG	ANNULAR	0,2553357	0,05385467	1,151116	90,19911	90,82719	89,18722	1,639961	103,1225	103						

247	4	800	88	13	120,7975	781	BUBBLYSLUG	CHURN	0,1228394	0,1032632	1,407732	90,94126	91,25447	90,60022	0,654247	101,6662	101,943	101,3186	0,624403	70,58437	74,71647	66,4197	8,296773
248	4	800	88	14	133,1525	861	BUBBLYSLUG	CHURN	0,162006	0,104217	1,633708	91,07999	91,52393	90,60001	0,923919	102,2752	102,5257	102,0279	0,497841	78,11718	82,23808	73,43874	8,799346
249	4	800	88	15	144,9525	938	BUBBLYSLUG	CHURN	0,2397935	0,08456024	1,337422	91,75434	92,28819	91,26745	1,020738	102,4162	102,6637	102,2393	0,424392	84,54564	88,95046	79,7252	9,225256
250	4	800	88	16	160,9875	1041	BUBBLYSLUG	CHURN	0,3458321	0,06721497	1,491434	90,18242	91,37212	89,43495	1,937167	102,1898	102,3206	102,0568	0,263852	94,86578	99,40233	89,54247	9,85986

Table 5 Statistical Value of Datas

Receiving the frequencies of the data with the FFT method

FFT (fast fourier transform) method was used to obtain the frequency values of the data. Frequency values of all data were obtained using a single script in Matlab environment.

Fast Fouierr Transform

A fast Fourier transform (FFT) is an algorithm that computes the discrete Fourier transform (DFT) of a sequence, or its inverse (IDFT). Fourier analysis converts a signal from its original domain (often time or space) to a representation in the frequency domain and vice versa. The DFT is obtained by decomposing a sequence of values into components of different frequencies.

FFT method was applied to 750 different data and frequency values were obtained. Again, FFT application and frequency values were obtained in Matlab environment with the help of a single script. All scripts have been added to appendix.

Some data and their FFT graph

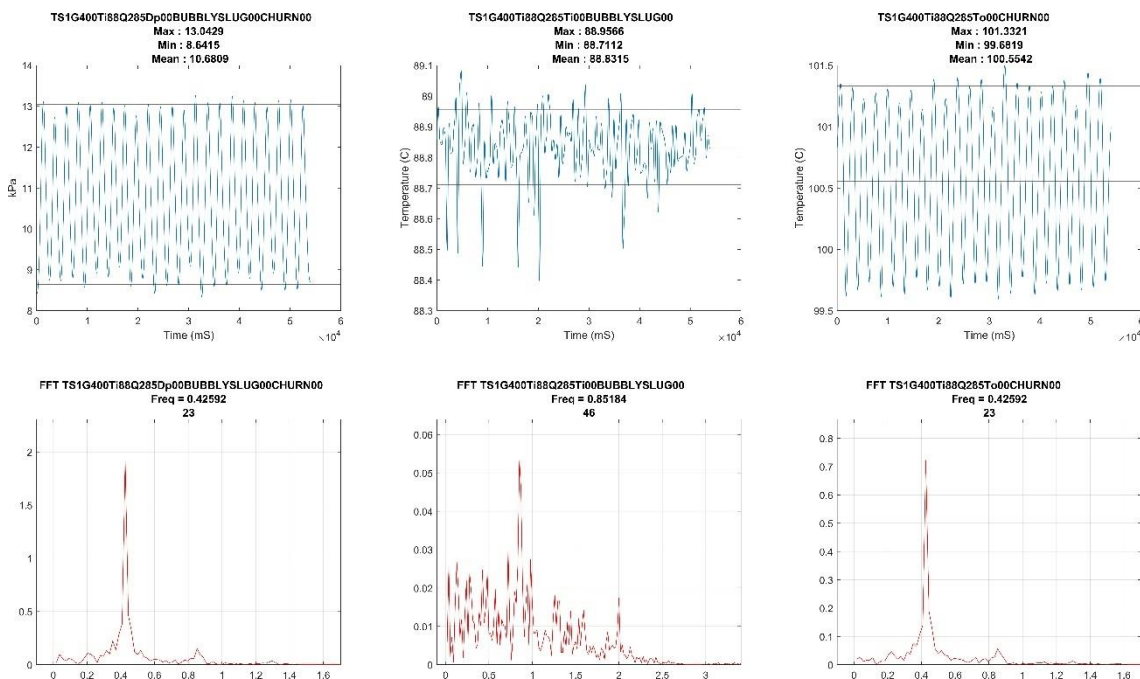


Figure 12 Fast Fouierr Transform graphs of TS1G400Q285

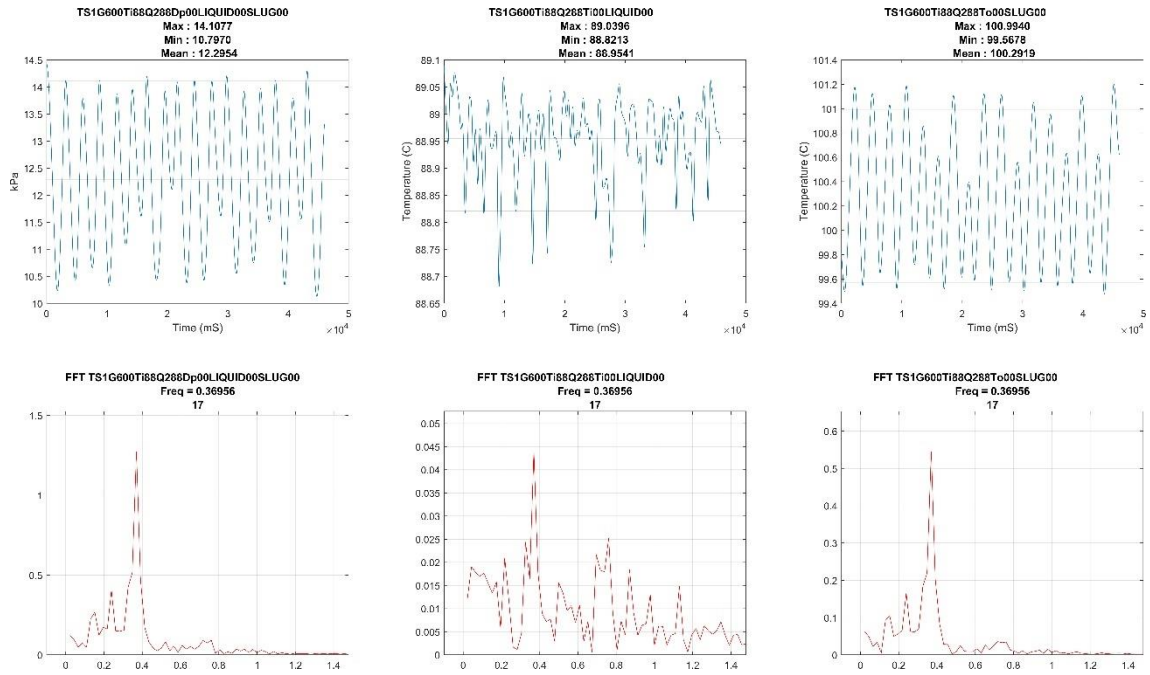


Figure 12 Fast Fourier Transform graphs of TS1G600Q288

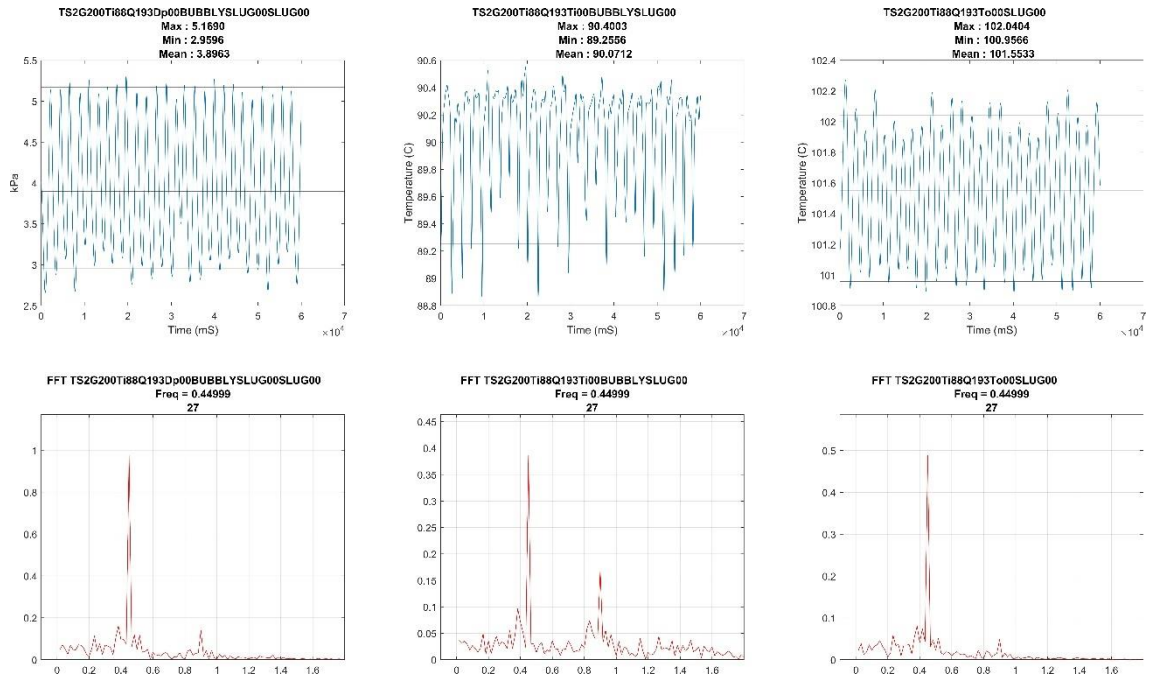


Figure 13 Fast Fourier Transform graphs of TS2G200Q193

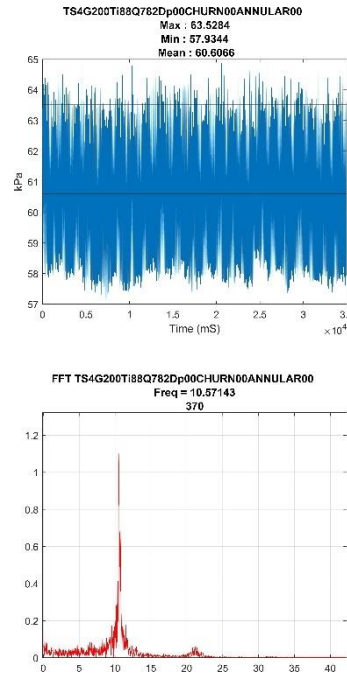


Figure 14 Fast Fourier Transform graphs of TS4G200Q782 for only Difference of Pressure

At the end of this stage, Frequency, Amplitude, Maximum value and Minimum values were obtained for each data set (for T_{inlet}, T_{outlet} and Dp). After this step, tables containing the frequency, minimum, maximum and average values of each data set were prepared.

Table for Outlet Temperature

DATA	REGIME	MAX (C)	MIN (C)	MEAN (C)	FREQUENCY (Hz)
TS1G200Ti88Q86To00PERIODIC00	PERIODIC	101.7936	100.3878	101.5185	0.153843
TS1G200Ti88Q94To00PERIODIC00	PERIODIC	101.9261	99.99988	101.4776	0.107382
TS1G200Ti88Q102To00PERIODIC00	PERIODIC	102.2782	101.2955	101.8471	0.7213
TS1G200Ti88Q118To00PERIODIC00	PERIODIC	102.8473	102.0176	102.4757	1.133314
TS1G200Ti88Q144To00BUBBLYSLUG00	BUBBLYSLUG	103.7259	103.5092	103.6501	0.581808
TS1G200Ti88Q174To00SLUG00	SLUG	104.0354	103.6776	103.8892	0.02
TS1G200Ti88Q247To00CHURN00	CHURN	104.6112	104.4206	104.5312	0.619988
TS1G200Ti88Q293To00CHURN00	CHURN	100.7605	99.49763	100.2152	0.538453
TS1G200Ti88Q346To00CHURN00	CHURN	100.2194	100.0219	100.1315	0.639987
TS1G200Ti88Q376To00CHURN00	CHURN	100.1216	99.96292	100.0433	0.444428
TS1G200Ti88Q423To00CHURN00	CHURN	100.3213	100.0384	100.1684	0.016666
TS1G400Ti88Q118To00BUBBLYSLUG00	BUBBLYSLUG	103.1696	101.9349	102.8579	0.119998
TS1G400Ti88Q137To00BUBBLYSLUG00	BUBBLYSLUG	103.4292	102.5736	103.0406	0.62
TS1G400Ti88Q182To00SLUG00	SLUG	104.6204	104.3383	104.5423	0.030519
TS1G400Ti88Q247To00CHURN00	CHURN	101.3735	99.8461	100.5145	0.233326
TS1G400Ti88Q285To00CHURN00	CHURN	101.3321	99.68186	100.5542	0.425918
TS1G400Ti88Q329To00CHURN00	CHURN	100.2021	99.96557	100.0883	0.366661
TS1G400Ti88Q370To00CHURN00	CHURN	100.1556	99.90509	100.0322	0.766654
TS1G400Ti88Q423To00ANNULAR00	ANNULAR	100.4539	100.2862	100.3651	0.714286
TS1G400Ti88Q472To00ANNULAR00	ANNULAR	100.5433	100.3691	100.4487	0.47999
TS1G400Ti88Q529To00ANNULAR00	ANNULAR	100.6054	100.4224	100.5092	0.179996
TS1G600Ti88Q118To00BUBBLY00	BUBBLY	101.4195	101.3982	101.4087	0.199992
TS1G600Ti88Q144To00BUBBLY00	BUBBLY	103.4704	103.2422	103.3647	0.729091
TS1G600Ti88Q179To00BUBBLYSLUG00	BUBBLYSLUG	104.111	103.3707	103.7135	0.55318
TS1G600Ti88Q203To00BUBBLYSLUG00	BUBBLYSLUG	105.0986	104.8697	105.0072	0.072726
TS1G600Ti88Q247To00SLUG00	SLUG	105.8514	105.6007	105.7351	0.179996
TS1G600Ti88Q288To00SLUG00	SLUG	100.994	99.5678	100.2919	0.369557
TS1G600Ti88Q337To00CHURN00	CHURN	99.94376	99.79867	99.86451	0.599985
TS1G600Ti88Q370To00CHURN00	CHURN	99.88538	99.65835	99.76552	0.824979
TS1G600Ti88Q429To00CHURN00	CHURN	100.1184	99.82979	99.95836	0.440663
TS1G600Ti88Q472To00CHURN00	CHURN	100.4865	100.0895	100.266	0.060604
TS1G600Ti88Q529To00ANNULAR00	ANNULAR	100.3537	100.2321	100.2886	0.681787
TS1G800Ti88Q144To00BUBBLY00	BUBBLY	101.4221	101.3942	101.4073	0.199987
TS1G800Ti88Q174To00BUBBLY00	BUBBLY	104.1772	104.1522	104.166	0.499986

TS1G800Ti88Q211To00BUBBLYSLUG00	BUBBLYSLUG	105.6241	105.5937	105.6066	0.081079
TS1G800Ti88Q247To00BUBBLYSLUG00	BUBBLYSLUG	106.4006	106.2967	106.353	0.075187
TS1G800Ti88Q291To00CHURN00	CHURN	107.556	107.3231	107.446	0.266658
TS1G800Ti88Q335To00CHURN00	CHURN	100.1349	99.99389	100.0577	0.479981
TS1G800Ti88Q387To00CHURN00	CHURN	100.3836	100.1564	100.2719	0.629606
TS1G800Ti88Q429To00CHURN00	CHURN	100.5686	100.3213	100.445	0.919963
TS1G800Ti88Q472To00CHURN00	CHURN	100.9124	100.6951	100.8047	0.749938
TS1G800Ti88Q526To00CHURN00	CHURN	100.9559	100.6701	100.8066	0.576901
TS1G800Ti88Q591To00ANNULAR00	ANNULAR	100.8749	100.6805	100.7738	0.428551
TS1G800Ti88Q649To00ANNULAR00	ANNULAR	100.9964	100.8437	100.9138	0.39998
TS2G200Ti88Q55To00SLUG00	SLUG	96.20335	96.07611	96.13562	0.099998
TS2G200Ti88Q75To00SLUG00	SLUG	99.74912	99.63783	99.69397	0.404752
TS2G200Ti88Q93To00SLUG00	SLUG	102.0555	98.27711	99.83263	0.758595
TS2G200Ti88Q113To00SLUG00	SLUG	102.8434	96.98633	100.0085	0.699965
TS2G200Ti88Q136To00SLUG00	SLUG	102.7794	101.8349	102.4356	0.056337
TS2G200Ti88Q165To00SLUG00	SLUG	102.5136	101.446	101.9642	0.12903
TS2G200Ti88Q193To00SLUG00	SLUG	102.0404	100.9566	101.5533	0.449993
TS2G200Ti88Q230To00CHURN00	CHURN	101.5013	101.1929	101.3628	0.890893
TS2G200Ti88Q261To00CHURN00	CHURN	101.7425	101.3742	101.5401	0.718042
TS2G200Ti88Q295To00CHURN00	CHURN	101.743	101.5225	101.6273	0.680837
TS2G200Ti88Q324To00CHURN00	CHURN	101.6995	101.5114	101.614	0.688177
TS2G200Ti88Q361To00CHURN00	CHURN	101.66	101.4472	101.5579	0.666653
TS2G200Ti88Q398To00CHURN00	CHURN	101.8436	101.6712	101.7598	0.562488
TS2G200Ti88Q446To00ANNULAR00	ANNULAR	101.7125	101.5644	101.6408	0.5111
TS2G200Ti88Q490To00ANNULAR00	ANNULAR	101.7811	101.6704	101.7252	0.538451
TS2G200Ti88Q552To00ANNULAR00	ANNULAR	101.8256	101.6242	101.7161	0.049999
TS2G200Ti88Q605To00ANNULAR00	ANNULAR	102.0356	101.8352	101.9193	0.018181
TS2G200Ti88Q660To00ANNULAR00	ANNULAR	102.3199	102.1491	102.2386	0.024999
TS2G200Ti88Q717To00ANNULAR00	ANNULAR	102.3155	102.1777	102.247	0.323441
TS2G200Ti88Q783To00ANNULAR00	ANNULAR	102.2524	102.1435	102.1943	0.666652
TS2G200Ti88Q856To00ANNULAR00	ANNULAR	102.6302	102.4207	102.5236	0.016129
TS2G200Ti88Q915To00ANNULAR00	ANNULAR	102.6907	102.5463	102.6059	0.377769
TS2G200Ti88Q1006To00ANNULAR00	ANNULAR	103.38	103.2018	103.2845	0.018181
TS2G400Ti88Q92To00SLUG00	SLUG	97.45086	97.31852	97.38054	0.02
TS2G400Ti88Q113To00SLUG00	SLUG	101.989	99.17754	100.4884	0.41666
TS2G400Ti88Q135To00SLUG00	SLUG	101.9024	97.61707	99.69129	0.599985
TS2G400Ti88Q164To00SLUG00	SLUG	102.2873	101.2462	101.9417	0.072463
TS2G400Ti88Q196To00SLUG00	SLUG	102.162	100.9812	101.6576	0.274506
TS2G400Ti88Q235To00SLUG00	SLUG	101.2659	101.0568	101.1498	0.279994
TS2G400Ti88Q282To00SLUG00	SLUG	101.338	101.1075	101.2157	0.649984
TS2G400Ti88Q327To00CHURN00	CHURN	101.7027	101.5201	101.5997	1.266646

TS2G400Ti88Q364To00CHURN00	CHURN	101.7943	101.475	101.6448	0.139997
TS2G400Ti88Q394To00CHURN00	CHURN	101.8685	101.7322	101.8028	0.839983
TS2G400Ti88Q462To00CHURN00	CHURN	101.9458	101.7254	101.8132	0.049999
TS2G400Ti88Q552To00ANNULAR00	ANNULAR	102.0324	101.7922	101.9109	0.022222
TS2G400Ti88Q637To00ANNULAR00	ANNULAR	102.4289	102.1382	102.2787	0.179996
TS2G600Ti88Q106To00BUBBLY00	BUBBLY	98.70025	98.48029	98.5791	0.033332
TS2G600Ti88Q134To00SLUG00	SLUG	101.1014	99.986	100.4663	0.085712
TS2G600Ti88Q164To00SLUG00	SLUG	101.7246	100.0134	101.0559	0.066664
TS2G600Ti88Q191To00SLUG00	SLUG	101.956	100.8312	101.4932	0.132529
TS2G600Ti88Q221To00SLUG00	SLUG	101.8876	100.6543	101.0128	0.039215
TS2G600Ti88Q251To00SLUG00	SLUG	100.8917	100.7167	100.807	0.671419
TS2G600Ti88Q297To00CHURN00	CHURN	101.0723	100.8275	100.9637	0.680257
TS2G600Ti88Q347To00CHURN00	CHURN	101.4573	101.163	101.3124	0.763622
TS2G600Ti88Q408To00CHURN00	CHURN	101.5813	101.322	101.4525	0.599989
TS2G600Ti88Q485To00ANNULAR00	ANNULAR	101.8292	101.6349	101.7324	0.473676
TS2G600Ti88Q535To00ANNULAR00	ANNULAR	101.909	101.6498	101.7659	0.249996
TS2G600Ti88Q646To00ANNULAR00	ANNULAR	102.0709	101.8429	101.9516	0.02008
TS2G600Ti88Q764To00ANNULAR00	ANNULAR	102.6564	102.4823	102.5747	0.324992
TS2G600Ti88Q848To00ANNULAR00	ANNULAR	103.0962	102.9679	103.0294	0.542842
TS2G600Ti88Q1015To00ANNULAR00	ANNULAR	103.9296	103.7149	103.8111	0.028571
TS2G800Ti88Q135To00BUBBLY00	BUBBLY	96.34402	96.25096	96.29568	0.166667
TS2G800Ti88Q190To00SLUG00	SLUG	99.86205	99.7307	99.78536	0.025
TS2G800Ti88Q221To00SLUG00	SLUG	99.1899	98.98115	99.09393	0.034482
TS2G800Ti88Q252To00SLUG00	SLUG	101.0356	100.8728	100.9516	0.384608
TS2G800Ti88Q297To00CHURN00	CHURN	101.1471	100.9265	101.0442	0.766654
TS2G800Ti88Q314To00CHURN00	CHURN	101.2502	100.9425	101.1025	0.399993
TS2G800Ti88Q354To00CHURN00	CHURN	101.3618	101.1217	101.2355	1.333302
TS2G800Ti88Q398To00CHURN00	CHURN	101.5159	101.2679	101.3883	1.047607
TS2G800Ti88Q437To00CHURN00	CHURN	101.6146	101.3769	101.4919	1.105234
TS2G800Ti88Q484To00CHURN00	CHURN	101.912	101.6882	101.7959	1.264127
TS2G800Ti88Q535To00CHURN00	CHURN	102.0137	101.7863	101.8884	0.239995
TS2G800Ti88Q592To00CHURN00	CHURN	102.228	101.9396	102.0773	0.242854
TS2G800Ti88Q646To00CHURN00	CHURN	102.5174	102.2157	102.3415	0.018181
TS2G800Ti88Q693To00ANNULAR00	ANNULAR	102.6481	102.4996	102.5751	0.833319
TS2G800Ti88Q764To00ANNULAR00	ANNULAR	102.8299	102.6848	102.752	0.614024
TS2G800Ti88Q824To00ANNULAR00	ANNULAR	103.2304	103.0165	103.1359	0.015873
TS2G800Ti88Q943To00ANNULAR00	ANNULAR	103.6971	103.5982	103.6516	0.683322
TS3G200Ti88Q61To00PERIODIC00	PERIODIC	96.5685	96.06129	96.27903	0.057142
TS3G200Ti88Q83To00PERIODIC00	PERIODIC	100.6793	94.80521	98.01581	0.59994
TS3G200Ti88Q107To00SLUG00	SLUG	101.8588	101.4148	101.7241	0.059701

TS3G200Ti88Q156To00SLUG00	SLUG	101.9556	100.7404	101.3902	0.089742
TS3G200Ti88Q189To00SLUG00	SLUG	101.4177	99.93174	100.7546	0.39285
TS3G200Ti88Q223To00SLUG00	SLUG	100.837	100.4902	100.6635	0.519221
TS3G200Ti88Q267To00CHURN00	CHURN	100.6436	100.4478	100.5471	0.709078
TS3G200Ti88Q325To00CHURN00	CHURN	101.0383	100.8701	100.945	0.571418
TS3G200Ti88Q365To00CHURN00	CHURN	100.0913	99.92064	100.0071	0.125745
TS3G200Ti88Q419To00CHURN00	CHURN	100.28	100.1707	100.2232	0.351845
TS3G200Ti88Q466To00CHURN00	CHURN	100.3656	100.2423	100.3063	0.187494
TS3G200Ti88Q514To00ANNULAR00	ANNULAR	100.4948	100.319	100.4052	0.036363
TS3G200Ti88Q594To00ANNULAR00	ANNULAR	100.8884	100.7211	100.8019	0.037036
TS3G200Ti88Q678To00ANNULAR00	ANNULAR	100.8896	100.7229	100.8006	0.021008
TS3G200Ti88Q731To00ANNULAR00	ANNULAR	101.1694	101.0475	101.1048	0.227747
TS3G200Ti88Q795To00ANNULAR00	ANNULAR	101.2595	101.0603	101.1501	0.03125
TS3G200Ti88Q856To00ANNULAR00	ANNULAR	101.3088	101.1442	101.2296	0.030302
TS3G200Ti88Q926To00ANNULAR00	ANNULAR	102.148	102.0262	102.0854	0.049998
TS3G200Ti88Q1003To00ANNULAR00	ANNULAR	102.1398	101.9787	102.0675	0.055552
TS3G400Ti88Q79To00SLUG00	SLUG	98.26067	98.05401	98.16901	0.033333
TS3G400Ti88Q105To00SLUG00	SLUG	101.9968	101.8562	101.9276	0.039999
TS3G400Ti88Q126To00SLUG00	SLUG	101.9869	101.8481	101.9251	0.12195
TS3G400Ti88Q156To00SLUG00	SLUG	102.1486	100.881	101.7804	0.112864
TS3G400Ti88Q184To00SLUG00	SLUG	102.2134	100.8063	101.6522	0.210758
TS3G400Ti88Q218To00SLUG00	SLUG	101.9326	100.7516	101.042	0.04665
TS3G400Ti88Q260To00SLUG00	SLUG	100.8779	100.6762	100.7672	0.639987
TS3G400Ti88Q320To00SLUG00	SLUG	101.2287	100.9854	101.0917	0.527763
TS3G400Ti88Q371To00CHURN00	CHURN	101.4608	101.1507	101.3082	0.039999
TS3G400Ti88Q418To00CHURN00	CHURN	101.4257	101.1385	101.2805	0.024999
TS3G400Ti88Q452To00CHURN00	CHURN	101.3489	101.1122	101.2256	0.032258
TS3G400Ti88Q510To00ANNULAR00	ANNULAR	101.4489	101.3365	101.3897	0.557135
TS3G400Ti88Q571To00ANNULAR00	ANNULAR	101.7453	101.5969	101.6694	0.218178
TS3G400Ti88Q665To00ANNULAR00	ANNULAR	102.076	101.9296	101.9975	0.374991
TS3G400Ti88Q731To00ANNULAR00	ANNULAR	101.9034	101.7742	101.8417	0.559989
TS3G400Ti88Q790To00ANNULAR00	ANNULAR	102.1198	101.9161	102.0175	0.413786
TS3G400Ti88Q882To00ANNULAR00	ANNULAR	102.3753	102.0258	102.2052	0.015384
TS3G400Ti88Q926To00ANNULAR00	ANNULAR	102.8795	102.6732	102.7699	0.799987
TS3G600Ti88Q110To00SLUG00	SLUG	99.20685	99.00621	99.11479	0.014286
TS3G600Ti88Q131To00SLUG00	SLUG	102.0271	100.0682	101.0721	0.515136
TS3G600Ti88Q164To00SLUG00	SLUG	102.3451	101.5061	102.1878	0.045402
TS3G600Ti88Q200To00CHURN00	CHURN	102.3485	101.1694	101.8406	0.137562
TS3G600Ti88Q247To00CHURN00	CHURN	102.0787	101.0506	101.1688	0.016667
TS3G600Ti88Q282To00CHURN00	CHURN	101.1704	100.9709	101.0673	0.679986
TS3G600Ti88Q327To00CHURN00	CHURN	101.3025	101.0869	101.1967	0.811245

TS3G600Ti88Q365To00ANNULAR00	ANNULAR	101.5834	101.3114	101.4299	0.327267
TS3G600Ti88Q412To00ANNULAR00	ANNULAR	101.5481	101.3928	101.4723	0.545445
TS3G600Ti88Q457To00ANNULAR00	ANNULAR	101.5434	101.3798	101.4626	0.499988
TS3G600Ti88Q510To00ANNULAR00	ANNULAR	101.5507	101.4251	101.4807	0.424989
TS3G600Ti88Q592To00ANNULAR00	ANNULAR	101.9642	101.7599	101.8658	0.049999
TS3G600Ti88Q665To00ANNULAR00	ANNULAR	101.9836	101.7753	101.8856	0.045452
TS3G600Ti88Q747To00ANNULAR00	ANNULAR	102.4555	102.2159	102.3278	0.024999
TS3G600Ti88Q801To00ANNULAR00	ANNULAR	102.4753	102.2874	102.3794	0.244439
TS3G600Ti88Q880To00ANNULAR00	ANNULAR	102.6643	102.4425	102.5611	0.056818
TS3G800Ti88Q127To00SLUG00	SLUG	99.23347	99.11444	99.17366	0.45
TS3G800Ti88Q155To00SLUG00	SLUG	101.5977	100.6928	101.1692	0.719971
TS3G800Ti88Q184To00SLUG00	SLUG	102.2125	101.5949	101.9989	0.150943
TS3G800Ti88Q216To00SLUG00	SLUG	102.33	101.2036	102.054	0.094593
TS3G800Ti88Q269To00SLUG00	SLUG	101.3743	101.0832	101.2451	0.024999
TS3G800Ti88Q327To00SLUG00	SLUG	101.5586	101.1411	101.336	0.092591
TS3G800Ti88Q375To00SLUG00	SLUG	101.7812	101.5314	101.6574	0.774981
TS3G800Ti88Q429To00SLUG00	SLUG	102.0127	101.799	101.8966	0.456512
TS3G800Ti88Q504To00CHURN00	CHURN	102.211	101.9401	102.043	0.024999
TS3G800Ti88Q580To00CHURN00	CHURN	102.1552	101.8813	102.0091	0.119998
TS3G800Ti88Q655To00CHURN00	CHURN	102.4518	102.3379	102.3924	0.744169
TS3G800Ti88Q715To00ANNULAR00	ANNULAR	102.5149	102.3435	102.4296	0.304335
TS3G800Ti88Q787To00ANNULAR00	ANNULAR	102.6659	102.5259	102.5965	0.771407
TS3G800Ti88Q848To00ANNULAR00	ANNULAR	103.071	102.8067	102.9243	0.039999
TS3G800Ti88Q938To00ANNULAR00	ANNULAR	103.1888	102.8532	102.9985	0.02
TS3G800Ti88Q1001To00ANNULAR00	ANNULAR	103.3013	102.9185	103.0872	0.02
TS3G800Ti88Q1089To00ANNULAR00	ANNULAR	104.0433	103.8877	103.9522	0.874978
TS3G800Ti88Q1148To00ANNULAR00	ANNULAR	104.3142	103.9148	104.0981	0.066667
TS4G200Ti88Q67To00BUBBLY00	BUBBLY	96.54337	96.4344	96.48509	0.076917
TS4G200Ti88Q89To00SLUG00	SLUG	102.6015	98.04515	101.6334	0.079998
TS4G200Ti88Q120To00SLUG00	SLUG	102.7174	101.5256	102.3059	0.536836
TS4G200Ti88Q145To00SLUG00	SLUG	102.7762	101.5118	102.2362	0.057142
TS4G200Ti88Q183To00SLUG00	SLUG	102.5004	101.325	101.8491	0.157893
TS4G200Ti88Q219To00SLUG00	SLUG	101.3692	101.1365	101.2609	0.749987
TS4G200Ti88Q264To00SLUG00	SLUG	101.4758	101.0422	101.2716	0.699988
TS4G200Ti88Q307To00CHURN00	CHURN	101.6181	101.3823	101.4981	0.699983
TS4G200Ti88Q353To00CHURN00	CHURN	100.6612	100.499	100.5855	0.368411
TS4G200Ti88Q400To00CHURN00	CHURN	101.1493	100.9194	101.0262	0.030769
TS4G200Ti88Q461To00CHURN00	CHURN	100.9431	100.833	100.8871	0.466659
TS4G200Ti88Q520To00ANNULAR00	ANNULAR	101.1351	100.9828	101.0611	0.02
TS4G200Ti88Q576To00ANNULAR00	ANNULAR	101.0289	100.9204	100.9693	0.03846
TS4G200Ti88Q649To00ANNULAR00	ANNULAR	101.666	101.5403	101.6013	0.291667

TS4G200Ti88Q716To00ANNULAR00	ANNULAR	101.9477	101.8099	101.8881	0.0625
TS4G200Ti88Q782To00ANNULAR00	ANNULAR	101.8753	101.7784	101.8255	0.771429
TS4G200Ti88Q888To00ANNULAR00	ANNULAR	102.7728	102.6513	102.7102	0.131579
TS4G200Ti88Q1017To00ANNULAR00	ANNULAR	102.8686	102.772	102.8139	0.199993
TS4G400Ti88Q120To00SLUG00	SLUG	97.12	97.01745	97.07752	0.059999
TS4G400Ti88Q153To00SLUG00	SLUG	102.7982	101.9451	102.3938	0.09756
TS4G400Ti88Q191To00SLUG00	SLUG	101.9063	100.7479	101.1057	0.090908
TS4G400Ti88Q213To00SLUG00	SLUG	100.5036	100.1319	100.3204	0.595224
TS4G400Ti88Q274To00SLUG00	SLUG	100.5916	100.2175	100.4061	1.114254
TS4G400Ti88Q332To00SLUG00	SLUG	99.64458	99.40694	99.51402	0.49999
TS4G400Ti88Q385To00SLUG00	SLUG	98.79183	98.4272	98.60588	0.094338
TS4G400Ti88Q455To00SLUG00	SLUG	101.5151	101.2702	101.3705	0.049999
TS4G400Ti88Q506To00CHURN00	CHURN	101.3099	101.079	101.2097	0.045452
TS4G400Ti88Q559To00CHURN00	CHURN	101.4718	101.2586	101.364	0.028571
TS4G400Ti88Q633To00ANNULAR00	ANNULAR	101.7589	101.4933	101.6085	0.0125
TS4G400Ti88Q702To00ANNULAR00	ANNULAR	102.9181	102.7743	102.8438	0.512183
TS4G400Ti88Q775To00ANNULAR00	ANNULAR	103.2005	103.033	103.1225	0.215682
TS4G400Ti88Q862To00ANNULAR00	ANNULAR	103.3088	103.1608	103.2294	0.114282
TS4G400Ti88Q953To00ANNULAR00	ANNULAR	103.5802	103.4951	103.542	1.260111
TS4G600Ti88Q91To00BUBBLY00	BUBBLY	96.81855	96.70347	96.76537	0.02
TS4G600Ti88Q113To00BUBBLYSLUG00	BUBBLYSLUG	100.2658	100.0857	100.167	0.017857
TS4G600Ti88Q147To00SLUG00	SLUG	102.5601	102.4598	102.5116	0.033332
TS4G600Ti88Q183To00SLUG00	SLUG	102.6223	101.4283	102.1188	0.241932
TS4G600Ti88Q220To00SLUG00	SLUG	101.4304	101.1101	101.2867	0.466659
TS4G600Ti88Q256To00SLUG00	SLUG	101.3283	100.9976	101.1734	0.618176
TS4G600Ti88Q307To00SLUG00	SLUG	100.8156	100.4653	100.6604	0.928558
TS4G600Ti88Q344To00SLUG00	SLUG	100.7269	100.3646	100.5592	0.660702
TS4G600Ti88Q400To00SLUG00	SLUG	100.4682	100.2314	100.3462	0.283329
TS4G600Ti88Q464To00SLUG00	SLUG	100.7519	100.4694	100.6331	0.142855
TS4G600Ti88Q511To00SLUG00	SLUG	100.727	100.2995	100.5348	0.122446
TS4G600Ti88Q574To00CHURN00	CHURN	100.5545	100.2427	100.4036	0.015151
TS4G600Ti88Q636To00CHURN00	CHURN	101.3147	100.9613	101.1403	0.026666
TS4G600Ti88Q702To00CHURN00	CHURN	101.4473	101.0932	101.2658	0.018181
TS4G600Ti88Q775To00CHURN00	CHURN	101.2424	100.9511	101.1066	0.014493
TS4G600Ti88Q869To00ANNULAR00	ANNULAR	101.903	101.7723	101.8363	0.657133
TS4G600Ti88Q957To00ANNULAR00	ANNULAR	102.0919	101.8954	101.9908	0.081966
TS4G600Ti88Q1034To00ANNULAR00	ANNULAR	102.1939	102.0154	102.0895	0.099998
TS4G800Ti88Q116To00SLUG00	SLUG	98.74243	98.62981	98.68905	0.0375
TS4G800Ti88Q148To00SLUG00	SLUG	102.1773	101.908	102.0775	0.022727
TS4G800Ti88Q181To00SLUG00	SLUG	102.1679	101.0585	101.7257	0.136362

TS4G800Ti88Q217To00SLUG00	SLUG	101.6901	100.6732	101.1255	0.12857
TS4G800Ti88Q258To00SLUG00	SLUG	100.5408	100.3283	100.4452	0.707681
TS4G800Ti88Q302To00SLUG00	SLUG	100.6619	100.3793	100.532	0.968735
TS4G800Ti88Q353To00SLUG00	SLUG	100.8612	100.3181	100.6371	0.014286
TS4G800Ti88Q418To00SLUG00	SLUG	100.7716	100.3991	100.5972	0.299996
TS4G800Ti88Q469To00SLUG00	SLUG	100.8353	100.5603	100.702	0.47999
TS4G800Ti88Q534To00SLUG00	SLUG	101.1336	100.69	100.9334	0.016949
TS4G800Ti88Q626To00SLUG00	SLUG	101.6954	101.1804	101.4739	0.011111
TS4G800Ti88Q719To00CHURN00	CHURN	101.7546	101.2787	101.5368	0.015384
TS4G800Ti88Q781To00CHURN00	CHURN	101.8499	101.4342	101.6662	0.027777
TS4G800Ti88Q861To00CHURN00	CHURN	102.3647	102.1664	102.2752	0.891868
TS4G800Ti88Q938To00CHURN00	CHURN	102.605	102.2515	102.4162	0.062498
TS4G800Ti88Q1041To00CHURN00	CHURN	102.27	102.1207	102.1899	0.129028

Table 6 Min, Max, Mean and Frequency Values of Outlet Temperature Datas

Table for Inlet Temperature

DATA	REGIME	MAX	MIN	MEAN	FREQ
TS1G200Ti88Q86Ti00PERIODIC00	PERIODIC	88.36687	87.45484	87.73765	0.153843
TS1G200Ti88Q94Ti00PERIODIC00	PERIODIC	90.19627	87.52081	88.06245	0.214764
TS1G200Ti88Q102Ti00PERIODIC00	PERIODIC	94.08517	89.42529	91.45737	0.7213
TS1G200Ti88Q118Ti00PERIODIC00	PERIODIC	98.52625	88.49868	93.66058	1.133314
TS1G200Ti88Q144Ti00PERIODIC00	PERIODIC	91.46683	86.73186	88.32385	0.745441
TS1G200Ti88Q174Ti00PERIODIC00	PERIODIC	94.78964	86.79489	89.20789	0.219996
TS1G200Ti88Q247Ti00PERIODIC00	PERIODIC	90.78752	88.29955	89.42427	0.619988
TS1G200Ti88Q293Ti00BUBBLYSLUG00	BUBBLYSLUG	93.93744	89.16466	90.95639	0.538453
TS1G200Ti88Q346Ti00SLUG00	SLUG	97.06509	90.87251	92.87285	0.099998
TS1G200Ti88Q376Ti00SLUG00	SLUG	95.68108	89.51792	91.57725	0.037036
TS1G200Ti88Q423Ti00SLUG00	SLUG	94.13373	89.40405	91.16682	0.466659
TS1G400Ti88Q118Ti00PERIODIC00	PERIODIC	88.81896	86.77179	88.40753	0.179996
TS1G400Ti88Q137Ti00PERIODIC00	PERIODIC	88.42375	87.54599	88.07105	0.62
TS1G400Ti88Q182Ti00BUBBLY00	BUBBLY	88.96654	88.71386	88.8385	0.762963
TS1G400Ti88Q247Ti00BUBBLYSLUG00	BUBBLYSLUG	89.27584	88.98592	89.1694	0.533316
TS1G400Ti88Q285Ti00BUBBLYSLUG00	BUBBLYSLUG	88.95661	88.71118	88.83151	0.851836
TS1G400Ti88Q329Ti00BUBBLYSLUG00	BUBBLYSLUG	89.39166	89.24374	89.31139	0.866652
TS1G400Ti88Q370Ti00BUBBLYSLUG00	BUBBLYSLUG	88.74434	88.51465	88.64038	0.449993
TS1G400Ti88Q423Ti00BUBBLYSLUG00	BUBBLYSLUG	89.07857	88.71739	88.89425	0.428571
TS1G400Ti88Q472Ti00BUBBLYSLUG00	BUBBLYSLUG	89.55436	88.71016	89.08126	0.079998
TS1G400Ti88Q529Ti00SLUG00	SLUG	90.0546	89.04198	89.3678	0.079998
TS1G600Ti88Q118Ti00LIQUID00	LIQUID	88.92143	88.87905	88.8999	0.199992
TS1G600Ti88Q144Ti00LIQUID00	LIQUID	88.78327	88.68131	88.7409	0.208312
TS1G600Ti88Q179Ti00LIQUID00	LIQUID	89.42905	88.74436	89.12487	0.063828
TS1G600Ti88Q203Ti00LIQUID00	LIQUID	89.28321	89.08017	89.20941	0.072726
TS1G600Ti88Q247Ti00LIQUID00	LIQUID	89.42717	89.21518	89.34111	0.179996
TS1G600Ti88Q288Ti00LIQUID00	LIQUID	89.03956	88.8213	88.95414	0.369557
TS1G600Ti88Q337Ti00BUBBLY00	BUBBLY	89.45369	89.36818	89.41474	0.199995
TS1G600Ti88Q370Ti00BUBBLY00	BUBBLY	89.45464	89.34355	89.41476	0.149996
TS1G600Ti88Q429Ti00BUBBLY00	BUBBLY	89.49966	89.41376	89.46015	0.881326
TS1G600Ti88Q472Ti00BUBBLY00	BUBBLY	89.08912	88.91538	89.01377	0.212115
TS1G600Ti88Q529Ti00BUBBLY00	BUBBLY	89.47159	89.29689	89.38505	0.272715
TS1G800Ti88Q144Ti00LIQUID00	LIQUID	88.69678	88.65658	88.67469	0.133324
TS1G800Ti88Q174Ti00LIQUID00	LIQUID	88.50875	88.46538	88.4861	0.27777
TS1G800Ti88Q211Ti00LIQUID00	LIQUID	88.54316	88.4695	88.50029	0.027026

TS1G800Ti88Q247Ti00LIQUID00	LIQUID	88.55699	88.4473	88.49621	0.018797
TS1G800Ti88Q291Ti00LIQUID00	LIQUID	88.91966	88.82892	88.88229	0.199993
TS1G800Ti88Q335Ti00BUBBLY00	BUBBLY	88.6435	88.56963	88.6076	0.439982
TS1G800Ti88Q387Ti00BUBBLY00	BUBBLY	88.43783	88.37689	88.40769	0.703678
TS1G800Ti88Q429Ti00BUBBLY00	BUBBLY	88.45074	88.39891	88.42654	0.639974
TS1G800Ti88Q472Ti00BUBBLY00	BUBBLY	88.61332	88.57998	88.5982	0.749938
TS1G800Ti88Q526Ti00BUBBLY00	BUBBLY	88.49646	88.41038	88.45989	0.23076
TS1G800Ti88Q591Ti00BUBBLYSLUG00	BUBBLYSLUG	88.78048	88.66475	88.73231	0.523785
TS1G800Ti88Q649Ti00BUBBLYSLUG00	BUBBLYSLUG	88.66601	88.60729	88.63546	0.499975
TS2G200Ti88Q55Ti00LIQUID00	LIQUID	91.19599	91.1321	91.16107	0.024999
TS2G200Ti88Q75Ti00LIQUID00	LIQUID	91.0827	91.00404	91.04706	0.023809
TS2G200Ti88Q93Ti00LIQUID00	LIQUID	90.06761	89.23592	89.65025	0.758595
TS2G200Ti88Q113Ti00BUBBLY00	BUBBLY	90.38156	89.43461	89.95818	0.699965
TS2G200Ti88Q136Ti00BUBBLY00	BUBBLY	90.96091	89.98359	90.7042	0.056337
TS2G200Ti88Q165Ti00BUBBLY00	BUBBLY	90.04814	88.85582	89.79454	0.032258
TS2G200Ti88Q193Ti00BUBBLYSLUG00	BUBBLYSLUG	90.40029	89.25563	90.07124	0.449993
TS2G200Ti88Q230Ti00BUBBLYSLUG00	BUBBLYSLUG	90.41896	90.18096	90.31722	0.4909
TS2G200Ti88Q261Ti00BUBBLYSLUG00	BUBBLYSLUG	91.21676	89.80816	90.80213	0.063357
TS2G200Ti88Q295Ti00BUBBLYSLUG00	BUBBLYSLUG	91.14041	90.66599	90.92915	0.297866
TS2G200Ti88Q324Ti00BUBBLYSLUG00	BUBBLYSLUG	90.92974	90.22488	90.61003	0.105873
TS2G200Ti88Q361Ti00BUBBLYSLUG00	BUBBLYSLUG	90.9654	90.67947	90.83799	0.666653
TS2G200Ti88Q398Ti00BUBBLYSLUG00	BUBBLYSLUG	90.47601	90.15811	90.34112	0.374992
TS2G200Ti88Q446Ti00SLUG00	SLUG	90.24262	89.78732	90.06827	0.022222
TS2G200Ti88Q490Ti00SLUG00	SLUG	90.82499	90.57445	90.72378	0.384608
TS2G200Ti88Q552Ti00SLUG00	SLUG	91.29803	91.13111	91.21639	0.349991
TS2G200Ti88Q605Ti00SLUG00	SLUG	90.40588	90.11491	90.26994	0.036363
TS2G200Ti88Q660Ti00SLUG00	SLUG	89.78162	89.60375	89.70013	0.224994
TS2G200Ti88Q717Ti00SLUG00	SLUG	89.42664	89.18487	89.31517	0.026953
TS2G200Ti88Q783Ti00SLUG00	SLUG	90.055	89.87909	89.96631	0.377769
TS2G200Ti88Q856Ti00SLUG00	SLUG	89.34006	89.14354	89.24655	0.016129
TS2G200Ti88Q915Ti00SLUG00	SLUG	89.89767	89.6933	89.80066	0.311104
TS2G200Ti88Q1006Ti00SLUG00	SLUG	90.21204	90.02026	90.12544	0.272722
TS2G400Ti88Q92Ti00LIQUID00	LIQUID	89.51641	89.45542	89.48242	0.02
TS2G400Ti88Q113Ti00BUBBLY00	BUBBLY	91.45486	90.85282	91.25912	0.016666
TS2G400Ti88Q135Ti00BUBBLY00	BUBBLY	89.30541	88.62059	89.03752	0.599985
TS2G400Ti88Q164Ti00BUBBLY00	BUBBLY	91.22107	90.6182	91.07537	0.014493
TS2G400Ti88Q196Ti00BUBBLY00	BUBBLY	91.16974	90.54574	91.01783	0.274506
TS2G400Ti88Q235Ti00BUBBLYSLUG00	BUBBLYSLUG	91.30951	91.06822	91.21177	0.02
TS2G400Ti88Q282Ti00BUBBLYSLUG00	BUBBLYSLUG	89.47809	89.2956	89.40805	0.024999
TS2G400Ti88Q327Ti00BUBBLYSLUG00	BUBBLYSLUG	90.80464	90.57943	90.70647	0.016666
TS2G400Ti88Q364Ti00BUBBLYSLUG00	BUBBLYSLUG	89.11608	88.85112	88.98891	0.02

TS2G400Ti88Q394Ti00BUBBLYSLUG00	BUBBLYSLUG	90.99525	90.7623	90.89755	0.02
TS2G400Ti88Q462Ti00BUBBLYSLUG00	BUBBLYSLUG	90.25402	90.15706	90.20892	0.699983
TS2G400Ti88Q552Ti00BUBBLYSLUG00	BUBBLYSLUG	89.61463	89.47029	89.54008	0.022222
TS2G400Ti88Q637Ti00SLUG00	SLUG	90.09776	89.86635	89.98706	0.02
TS2G600Ti88Q106Ti00LIQUID00	LIQUID	91.38185	91.32636	91.35587	0.033332
TS2G600Ti88Q134Ti00BUBBLY00	BUBBLY	90.82392	90.72635	90.77921	0.028571
TS2G600Ti88Q164Ti00BUBBLY00	BUBBLY	88.97939	88.90512	88.93809	0.033332
TS2G600Ti88Q191Ti00BUBBLY00	BUBBLY	91.56047	91.34916	91.45341	0.012048
TS2G600Ti88Q221Ti00BUBBLY00	BUBBLY	90.61546	90.39826	90.53463	0.07843
TS2G600Ti88Q251Ti00BUBBLY00	BUBBLY	89.83077	89.69449	89.75106	0.014286
TS2G600Ti88Q297Ti00BUBBLY00	BUBBLY	89.4791	89.32198	89.40607	0.022675
TS2G600Ti88Q347Ti00BUBBLY00	BUBBLY	89.835	89.66057	89.77287	0.018181
TS2G600Ti88Q408Ti00BUBBLY00	BUBBLY	91.02436	90.90394	90.9652	0.018181
TS2G600Ti88Q485Ti00BUBBLY00	BUBBLY	91.90142	91.78849	91.84768	0.017544
TS2G600Ti88Q535Ti00BUBBLY00	BUBBLY	90.74759	90.53856	90.65577	0.033333
TS2G600Ti88Q646Ti00SLUG00	SLUG	92.00346	91.87773	91.9493	0.02008
TS2G600Ti88Q764Ti00SLUG00	SLUG	89.8696	89.73277	89.80871	0.024999
TS2G600Ti88Q848Ti00SLUG00	SLUG	92.06457	91.90366	91.98394	0.028571
TS2G600Ti88Q1015Ti00SLUG00	SLUG	90.74905	90.65495	90.70576	0.314277
TS2G800Ti88Q135Ti00LIQUID00	LIQUID	89.76131	89.70648	89.73385	0.277778
TS2G800Ti88Q190Ti00BUBBLY00	BUBBLY	90.32693	90.18667	90.2594	0.075
TS2G800Ti88Q221Ti00BUBBLY00	BUBBLY	87.59514	87.50524	87.54201	0.034482
TS2G800Ti88Q252Ti00BUBBLY00	BUBBLY	93.39954	93.18472	93.30124	0.01923
TS2G800Ti88Q297Ti00BUBBLY00	BUBBLY	93.58085	93.27143	93.43603	0.016666
TS2G800Ti88Q314Ti00BUBBLY00	BUBBLY	93.54601	93.21975	93.39098	0.016666
TS2G800Ti88Q354Ti00BUBBLY00	BUBBLY	93.62047	93.34481	93.50922	0.023809
TS2G800Ti88Q398Ti00BUBBLY00	BUBBLY	91.75562	91.57115	91.696	0.011905
TS2G800Ti88Q437Ti00BUBBLY00	BUBBLY	88.11547	88.02169	88.06345	0.026315
TS2G800Ti88Q484Ti00BUBBLY00	BUBBLY	87.51146	87.26813	87.38202	0.018868
TS2G800Ti88Q535Ti00BUBBLY00	BUBBLY	93.44077	93.21065	93.32966	0.02
TS2G800Ti88Q592Ti00BUBBLY00	BUBBLY	87.75911	87.37744	87.5603	0.014286
TS2G800Ti88Q646Ti00BUBBLY00	BUBBLY	91.86284	91.77274	91.82249	0.018181
TS2G800Ti88Q693Ti00BUBBLY00	BUBBLY	87.60163	87.28579	87.43636	0.016666
TS2G800Ti88Q764Ti00SLUG00	SLUG	89.52247	89.45249	89.48352	0.017544
TS2G800Ti88Q824Ti00SLUG00	SLUG	93.90718	93.53979	93.73101	0.015873
TS2G800Ti88Q943Ti00SLUG00	SLUG	93.9634	93.62452	93.80383	0.016666
TS3G200Ti88Q61Ti00PERIODIC00	PERIODIC	90.31074	90.2642	90.28578	0.014286
TS3G200Ti88Q83Ti00PERIODIC00	PERIODIC	91.49692	89.37211	90.18865	0.69993
TS3G200Ti88Q107Ti00PERIODIC00	PERIODIC	90.59177	89.57258	89.70809	0.059701
TS3G200Ti88Q156Ti00PERIODIC00	PERIODIC	92.70319	89.81669	90.63106	0.102563

TS3G200Ti88Q189Ti00PERIODIC00	PERIODIC	91.55069	89.53018	90.48575	0.410707
TS3G200Ti88Q223Ti00PERIODIC00	PERIODIC	92.78317	91.09991	92.10149	0.057691
TS3G200Ti88Q267Ti00PERIODIC00	PERIODIC	92.34553	90.47198	91.52902	0.054544
TS3G200Ti88Q325Ti00PERIODIC00	PERIODIC	91.04113	90.44827	90.72176	0.410707
TS3G200Ti88Q365Ti00PERIODIC00	PERIODIC	94.07558	92.37774	93.24475	0.015718
TS3G200Ti88Q419Ti00SLUG00	SLUG	90.65549	90.28292	90.41974	0.018518
TS3G200Ti88Q466Ti00SLUG00	SLUG	90.94253	90.55315	90.66149	0.124996
TS3G200Ti88Q514Ti00CHURN00	CHURN	91.38484	90.92702	91.0777	0.036363
TS3G200Ti88Q594Ti00CHURN00	CHURN	90.50857	89.99801	90.34609	0.111109
TS3G200Ti88Q678Ti00CHURN00	CHURN	91.08188	90.68062	90.92986	0.294111
TS3G200Ti88Q731Ti00CHURN00	CHURN	90.7345	90.21264	90.54281	0.385417
TS3G200Ti88Q795Ti00CHURN00	CHURN	91.18605	90.78526	91.02536	0.359369
TS3G200Ti88Q856Ti00CHURN00	CHURN	91.3489	90.85753	91.144	0.484834
TS3G200Ti88Q926Ti00CHURN00	CHURN	90.9128	90.428	90.68403	0.499975
TS3G200Ti88Q1003Ti00CHURN00	CHURN	91.51354	90.85835	91.19376	0.499972
TS3G400Ti88Q79Ti00BUBBLY00	BUBBLY	91.03963	90.99924	91.02069	0.016666
TS3G400Ti88Q105Ti00BUBBLY00	BUBBLY	91.06369	90.90941	90.98529	0.02
TS3G400Ti88Q126Ti00BUBBLY00	BUBBLY	90.63399	90.53941	90.58815	0.19512
TS3G400Ti88Q156Ti00BUBBLY00	BUBBLY	91.11717	90.88502	91.02	0.112864
TS3G400Ti88Q184Ti00BUBBLY00	BUBBLY	90.7423	90.63164	90.68728	0.987233
TS3G400Ti88Q218Ti00BUBBLY00	BUBBLY	90.62347	90.40606	90.49898	0.007775
TS3G400Ti88Q260Ti00BUBBLYSLUG00	BUBBLYSLUG	90.79563	90.6985	90.7453	0.239995
TS3G400Ti88Q320Ti00SLUG00	SLUG	90.5915	90.52063	90.55373	0.861087
TS3G400Ti88Q371Ti00SLUG00	SLUG	91.25007	91.1106	91.1806	0.039999
TS3G400Ti88Q418Ti00SLUG00	SLUG	91.1709	91.06268	91.1119	0.149996
TS3G400Ti88Q452Ti00SLUG00	SLUG	90.79763	90.65609	90.72053	0.016129
TS3G400Ti88Q510Ti00SLUG00	SLUG	91.19861	91.09114	91.13976	0.014286
TS3G400Ti88Q571Ti00SLUG00	SLUG	91.15256	91.01616	91.07573	0.018181
TS3G400Ti88Q665Ti00CHURN00	CHURN	89.72351	89.62937	89.67266	0.024999
TS3G400Ti88Q731Ti00CHURN00	CHURN	90.22975	90.13253	90.18006	0.02
TS3G400Ti88Q790Ti00CHURN00	CHURN	89.74617	89.65965	89.70239	0.017241
TS3G400Ti88Q882Ti00CHURN00	CHURN	90.63204	90.413	90.57114	0.015384
TS3G400Ti88Q926Ti00CHURN00	CHURN	90.94168	90.82308	90.89116	0.016666
TS3G600Ti88Q110Ti00LIQUID00	LIQUID	90.50822	90.44393	90.4789	0.014286
TS3G600Ti88Q131Ti00LIQUID00	LIQUID	90.02534	89.91642	89.97237	0.272719
TS3G600Ti88Q164Ti00BUBBLY00	BUBBLY	90.67338	90.49287	90.59539	0.011351
TS3G600Ti88Q200Ti00BUBBLY00	BUBBLY	90.37737	90.13601	90.25716	0.050023
TS3G600Ti88Q247Ti00BUBBLY00	BUBBLY	90.46586	90.06192	90.28901	0.003333
TS3G600Ti88Q282Ti00BUBBLY00	BUBBLY	90.32775	90.21017	90.26577	0.02
TS3G600Ti88Q327Ti00BUBBLY00	BUBBLY	89.96633	89.86081	89.91824	0.016556
TS3G600Ti88Q365Ti00BUBBLY00	BUBBLY	90.05597	89.94202	89.99828	0.018181

TS3G600Ti88Q412Ti00BUBBLY00	BUBBLY	90.02973	89.97603	90.00183	0.690897
TS3G600Ti88Q457Ti00BUBBLY00	BUBBLY	90.42308	90.30214	90.36362	0.024999
TS3G600Ti88Q510Ti00BUBBLY00	BUBBLY	90.44041	90.35483	90.39788	0.024999
TS3G600Ti88Q592Ti00BUBBLY00	BUBBLY	89.93452	89.83851	89.88535	0.024999
TS3G600Ti88Q665Ti00BUBBLY00	BUBBLY	91.11797	91.07023	91.08985	0.90905
TS3G600Ti88Q747Ti00BUBBLY00	BUBBLY	90.18084	90.12794	90.15845	0.549986
TS3G600Ti88Q801Ti00BUBBLY00	BUBBLY	90.13692	90.08996	90.11225	0.866647
TS3G600Ti88Q880Ti00BUBBLY00	BUBBLY	90.09124	90.05224	90.07336	1.079545
TS3G800Ti88Q127Ti00LIQUID00	LIQUID	89.25593	89.18098	89.21646	0.05
TS3G800Ti88Q155Ti00LIQUID00	LIQUID	88.11555	87.89917	88.00396	0.079997
TS3G800Ti88Q184Ti00LIQUID00	LIQUID	89.05113	88.7695	88.88609	0.037736
TS3G800Ti88Q216Ti00LIQUID00	LIQUID	88.65396	88.34453	88.49868	0.013513
TS3G800Ti88Q269Ti00LIQUID00	LIQUID	91.38485	91.14993	91.31632	0.049999
TS3G800Ti88Q327Ti00LIQUID00	LIQUID	89.51297	89.36143	89.43463	0.018518
TS3G800Ti88Q375Ti00LIQUID00	LIQUID	88.37698	88.3638	88.36665	0.024999
TS3G800Ti88Q429Ti00LIQUID00	LIQUID	88.54973	88.38433	88.47137	0.021739
TS3G800Ti88Q504Ti00BUBBLY00	BUBBLY	89.3475	89.28476	89.31014	0.024999
TS3G800Ti88Q580Ti00BUBBLY00	BUBBLY	89.44858	89.36068	89.39926	0.02
TS3G800Ti88Q655Ti00BUBBLY00	BUBBLY	89.49659	89.40076	89.44975	0.023255
TS3G800Ti88Q715Ti00BUBBLY00	BUBBLY	91.78891	91.26145	91.6518	0.043476
TS3G800Ti88Q787Ti00BUBBLYSLUG00	BUBBLYSLUG	89.29988	89.23506	89.26968	0.028571
TS3G800Ti88Q848Ti00BUBBLYSLUG00	BUBBLYSLUG	92.1543	92.08038	92.11891	0.02
TS3G800Ti88Q938Ti00BUBBLYSLUG00	BUBBLYSLUG	89.90086	89.77638	89.83753	0.02
TS3G800Ti88Q1001Ti00SLUG00	SLUG	90.05226	89.88818	89.96073	0.02
TS3G800Ti88Q1089Ti00SLUG00	SLUG	91.92175	91.83394	91.87936	0.024999
TS3G800Ti88Q1148Ti00SLUG00	SLUG	91.93604	91.75711	91.84183	0.016667
TS4G200Ti88Q67Ti00PERIODIC00	PERIODIC	89.69372	89.64415	89.66795	0.461503
TS4G200Ti88Q89Ti00PERIODIC00	PERIODIC	90.87653	89.89162	90.09357	0.079998
TS4G200Ti88Q120Ti00PERIODIC00	PERIODIC	95.94627	90.09472	92.01354	0.536836
TS4G200Ti88Q145Ti00PERIODIC00	PERIODIC	92.32021	90.44922	91.1212	0.157141
TS4G200Ti88Q183Ti00PERIODIC00	PERIODIC	92.82333	90.53421	91.52675	0.199998
TS4G200Ti88Q219Ti00PERIODIC00	PERIODIC	91.35252	89.21739	90.25634	0.124998
TS4G200Ti88Q264Ti00PERIODIC00	PERIODIC	90.87846	89.03565	89.96449	0.299995
TS4G200Ti88Q307Ti00PERIODIC00	PERIODIC	91.77033	89.02056	90.29947	0.024999
TS4G200Ti88Q353Ti00PERIODIC00	PERIODIC	92.99112	90.48646	92.00204	0.078945
TS4G200Ti88Q400Ti00PERIODIC00	PERIODIC	91.32905	88.74395	90.06948	0.123075
TS4G200Ti88Q461Ti00BUBBLYSLUG00	BUBBLYSLUG	90.37456	89.11192	89.63431	0.066666
TS4G200Ti88Q520Ti00BUBBLYSLUG00	BUBBLYSLUG	90.26145	89.45108	89.82646	0.079998
TS4G200Ti88Q576Ti00BUBBLYSLUG00	BUBBLYSLUG	92.19715	90.36531	91.25293	0.11538
TS4G200Ti88Q649Ti00CHURN00	CHURN	97.57785	94.93263	96.14477	0.833333
TS4G200Ti88Q716Ti00CHURN00	CHURN	97.9424	93.8496	96.03898	0.25

TS4G200Ti88Q782Ti00CHURN00	CHURN	100.5794	96.9382	98.64892	0.742857
TS4G200Ti88Q888Ti00CHURN00	CHURN	101.1446	95.67051	97.78942	0.078947
TS4G200Ti88Q1017Ti00CHURN00	CHURN	99.72557	95.18887	97.01287	0.533316
TS4G400Ti88Q120Ti00BUBBLY00	BUBBLY	90.76912	90.73017	90.74959	0.02
TS4G400Ti88Q153Ti00BUBBLY00	BUBBLY	89.41984	89.2841	89.34311	0.012195
TS4G400Ti88Q191Ti00BUBBLY00	BUBBLY	90.87208	90.30791	90.65582	0.009091
TS4G400Ti88Q213Ti00BUBBLYSLUG00	BUBBLYSLUG	89.76069	89.3518	89.5795	0.928549
TS4G400Ti88Q274Ti00BUBBLYSLUG00	BUBBLYSLUG	89.35237	88.98741	89.16783	1.199966
TS4G400Ti88Q332Ti00BUBBLYSLUG00	BUBBLYSLUG	90.31007	89.82416	90.04596	0.104164
TS4G400Ti88Q385Ti00BUBBLYSLUG00	BUBBLYSLUG	90.26277	89.84462	90.05545	0.037735
TS4G400Ti88Q455Ti00BUBBLYSLUG00	BUBBLYSLUG	90.181	89.8828	90.01803	0.299993
TS4G400Ti88Q506Ti00BUBBLYSLUG00	BUBBLYSLUG	91.15335	90.81826	91.03002	0.045452
TS4G400Ti88Q559Ti00BUBBLYSLUG00	BUBBLYSLUG	89.82436	89.57086	89.72797	0.028571
TS4G400Ti88Q633Ti00BUBBLYSLUG00	BUBBLYSLUG	91.13148	90.78543	91.01474	0.0125
TS4G400Ti88Q702Ti00BUBBLYSLUG00	BUBBLYSLUG	89.89992	89.3205	89.68042	0.097559
TS4G400Ti88Q775Ti00BUBBLYSLUG00	BUBBLYSLUG	90.53517	89.69756	90.19909	0.137252
TS4G400Ti88Q862Ti00CHURN00	CHURN	94.52463	92.26754	92.90632	0.114282
TS4G400Ti88Q953Ti00CHURN00	CHURN	95.14018	93.24055	94.23888	0.609731
TS4G600Ti88Q91Ti00LIQUID00	LIQUID	88.34753	88.19751	88.26974	0.02
TS4G600Ti88Q113Ti00BUBBLY00	BUBBLY	89.44268	89.26984	89.34107	0.017857
TS4G600Ti88Q147Ti00BUBBLY00	BUBBLY	91.41316	91.32553	91.37049	0.033332
TS4G600Ti88Q183Ti00BUBBLY00	BUBBLY	92.18826	91.45949	91.83666	0.016129
TS4G600Ti88Q220Ti00BUBBLY00	BUBBLY	92.23069	91.60615	91.91524	0.016666
TS4G600Ti88Q256Ti00BUBBLYSLUG00	BUBBLYSLUG	91.59735	91.12979	91.37257	0.009091
TS4G600Ti88Q307Ti00BUBBLYSLUG00	BUBBLYSLUG	90.02727	89.47272	89.72687	0.014286
TS4G600Ti88Q344Ti00BUBBLYSLUG00	BUBBLYSLUG	88.94442	88.50502	88.7056	0.017857
TS4G600Ti88Q400Ti00BUBBLYSLUG00	BUBBLYSLUG	92.16006	91.85663	92.02282	0.016666
TS4G600Ti88Q464Ti00BUBBLYSLUG00	BUBBLYSLUG	91.84789	91.56479	91.72407	0.014286
TS4G600Ti88Q511Ti00BUBBLYSLUG00	BUBBLYSLUG	89.28473	88.98442	89.13241	0.020408
TS4G600Ti88Q574Ti00BUBBLYSLUG00	BUBBLYSLUG	91.90845	91.70403	91.8072	0.015151
TS4G600Ti88Q636Ti00BUBBLYSLUG00	BUBBLYSLUG	91.78516	91.27608	91.58263	0.013333
TS4G600Ti88Q702Ti00BUBBLYSLUG00	BUBBLYSLUG	89.73866	89.43998	89.60868	0.654534
TS4G600Ti88Q775Ti00BUBBLYSLUG00	BUBBLYSLUG	91.48119	90.82899	91.20979	0.014493
TS4G600Ti88Q869Ti00BUBBLYSLUG00	BUBBLYSLUG	89.92813	88.90399	89.615	0.028571
TS4G600Ti88Q957Ti00BUBBLYSLUG00	BUBBLYSLUG	91.46023	90.06791	91.0072	0.016393
TS4G600Ti88Q1034Ti00SLUG00	SLUG	89.60156	88.54908	88.95284	0.016666
TS4G800Ti88Q116Ti00LIQUID00	LIQUID	89.91963	89.85081	89.88387	0.0125
TS4G800Ti88Q148Ti00BUBBLY00	BUBBLY	90.14927	90.00268	90.08308	0.113634
TS4G800Ti88Q181Ti00BUBBLY00	BUBBLY	91.02636	90.41707	90.83342	0.015151
TS4G800Ti88Q217Ti00BUBBLY00	BUBBLY	90.16543	89.70793	89.92627	0.057142

TS4G800Ti88Q258Ti00BUBBLY00	BUBBLY	91.26217	90.95176	91.11061	0.015384
TS4G800Ti88Q302Ti00BUBBLY00	BUBBLY	90.28138	90.0549	90.17605	0.046874
TS4G800Ti88Q353Ti00BUBBLY00	BUBBLY	90.77263	90.49933	90.6538	0.014286
TS4G800Ti88Q418Ti00BUBBLY00	BUBBLY	91.02453	90.81104	90.91379	0.0125
TS4G800Ti88Q469Ti00BUBBLYSLUG00	BUBBLYSLUG	90.31178	90.05565	90.18564	0.099998
TS4G800Ti88Q534Ti00BUBBLYSLUG00	BUBBLYSLUG	90.75961	90.49275	90.62992	0.016949
TS4G800Ti88Q626Ti00BUBBLYSLUG00	BUBBLYSLUG	90.88198	90.40222	90.68906	0.011111
TS4G800Ti88Q719Ti00BUBBLYSLUG00	BUBBLYSLUG	90.32786	89.95959	90.15889	0.24615
TS4G800Ti88Q781Ti00BUBBLYSLUG00	BUBBLYSLUG	91.05305	90.78575	90.94119	0.388878
TS4G800Ti88Q861Ti00BUBBLYSLUG00	BUBBLYSLUG	91.2915	90.86184	91.07979	0.324316
TS4G800Ti88Q938Ti00BUBBLYSLUG00	BUBBLYSLUG	92.1315	91.4534	91.75435	0.156245
TS4G800Ti88Q1041Ti00BUBBLYSLUG00	BUBBLYSLUG	90.57017	89.79535	90.18228	0.580626

Table 7 Min, Max, Mean and Frequency Values of Outlet Temperature Datas

Table for Dp

DATA	Regime Inlet	Regime Outlet	MAX	MIN	MEAN	FREQ
TS1G200Ti88Q86Dp00 PERIODIC00PERIODIC0 0	PERIODIC	PERIODIC	3.589415	0.222878515	0.5097393	0.153843
TS1G200Ti88Q94Dp00 PERIODIC00PERIODIC0 0	PERIODIC	PERIODIC	4.295738	-0.46300327	0.786891	0.013423
TS1G200Ti88Q102Dp0 0PERIODIC00PERIODIC 00	PERIODIC	PERIODIC	4.095597	-0.56276229	1.3422512	2.147506
TS1G200Ti88Q118Dp0 0PERIODIC00PERIODIC 00	PERIODIC	PERIODIC	4.77524	-0.57503338	1.5925447	1.716638
TS1G200Ti88Q144Dp0 0PERIODIC00BUBBLYSL UG00	PERIODIC	BUBBLYS LUG	3.064844	1.256961427	2.1584988	0.454537
TS1G200Ti88Q174Dp0 0PERIODIC00SLUG00	PERIODIC	SLUG	4.732673	1.261466949	3.2862517	0.079998
TS1G200Ti88Q247Dp0 0PERIODIC00CHURN00	PERIODIC	CHURN	7.357539	4.610050245	5.7244932	0.619988
TS1G200Ti88Q293Dp0 0BUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	9.353199	6.094433922	7.5769968	0.646144
TS1G200Ti88Q346Dp0 0SLUG00CHURN00	SLUG	CHURN	10.95828	10.30594494	10.602642	0.579988
TS1G200Ti88Q376Dp0 0SLUG00CHURN00	SLUG	CHURN	10.99848	10.33682378	10.68809	0.444428
TS1G200Ti88Q423Dp0 0SLUG00CHURN00	SLUG	CHURN	13.54925	12.55943022	13.040349	0.033333
TS1G400Ti88Q118Dp0 0PERIODIC00BUBBLYSL UG00	PERIODIC	BUBBLYS LUG	2.049843	1.097067947	1.4953251	2.559949
TS1G400Ti88Q137Dp0 0PERIODIC00BUBBLYSL UG00	PERIODIC	BUBBLYS LUG	6.523806	-0.08271894	3.0313834	2.24
TS1G400Ti88Q182Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	6.510612	3.651564036	4.7990225	0.030519
TS1G400Ti88Q247Dp0 0BUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	10.22649	6.734603223	8.8435903	0.233326
TS1G400Ti88Q285Dp0 0BUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	13.04285	8.641523997	10.680885	0.425918

TS1G400Ti88Q329Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	13.58869	12.88948484	13.229717	0.199997
TS1G400Ti88Q370Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	15.72319	15.07351176	15.383764	0.766654
TS1G400Ti88Q423Dp0 OBUBBLYSLUG00ANNULAR00	BUBBLYSLUG	ANNULAR	17.10539	16.52214055	16.851191	0.714286
TS1G400Ti88Q472Dp0 OBUBBLYSLUG00ANNULAR00	BUBBLYSLUG	ANNULAR	20.6384	20.03752869	20.361812	0.399992
TS1G400Ti88Q529Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	24.69854	23.89514642	24.32299	0.02
TS1G600Ti88Q118Dp0 OLIQUEID00BUBBLY00	LIQUID	BUBBLY	2.292444	2.206603889	2.2504567	49.998
TS1G600Ti88Q144Dp0 OLIQUEID00BUBBLY00	LIQUID	BUBBLY	3.520175	2.212168972	2.8254745	2.083116
TS1G600Ti88Q179Dp0 OLIQUEID00BUBBLYSLUG00	LIQUID	BUBBLYSLUG	11.03778	-1.20448176	4.7723005	2.255271
TS1G600Ti88Q203Dp0 OLIQUEID00BUBBLYSLUG00	LIQUID	BUBBLYSLUG	8.524069	6.264525311	7.237192	0.072726
TS1G600Ti88Q247Dp0 OLIQUEID00SLUG00	LIQUID	SLUG	11.65984	7.966489425	9.8208422	0.179996
TS1G600Ti88Q288Dp0 OLIQUEID00SLUG00	LIQUID	SLUG	14.10766	10.79701538	12.295415	0.369557
TS1G600Ti88Q337Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	16.6872	16.177499	16.449683	0.724982
TS1G600Ti88Q370Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	18.34102	17.65426858	18.030136	0.824979
TS1G600Ti88Q429Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	22.44198	21.7520118	22.124398	1.050812
TS1G600Ti88Q472Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	25.36356	24.52795032	24.959743	0.545438
TS1G600Ti88Q529Dp0 OBUBBLY00ANNULAR00	BUBBLY	ANNULAR	28.92452	28.11666896	28.483852	0.863597
TS1G800Ti88Q144Dp0 OLIQUEID00BUBBLY00	LIQUID	BUBBLY	3.164113	3.092585752	3.1282049	50.06333
TS1G800Ti88Q174Dp0 OLIQUEID00BUBBLY00	LIQUID	BUBBLY	3.51585	3.435724649	3.4758118	49.97083
TS1G800Ti88Q211Dp0 OLIQUEID00BUBBLYSLUG00	LIQUID	BUBBLYSLUG	5.921054	5.684256009	5.8052431	0.135131

TS1G800Ti88Q247Dp0 OLIQUEID00BUBBLYSLUG00	LIQUID	BUBBLYSLUG	8.782385	7.701104214	8.2117899	0.075187
TS1G800Ti88Q291Dp0 OLIQUEID00CHURN00	LIQUID	CHURN	14.14455	10.71464428	12.337911	0.266658
TS1G800Ti88Q335Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	16.86932	16.24605161	16.519185	0.439982
TS1G800Ti88Q387Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	19.80854	19.31245584	19.540549	1.074034
TS1G800Ti88Q429Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	22.64286	21.96093596	22.294281	0.75997
TS1G800Ti88Q472Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	25.9536	25.26416489	25.641223	0.749938
TS1G800Ti88Q526Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	29.35296	28.65108993	29.049764	0.615361
TS1G800Ti88Q591Dp0 OBUBBLYSLUG00ANNULAR00	BUBBLYSLUG	ANNULAR	34.55892	33.97016661	34.290731	0.428551
TS1G800Ti88Q649Dp0 OBUBBLYSLUG00ANNULAR00	BUBBLYSLUG	ANNULAR	39.24457	38.86065782	39.049878	0.849958
TS2G200Ti88Q55Dp00L IQUID00SLUG00	LIQUID	SLUG	0.898307	0.817244689	0.8578117	49.99875
TS2G200Ti88Q75Dp00L IQUID00SLUG00	LIQUID	SLUG	0.810193	0.729958424	0.7702163	49.95119
TS2G200Ti88Q93Dp00L IQUID00SLUG00	LIQUID	SLUG	3.08429	0.152397784	1.438032	2.103376
TS2G200Ti88Q113Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	5.021274	-1.4839709	1.6789723	2.149893
TS2G200Ti88Q136Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	2.750402	1.559180578	2.071813	0.056337
TS2G200Ti88Q165Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	3.579343	1.924418906	2.8145704	0.12903
TS2G200Ti88Q193Dp0 OBUBBLYSLUG00SLUG00	BUBBLYSLUG	SLUG	5.169035	2.959641066	3.8963128	0.449993
TS2G200Ti88Q230Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	5.527993	4.799452484	5.1520093	0.890893
TS2G200Ti88Q261Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	5.840913	4.925322899	5.4028733	0.718042
TS2G200Ti88Q295Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	6.729459	6.253793641	6.482234	0.680837

TS2G200Ti88Q324Dp0 0BUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	7.454366	7.050405049	7.2531981	0.688177
TS2G200Ti88Q361Dp0 0BUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	8.758965	8.333746797	8.5339241	0.666653
TS2G200Ti88Q398Dp0 0BUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	9.922812	9.321868765	9.6177109	0.583321
TS2G200Ti88Q446Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	11.86145	11.15792457	11.473761	0.222217
TS2G200Ti88Q490Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	13.35494	12.62513216	12.981862	0.211534
TS2G200Ti88Q552Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	15.5656	14.82590865	15.200644	0.024999
TS2G200Ti88Q605Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	17.52045	16.62358159	17.026979	0.018181
TS2G200Ti88Q660Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	19.17185	18.55492104	18.882443	0.599985
TS2G200Ti88Q717Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	21.60772	20.93905865	21.295302	0.323441
TS2G200Ti88Q783Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	24.60097	23.93909403	24.248583	0.111109
TS2G200Ti88Q856Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	27.52	26.74286792	27.142328	0.064515
TS2G200Ti88Q915Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	30.01351	29.52934693	29.770046	0.266661
TS2G200Ti88Q1006Dp0 00SLUG00ANNULAR00	SLUG	ANNULAR	33.85928	33.20808279	33.544934	0.072726
TS2G400Ti88Q92Dp00L IQUID00SLUG00	LIQUID	SLUG	1.545516	1.467719789	1.5065721	50.079
TS2G400Ti88Q113Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	2.883055	1.033971944	1.7805212	2.149964
TS2G400Ti88Q135Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	3.960168	0.663391806	2.0386864	2.249944
TS2G400Ti88Q164Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	4.785162	2.788542128	3.4598916	0.072463
TS2G400Ti88Q196Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	6.405592	3.933725984	4.9965605	0.274506
TS2G400Ti88Q235Dp0 0BUBBLYSLUG00SLUG00	BUBBLYSLUG	SLUG	6.90513	6.32694078	6.6041927	0.679986
TS2G400Ti88Q282Dp0 0BUBBLYSLUG00SLUG00	BUBBLYSLUG	SLUG	8.3548	7.678890545	8.0013171	0.649984

TS2G400Ti88Q327Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	10.24844	9.687414762	9.9743977	1.266646
TS2G400Ti88Q364Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	11.32712	10.8617266	11.105797	0.959981
TS2G400Ti88Q394Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	13.02955	12.66720121	12.850349	0.579988
TS2G400Ti88Q462Dp0 OBUBBLYSLUG00CHURN00	BUBBLYSLUG	CHURN	15.57917	15.14906923	15.356362	0.174996
TS2G400Ti88Q552Dp0 OBUBBLYSLUG00ANNULAR00	BUBBLYSLUG	ANNULAR	18.69011	18.20450261	18.430048	0.022222
TS2G400Ti88Q637Dp0 OSLUG00ANNULAR00	SLUG	ANNULAR	21.94349	20.71189013	21.315538	0.059999
TS2G600Ti88Q106Dp0 OLIQUID00BUBBLY00	LIQUID	BUBBLY	1.84189	1.76482562	1.803439	50.065
TS2G600Ti88Q134Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	2.607421	2.247884226	2.4138096	3.514185
TS2G600Ti88Q164Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	3.116733	2.550912177	2.8349097	2.866571
TS2G600Ti88Q191Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	6.690606	4.034516654	5.1371176	0.132529
TS2G600Ti88Q221Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	7.074283	4.262426961	6.2731085	0.039215
TS2G600Ti88Q251Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	7.605758	7.007566353	7.3108901	0.471422
TS2G600Ti88Q297Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	9.831934	9.094933418	9.4281931	0.680257
TS2G600Ti88Q347Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	12.51882	11.59556271	12.05539	0.763622
TS2G600Ti88Q408Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	16.23361	15.28312584	15.75171	0.599989
TS2G600Ti88Q485Dp0 OBUBBLY00ANNULAR00	BUBBLY	ANNULAR	20.42081	19.35252456	19.901524	0.017544
TS2G600Ti88Q535Dp0 OBUBBLY00ANNULAR00	BUBBLY	ANNULAR	21.02574	19.80111625	20.471391	0.016666
TS2G600Ti88Q646Dp0 OSLUG00ANNULAR00	SLUG	ANNULAR	25.80064	24.97526347	25.384479	0.281119
TS2G600Ti88Q764Dp0 OSLUG00ANNULAR00	SLUG	ANNULAR	31.19719	30.0348572	30.581716	0.024999

TS2G600Ti88Q848Dp0 0SLUG00ANNULAR00	SLUG	ANNULA R	37.45746	36.55934646	37.029264	0.085712
TS2G600Ti88Q1015Dp 00SLUG00ANNULAR00	SLUG	ANNULA R	45.51725	44.85234966	45.202837	0.514271
TS2G800Ti88Q135Dp0 0LIQUID00BUBBLY00	LIQUID	BUBBLY	3.848577	3.772199985	3.8102906	50
TS2G800Ti88Q190Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	4.280589	4.200519607	4.2410149	49.95
TS2G800Ti88Q221Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	4.347601	4.041750583	4.1145385	0.034482
TS2G800Ti88Q252Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	11.4293	11.07302335	11.254502	0.01923
TS2G800Ti88Q297Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	14.75566	13.64245726	14.084751	0.016666
TS2G800Ti88Q314Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	15.32646	14.32177294	14.756385	0.016666
TS2G800Ti88Q354Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	18.05246	16.57029471	17.105805	0.023809
TS2G800Ti88Q398Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	18.3814	17.57497342	17.921478	0.892847
TS2G800Ti88Q437Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	17.10588	16.39927796	16.70326	0.947343
TS2G800Ti88Q484Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	18.87353	17.87838858	18.314827	0.018868
TS2G800Ti88Q535Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	27.28417	26.93870133	27.111631	0.02
TS2G800Ti88Q592Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	24.45602	24.06147664	24.236522	0.014286
TS2G800Ti88Q646Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	32.49709	32.08972855	32.310219	0.018181
TS2G800Ti88Q693Dp0 0BUBBLY00ANNULAR0 0	BUBBLY	ANNULA R	31.31999	30.71493512	30.974386	0.016666
TS2G800Ti88Q764Dp0 0SLUG00ANNULAR00	SLUG	ANNULA R	36.24014	35.83588311	36.041996	0.999982
TS2G800Ti88Q824Dp0 0SLUG00ANNULAR00	SLUG	ANNULA R	48.08559	47.45320661	47.786799	0.015873
TS2G800Ti88Q943Dp0 0SLUG00ANNULAR00	SLUG	ANNULA R	53.13227	52.48917143	52.827905	0.016666
TS3G200Ti88Q61Dp00 PERIODIC00PERIODIC 0	PERIODIC	PERIODIC	1.07044	0.978043083	1.0260232	49.92786
TS3G200Ti88Q83Dp00 PERIODIC00PERIODIC 0	PERIODIC	PERIODIC	4.55898	-1.25096349	1.1730193	2.19978

TS3G200Ti88Q107Dp0 OPERIODIC00SLUG00	PERIODIC	SLUG	2.440138	1.790254022	2.1259169	0.059701
TS3G200Ti88Q156Dp0 OPERIODIC00SLUG00	PERIODIC	SLUG	4.51404	2.060242289	3.2640459	0.102563
TS3G200Ti88Q189Dp0 OPERIODIC00SLUG00	PERIODIC	SLUG	6.0163	3.064219448	4.4244367	0.410707
TS3G200Ti88Q223Dp0 OPERIODIC00SLUG00	PERIODIC	SLUG	6.393501	5.336911237	5.8453707	0.519221
TS3G200Ti88Q267Dp0 OPERIODIC00CHURN00	PERIODIC	CHURN	7.656308	6.922531324	7.3124022	0.709078
TS3G200Ti88Q325Dp0 OPERIODIC00CHURN00	PERIODIC	CHURN	10.04774	9.467530811	9.8205246	0.499991
TS3G200Ti88Q365Dp0 OPERIODIC00CHURN00	PERIODIC	CHURN	12.3183	11.47431754	11.917143	0.031436
TS3G200Ti88Q419Dp0 OSLUG00CHURN00	SLUG	CHURN	14.79896	14.06230694	14.409406	0.074073
TS3G200Ti88Q466Dp0 OSLUG00CHURN00	SLUG	CHURN	16.95931	16.16986353	16.569157	0.124996
TS3G200Ti88Q514Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	19.67247	18.85955537	19.217406	0.218178
TS3G200Ti88Q594Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	24.1831	22.64105008	23.427591	0.166664
TS3G200Ti88Q678Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	28.43878	26.68107787	27.533372	0.063024
TS3G200Ti88Q731Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	32.19066	30.38258892	31.332157	0.385417
TS3G200Ti88Q795Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	36.35447	34.50736666	35.576068	0.374994
TS3G200Ti88Q856Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	40.75471	38.2460568	39.647701	0.181813
TS3G200Ti88Q926Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	44.67451	41.91206165	43.32795	0.249988
TS3G200Ti88Q1003Dp0 OCHURN00ANNULAR00	CHURN	ANNULAR	49.97783	46.88941549	48.414718	0.166657
TS3G400Ti88Q79Dp00 BUBBLY00SLUG00	BUBBLY	SLUG	2.059747	1.964645481	2.0140012	50.1325
TS3G400Ti88Q105Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	2.740985	2.644117413	2.6946184	50.059
TS3G400Ti88Q126Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	3.530341	3.157012092	3.3549256	0.12195
TS3G400Ti88Q156Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	6.728237	3.075180142	4.1930966	0.112864

TS3G400Ti88Q184Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	7.574131	3.541326181	5.0768534	0.210758
TS3G400Ti88Q218Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	8.034291	4.417118893	6.7427065	0.04665
TS3G400Ti88Q260Dp0 0BUBBLYSLUG00SLUG00	BUBBLYSLUG	SLUG	9.324136	8.89140405	9.100947	0.639987
TS3G400Ti88Q320Dp0 0SLUG00SLUG00	SLUG	SLUG	12.51984	12.13380359	12.34971	0.805533
TS3G400Ti88Q371Dp0 0SLUG00CHURN00	SLUG	CHURN	15.0863	14.77715751	14.932572	0.259995
TS3G400Ti88Q418Dp0 0SLUG00CHURN00	SLUG	CHURN	17.30561	16.97738701	17.13276	0.274993
TS3G400Ti88Q452Dp0 0SLUG00CHURN00	SLUG	CHURN	19.20431	18.85101222	19.02756	0.241932
TS3G400Ti88Q510Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	22.04759	21.53576885	21.771792	0.085713
TS3G400Ti88Q571Dp0 0SLUG00ANNULAR00	SLUG	ANNULAR	25.64073	25.02443305	25.358189	0.036363
TS3G400Ti88Q665Dp0 0CHURN00ANNULAR00	CHURN	ANNULAR	31.04207	30.50866336	30.7575	0.349991
TS3G400Ti88Q731Dp0 0CHURN00ANNULAR00	CHURN	ANNULAR	35.03116	34.4077612	34.710697	0.339993
TS3G400Ti88Q790Dp0 0CHURN00ANNULAR00	CHURN	ANNULAR	39.0872	38.07983832	38.472181	0.017241
TS3G400Ti88Q882Dp0 0CHURN00ANNULAR00	CHURN	ANNULAR	46.19582	44.35151771	45.099996	0.276919
TS3G400Ti88Q926Dp0 0CHURN00ANNULAR00	CHURN	ANNULAR	48.61751	46.75709194	47.521838	0.499992
TS3G600Ti88Q110Dp0 0LIQUID00SLUG00	LIQUID	SLUG	2.22046	2.131241131	2.1773162	50.01357
TS3G600Ti88Q131Dp0 0LIQUID00SLUG00	LIQUID	SLUG	4.366093	1.408154523	2.671694	1.57571
TS3G600Ti88Q164Dp0 0BUBBLY00SLUG00	BUBBLY	SLUG	5.269609	4.220847228	4.5846172	0.136207
TS3G600Ti88Q200Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	7.956912	4.246823879	5.8585693	0.137562
TS3G600Ti88Q247Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	9.900357	5.698622161	9.2321862	0.016667
TS3G600Ti88Q282Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	11.44844	10.94421832	11.201357	0.679986
TS3G600Ti88Q327Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	13.62644	13.05943774	13.352641	1.225145

TS3G600Ti88Q365Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	16.09818	15.61188142	15.868911	0.927256
TS3G600Ti88Q412Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	18.43422	17.61673272	18.055561	0.054544
TS3G600Ti88Q457Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	21.69405	21.36834441	21.538506	0.674983
TS3G600Ti88Q510Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	23.58465	23.2347889	23.410882	0.299993
TS3G600Ti88Q592Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	29.14966	28.64411017	28.886966	0.124997
TS3G600Ti88Q665Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	34.67734	33.96224274	34.413805	0.045452
TS3G600Ti88Q747Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	38.74263	38.04913348	38.360249	0.024999
TS3G600Ti88Q801Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	41.78143	41.05761576	41.425406	0.244439
TS3G600Ti88Q880Dp0 OBUBBLY00ANNULARO 0	BUBBLY	ANNULA R	48.62469	47.81939305	48.240609	0.170455
TS3G800Ti88Q127Dp0 OLIQUID00SLUG00	LIQUID	SLUG	2.839077	2.746756656	2.7943218	50.1
TS3G800Ti88Q155Dp0 OLIQUID00SLUG00	LIQUID	SLUG	4.075487	2.628589445	3.2887732	2.23991
TS3G800Ti88Q184Dp0 OLIQUID00SLUG00	LIQUID	SLUG	8.219297	5.393627209	6.2402492	0.075472
TS3G800Ti88Q216Dp0 OLIQUID00SLUG00	LIQUID	SLUG	9.27807	5.740441058	6.7971859	0.094593
TS3G800Ti88Q269Dp0 OLIQUID00SLUG00	LIQUID	SLUG	12.34919	11.88250673	12.157538	0.424989
TS3G800Ti88Q327Dp0 OLIQUID00SLUG00	LIQUID	SLUG	14.19696	13.40845752	13.937493	0.722209
TS3G800Ti88Q375Dp0 OLIQUID00SLUG00	LIQUID	SLUG	19.68649	18.65699477	19.171568	0.024999
TS3G800Ti88Q429Dp0 OLIQUID00SLUG00	LIQUID	SLUG	23.85227	22.7758304	23.32026	0.021739
TS3G800Ti88Q504Dp0 OBUBBLY00CHURN00	BUBBLY	CHURN	27.12308	26.57309291	26.851386	0.524987

TS3G800Ti88Q580Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	32.76563	32.26715985	32.532738	0.739985
TS3G800Ti88Q655Dp0 0BUBBLY00CHURN00	BUBBLY	CHURN	38.95345	38.26490319	38.615632	0.023255
TS3G800Ti88Q715Dp0 0BUBBLY00ANNULAR0 0	BUBBLY	ANNULA R	42.7018	42.0790654	42.357324	0.173905
TS3G800Ti88Q787Dp0 0BUBBLYSLUG00ANNU LAR00	BUBBLYSL UG	ANNULA R	48.08812	47.4145542	47.729791	0.171424
TS3G800Ti88Q848Dp0 0BUBBLYSLUG00ANNU LAR00	BUBBLYSL UG	ANNULA R	52.88769	52.05643691	52.477262	0.02
TS3G800Ti88Q938Dp0 0BUBBLYSLUG00ANNU LAR00	BUBBLYSL UG	ANNULA R	55.63466	54.65808439	55.099148	0.24
TS3G800Ti88Q1001Dp 00SLUG00ANNULAR00	SLUG	ANNULA R	60.29978	59.06166055	59.61979	0.02
TS3G800Ti88Q1089Dp 00SLUG00ANNULAR00	SLUG	ANNULA R	69.14865	67.85844329	68.456575	0.299993
TS3G800Ti88Q1148Dp 00SLUG00ANNULAR00	SLUG	ANNULA R	73.83785	72.3662382	72.925708	0.066667
TS4G200Ti88Q67Dp00 PERIODIC00BUBBLY00	PERIODIC	BUBBLY	0.887333	0.824540927	0.8599558	0.076917
TS4G200Ti88Q89Dp00 PERIODIC00SLUG00	PERIODIC	SLUG	1.596747	0.639403587	1.025845	2.679946
TS4G200Ti88Q120Dp0 0PERIODIC00SLUG00	PERIODIC	SLUG	2.924863	0.688184145	1.9415788	0.536836
TS4G200Ti88Q145Dp0 0PERIODIC00SLUG00	PERIODIC	SLUG	5.576889	1.689136183	3.7738118	0.057142
TS4G200Ti88Q183Dp0 0PERIODIC00SLUG00	PERIODIC	SLUG	6.500083	3.070140451	5.2243824	0.157893
TS4G200Ti88Q219Dp0 0PERIODIC00SLUG00	PERIODIC	SLUG	8.141883	7.293222655	7.7058034	0.749987
TS4G200Ti88Q264Dp0 0PERIODIC00SLUG00	PERIODIC	SLUG	10.3194	8.845037991	9.6797955	0.699988
TS4G200Ti88Q307Dp0 0PERIODIC00CHURN00	PERIODIC	CHURN	12.51467	11.40403819	12.017016	0.699983
TS4G200Ti88Q353Dp0 0PERIODIC00CHURN00	PERIODIC	CHURN	16.80188	15.06745509	15.893552	0.184206
TS4G200Ti88Q400Dp0 0PERIODIC00CHURN00	PERIODIC	CHURN	19.95882	18.10019139	18.997062	0.353841
TS4G200Ti88Q461Dp0 0BUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	26.40362	23.70525288	25.05821	0.099998

TS4G200Ti88Q520Dp0 OBUBBLYSLUG00ANNUL AR00	BUBBLYSL UG	ANNULA R	31.70021	28.74770291	30.158062	0.099998
TS4G200Ti88Q576Dp0 OBUBBLYSLUG00ANNUL AR00	BUBBLYSL UG	ANNULA R	37.87843	35.66394071	36.795769	10.15346
TS4G200Ti88Q649Dp0 OCHURN00ANNULAR00	CHURN	ANNULA R	47.99674	43.67045103	45.744867	9.333333
TS4G200Ti88Q716Dp0 OCHURN00ANNULAR00	CHURN	ANNULA R	56.59544	51.9055022	54.148371	10.0625
TS4G200Ti88Q782Dp0 OCHURN00ANNULAR00	CHURN	ANNULA R	63.52836	57.93438756	60.606556	10.57143
TS4G200Ti88Q888Dp0 OCHURN00ANNULAR00	CHURN	ANNULA R	76.7597	70.69636324	73.590852	11.63158
TS4G200Ti88Q1017Dp 0OCHURN00ANNULAR0 0	CHURN	ANNULA R	89.17893	83.76961922	86.502105	18.66604
TS4G400Ti88Q120Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	1.907111	1.86961479	1.890821	49.939
TS4G400Ti88Q153Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	7.413502	5.677416383	6.5106683	0.09756
TS4G400Ti88Q191Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	10.24623	6.913276532	9.2165186	0.090908
TS4G400Ti88Q213Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	10.82775	9.657321776	10.163672	0.809505
TS4G400Ti88Q274Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	13.61014	11.8710742	12.692346	1.199966
TS4G400Ti88Q332Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	21.1561	19.61928213	20.327077	0.020833
TS4G400Ti88Q385Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	25.55406	23.60372615	24.568752	0.018868
TS4G400Ti88Q455Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	30.75004	29.02274237	29.814846	0.249994
TS4G400Ti88Q506Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	35.75408	34.59676287	35.179671	5.636107
TS4G400Ti88Q559Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	40.765	39.32043323	40.016565	6.914088
TS4G400Ti88Q633Dp0 OBUBBLYSLUG00ANNUL AR00	BUBBLYSL UG	ANNULA R	49.16506	44.42107179	47.427936	0.025

TS4G400Ti88Q702Dp0 OBUBBLYSLUG00ANNU LAR00	BUBBLYSL UG	ANNULA R	55.05047	52.66722764	53.798988	9.682691
TS4G400Ti88Q775Dp0 OBUBBLYSLUG00ANNU LAR00	BUBBLYSL UG	ANNULA R	62.16464	59.71124764	60.890052	11.35272
TS4G400Ti88Q862Dp0 OCHURN00ANNULAR00	CHURN	ANNULA R	70.95552	67.77494977	69.298293	12.99963
TS4G400Ti88Q953Dp0 OCHURN00ANNULAR00	CHURN	ANNULA R	83.74475	77.90071593	80.764597	12.68241
TS4G600Ti88Q91Dp00L IQUID00BUBBLY00	LIQUID	BUBBLY	2.454456	2.348977079	2.4173091	0.02
TS4G600Ti88Q113Dp0 OBUBBLY00BUBBLYSLU G00	BUBBLY	BUBBLYS LUG	2.379711	2.306469019	2.3486975	0.142855
TS4G600Ti88Q147Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	5.031668	4.739625401	4.9161958	0.033332
TS4G600Ti88Q183Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	8.933702	5.871464225	7.2936653	0.241932
TS4G600Ti88Q220Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	11.75563	10.44002528	11.07031	0.433326
TS4G600Ti88Q256Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	13.4752	11.38671984	12.540684	0.918173
TS4G600Ti88Q307Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	16.88231	14.42352372	15.555983	0.514278
TS4G600Ti88Q344Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	19.45731	17.35224495	18.347582	1.303548
TS4G600Ti88Q400Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	26.28541	23.9401014	25.195883	0.383327
TS4G600Ti88Q464Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	32.48348	28.50627757	30.718459	0.014286
TS4G600Ti88Q511Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	37.1501	33.5710676	35.442634	0.020408
TS4G600Ti88Q574Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	45.57882	41.66580056	43.649237	0.287874
TS4G600Ti88Q636Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	51.41132	46.59300433	48.962392	0.119998

TS4G600Ti88Q702Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	56.14049	53.48992914	54.738395	6.96351
TS4G600Ti88Q775Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	66.8284	60.65693377	63.810669	0.014493
TS4G600Ti88Q869Dp0 OBUBBLYSLUG00ANNU LAR00	BUBBLYSL UG	ANNULA R	75.19903	71.74135938	73.353198	8.828445
TS4G600Ti88Q957Dp0 OBUBBLYSLUG00ANNU LAR00	BUBBLYSL UG	ANNULA R	85.55002	79.72571409	82.638324	0.36065
TS4G600Ti88Q1034Dp 00SLUG00ANNULAR00	SLUG	ANNULA R	94.94266	88.25142518	91.614816	0.133331
TS4G800Ti88Q116Dp0 OLIQUEID00SLUG00	LIQUID	SLUG	3.81151	3.678506879	3.7632614	0.0125
TS4G800Ti88Q148Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	4.585913	4.149912975	4.3546951	0.022727
TS4G800Ti88Q181Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	9.774498	7.738509668	8.6165956	0.136362
TS4G800Ti88Q217Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	11.66037	8.46270862	10.282325	0.057142
TS4G800Ti88Q258Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	15.44148	14.58022277	14.974296	0.569222
TS4G800Ti88Q302Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	18.39591	17.06144802	17.748944	1.718723
TS4G800Ti88Q353Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	23.72843	22.72206034	23.219998	1.214268
TS4G800Ti88Q418Dp0 OBUBBLY00SLUG00	BUBBLY	SLUG	30.45961	27.33068806	29.185301	0.025
TS4G800Ti88Q469Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	33.89622	30.41389696	32.592275	0.119998
TS4G800Ti88Q534Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	40.47963	36.7139517	38.903409	0.271182
TS4G800Ti88Q626Dp0 OBUBBLYSLUG00SLUG0 0	BUBBLYSL UG	SLUG	50.94312	44.80477863	48.601704	0.022222
TS4G800Ti88Q719Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	64.75418	58.16778525	61.593853	0.092306
TS4G800Ti88Q781Dp0 OBUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	72.17054	69.0916096	70.582987	5.860948

TS4G800Ti88Q861Dp0 0BUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	81.22593	74.20003744	78.117209	0.21621
TS4G800Ti88Q938Dp0 0BUBBLYSLUG00CHUR N00	BUBBLYSL UG	CHURN	87.65224	80.9937554	84.545463	0.156245
TS4G800Ti88Q1041Dp 00BUBBLYSLUG00CHU RN00	BUBBLYSL UG	CHURN	96.55887	93.29281196	94.86589	9.902906

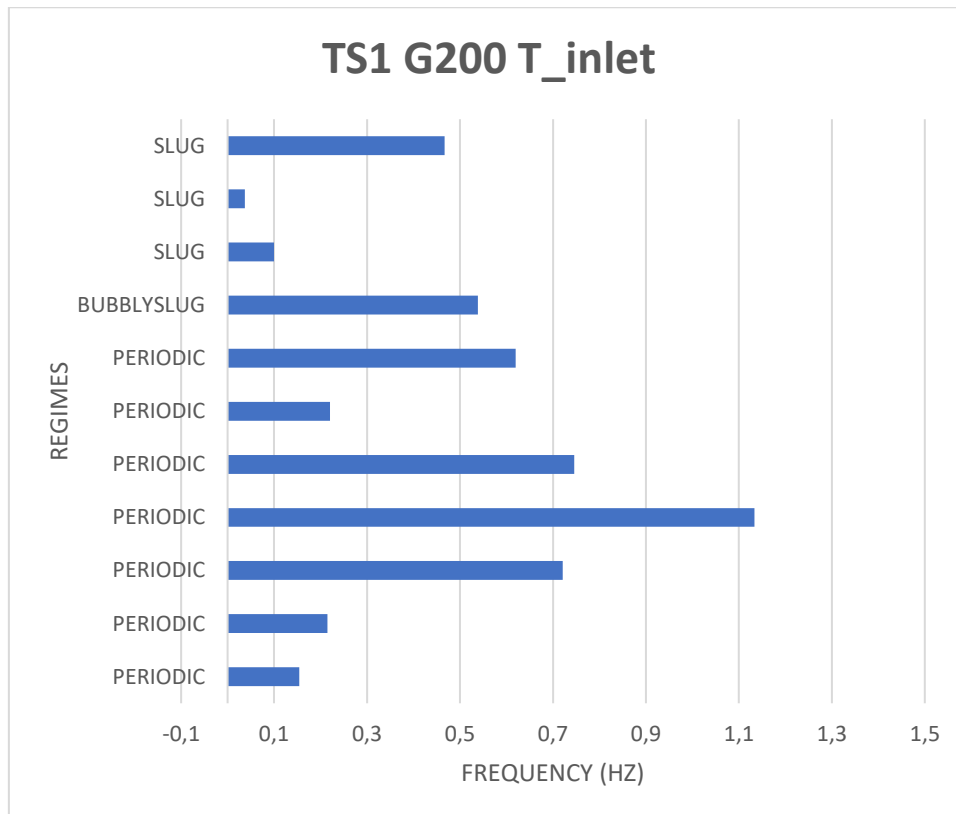
Table 8 Min, Max, Mean and Frequency Values of Difference of Pressure

RESULT AND DISCUSSION

A graph of frequencies and regimes was created at different heat flux and mass flux values of each test section.

Graphs

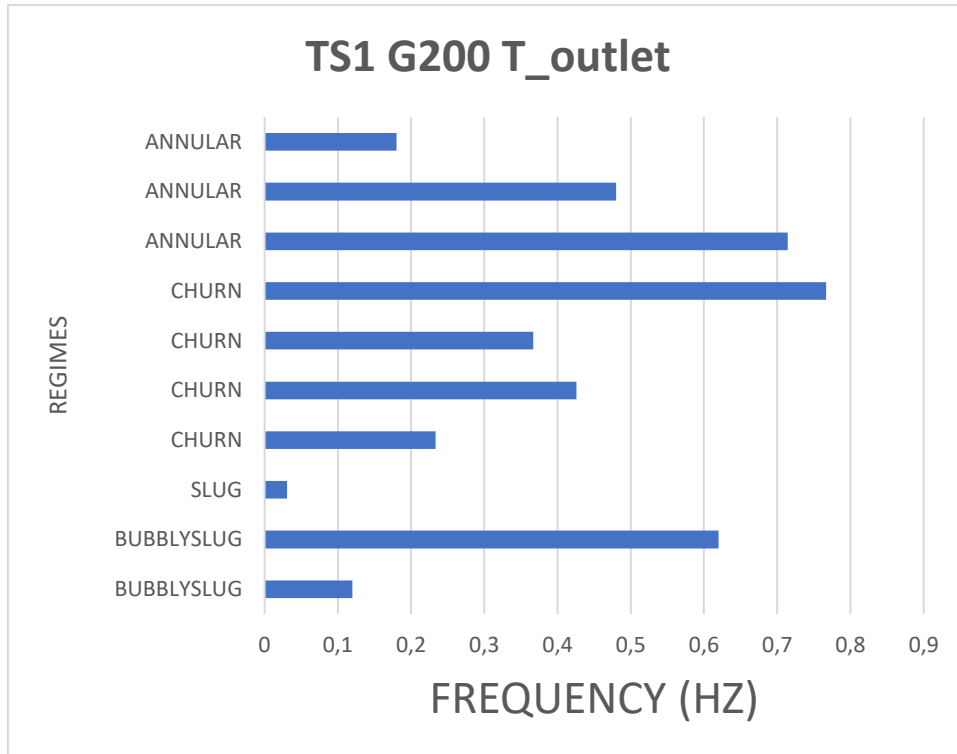
TS1 G200 T_inlet



The frequency range in which the slug regime is observed is 0.03 - 0.46 Hz.

The frequency range in which the periodic regime is observed is 0.15-1.13 Hz.

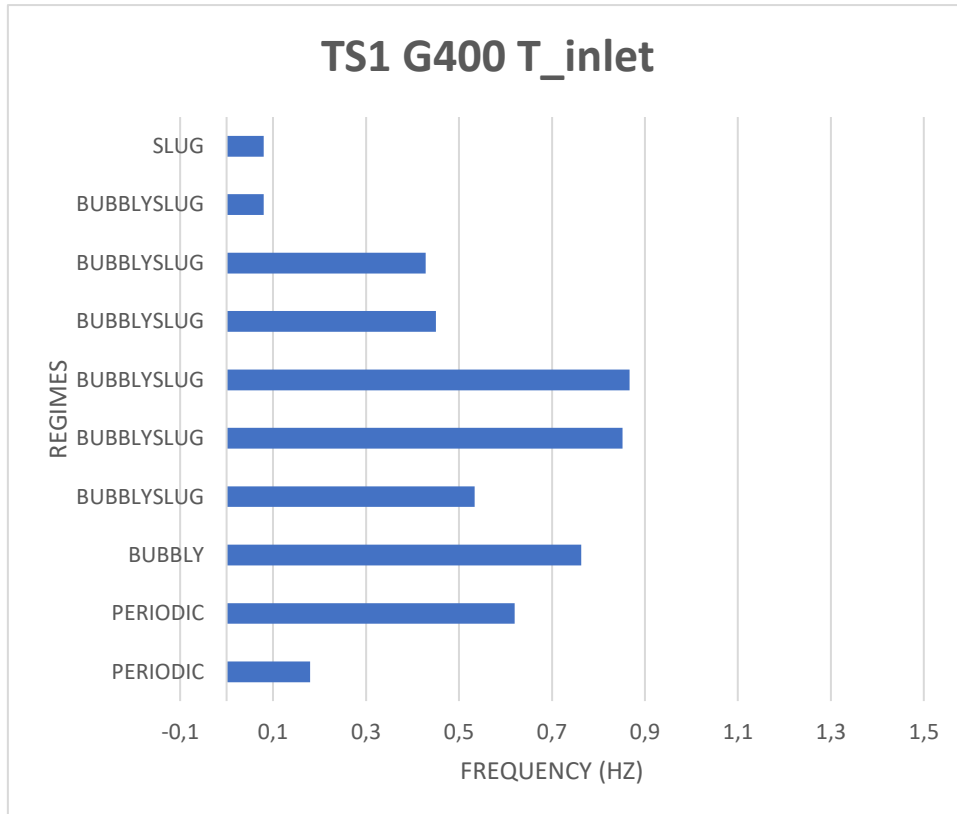
TS1 G200 T_outlet



The frequency range in which the Churn regime is observed is 0.01 – 0.64 Hz.

The frequency range in which the periodic regime is observed is 0.1-1.13 Hz.

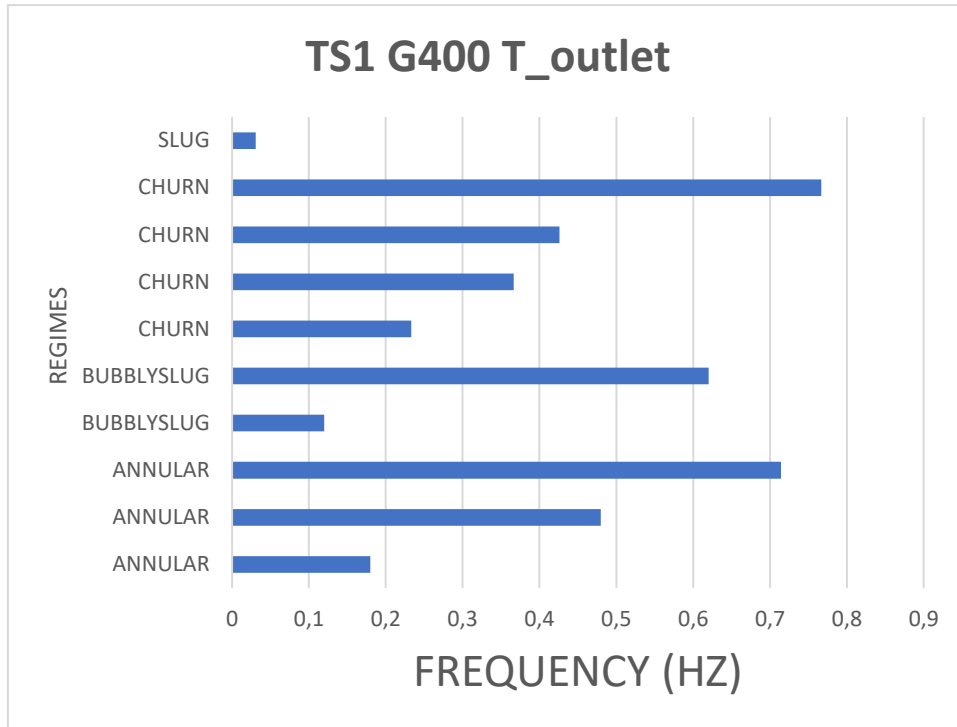
TS1 G400 T_inlet



The frequency range in which the Bubbly-Slug regimen is observed is 0.07-0.86 Hz.

The frequency range in which the periodic regime is observed is 0.18-0.62 Hz.

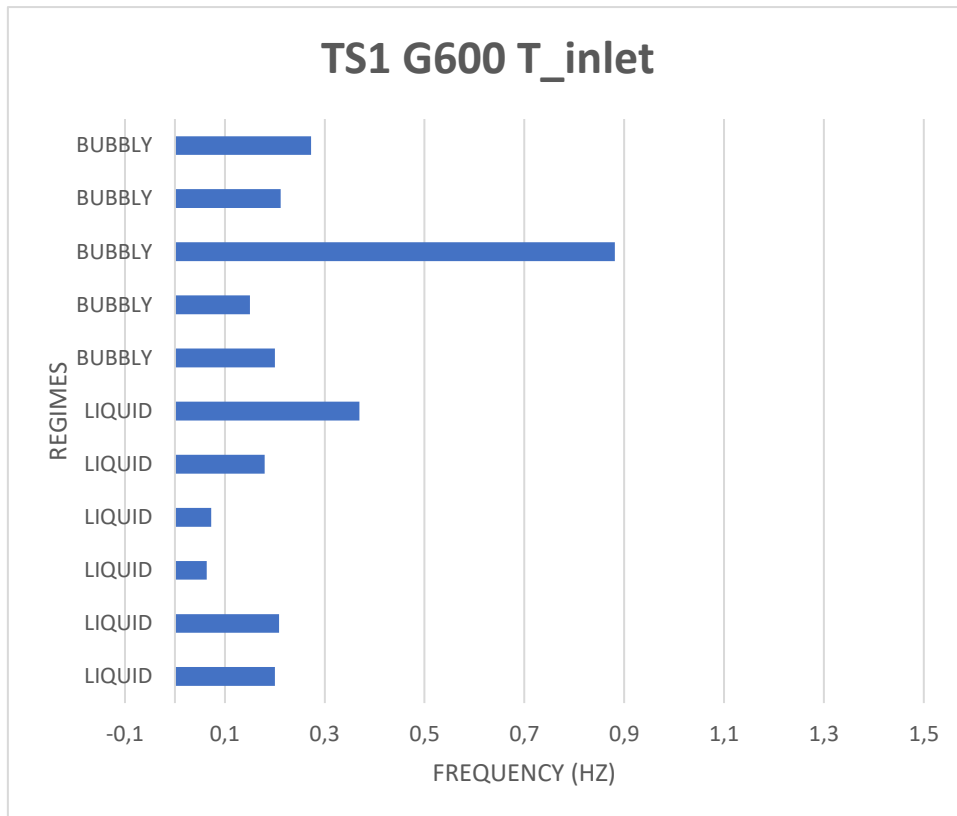
TS1 G400 T_outlet



The frequency range in which the annular regime is observed is 0.17-0.71 Hz.

The frequency range in which the Churn regime is observed is 0.23-0.76 Hz.

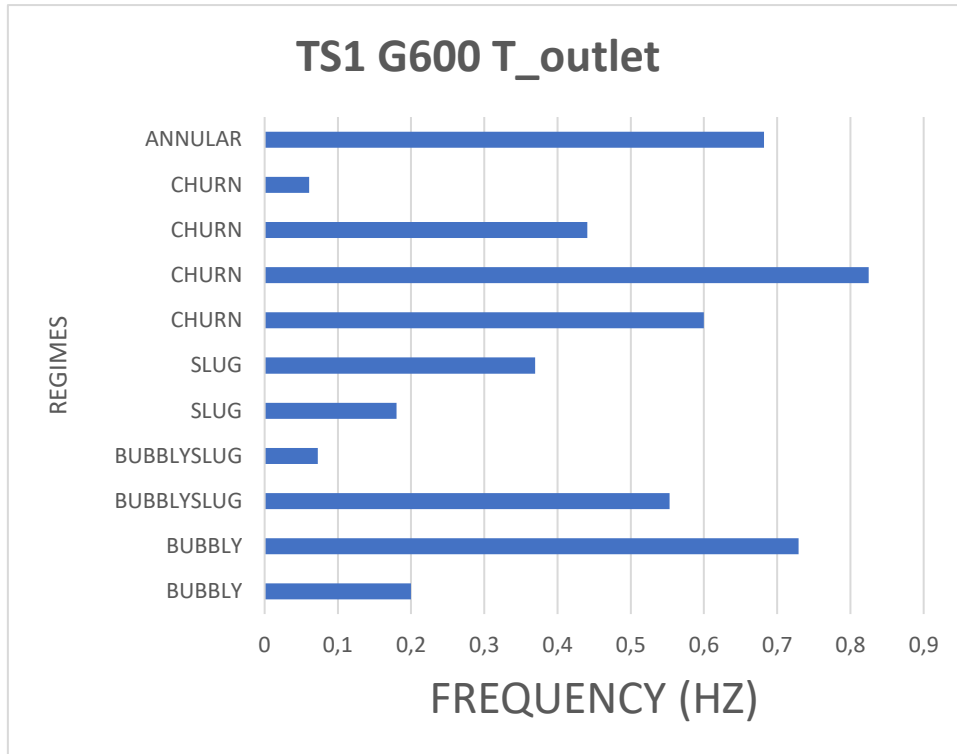
TS1 G600 T_inlet



The frequency range in which the Bubbly regime is observed is 0.14-0.88 Hz.

The frequency range in which the liquid regime is observed is 0.06-0.37 Hz.

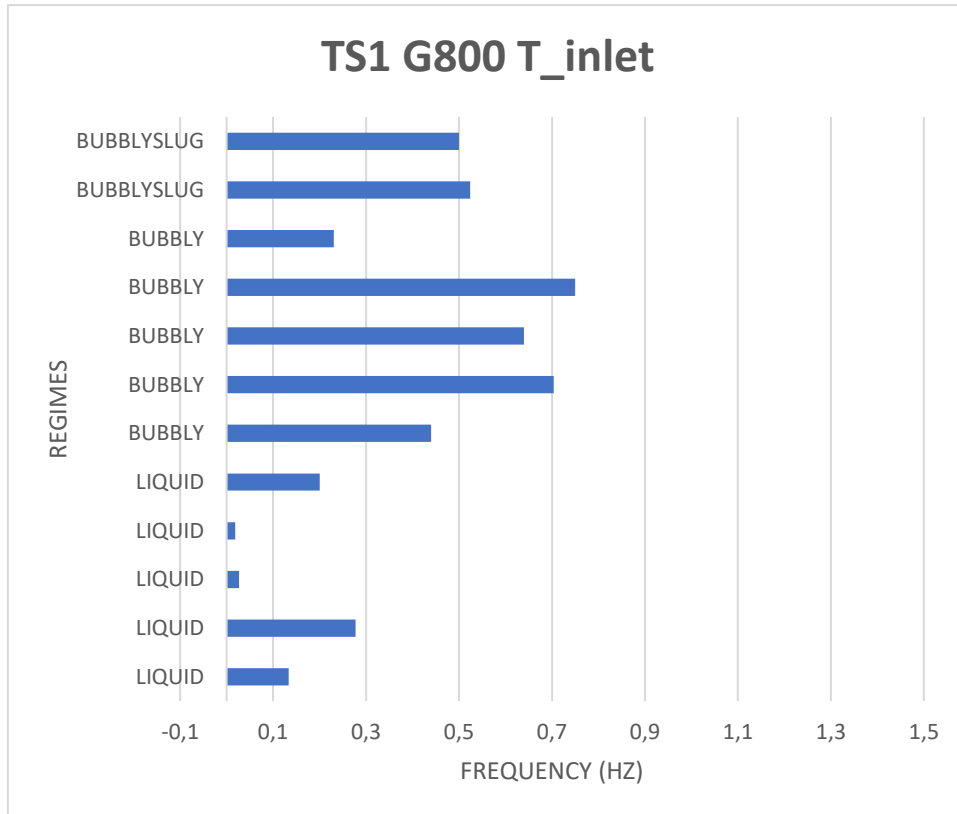
TS1 G600 T_outlet



The frequency range in which the Churn regime is observed is 0.06-0.82 Hz.

The frequency range in which the slug regime is observed is 0.17-0.36 Hz.

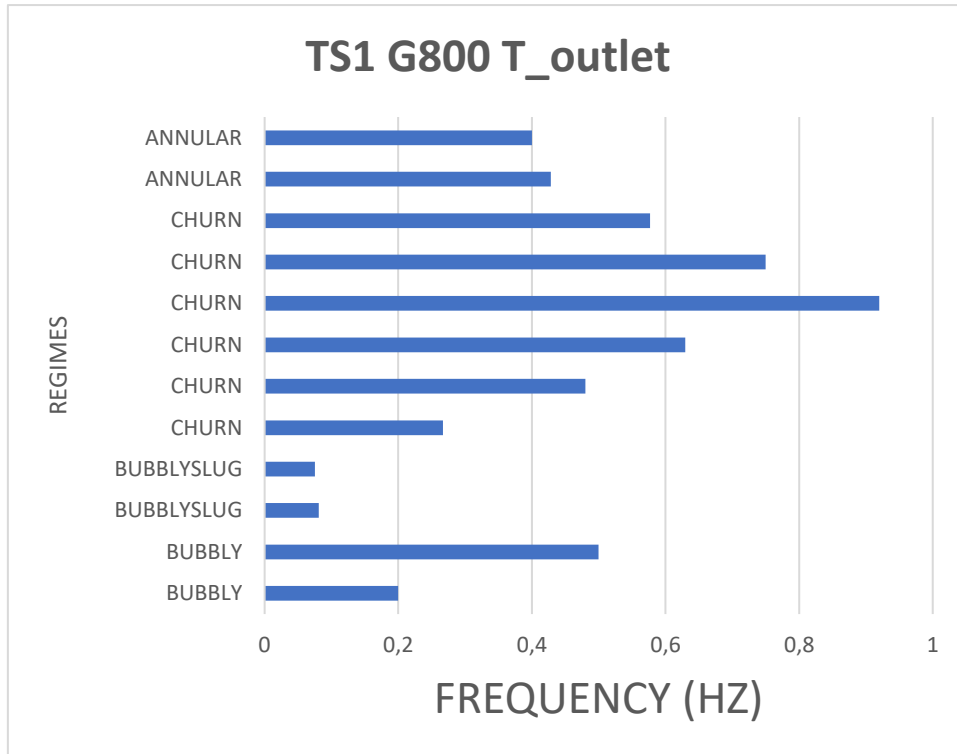
TS1 G800 T_inlet



The frequency range in which the Bubbly regime is observed is 0.23-0.74 Hz.

The frequency range in which the liquid regime is observed is 0.018-0.277 Hz.

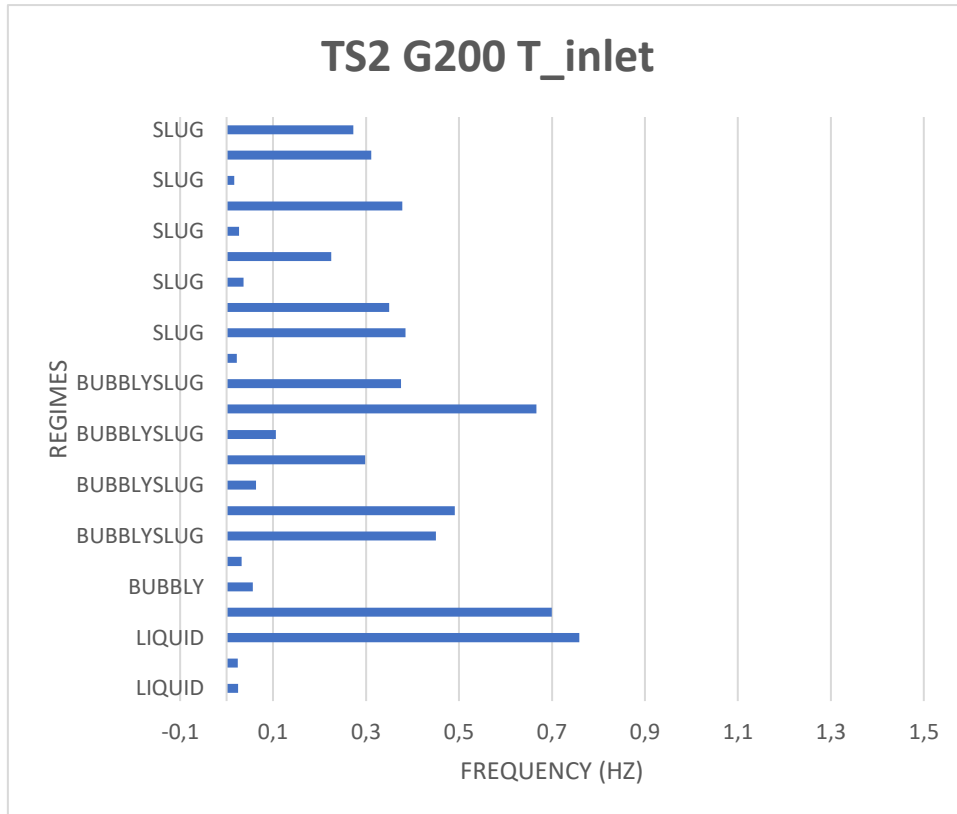
TS1 G800 T_outlet



The frequency range in which the Churn regime is observed is 0.26-0.91 Hz.

The frequency range in which the bubbly regime is observed is 0.2-0.5 Hz.

TS2 G200 T_inlet



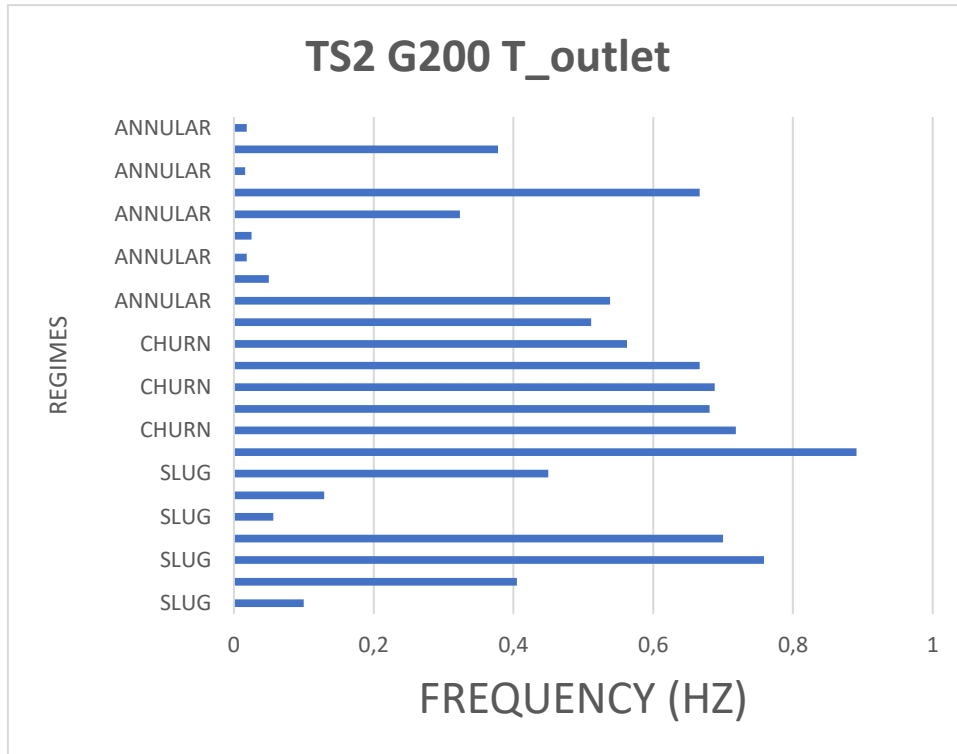
The frequency range in which the Bubbly regime is observed is 0.03-0.7 Hz.

The frequency range in which the Bubbly-Slug regime is observed is 0.06-0.66 Hz.

The frequency range in which the Liquid regime is observed is 0.02-0.75 Hz.

The frequency range in which the slug regime is observed is 0.01-0.38 Hz.

TS2 G200 T_outlet

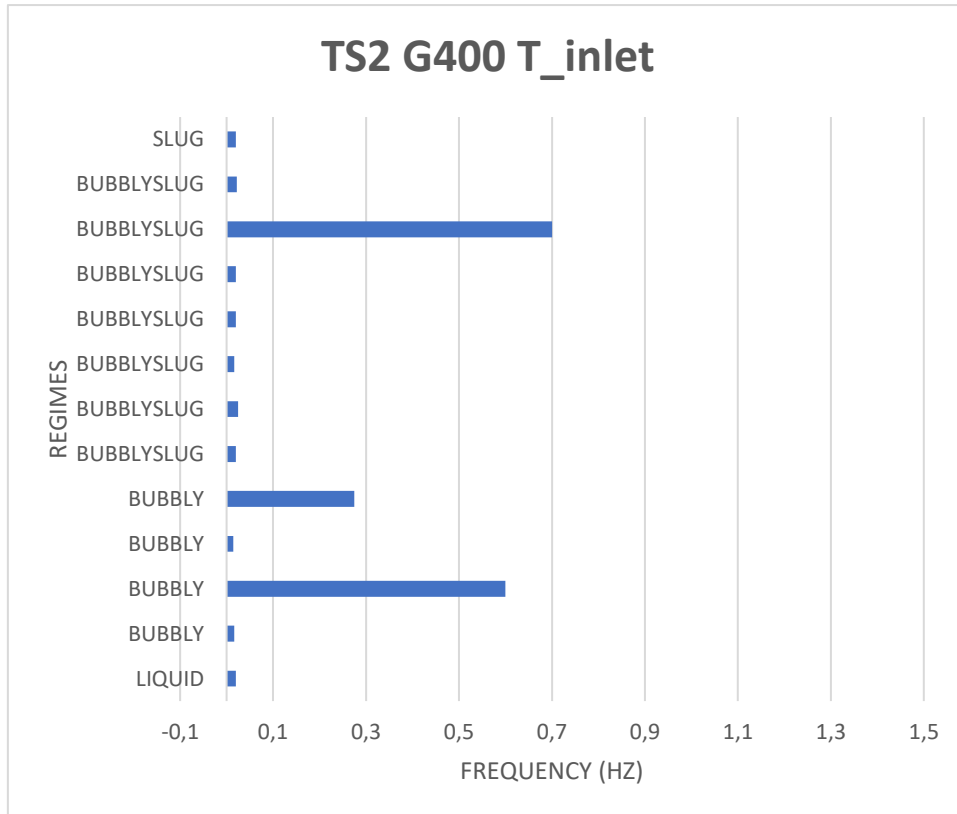


The frequency range in which the annular regime is observed is 0.02-0.66 Hz.

The frequency range in which the Churn regime is observed is 0.56-0.89 Hz.

The frequency range in which the slug regime is observed is 0.05-0.75 Hz.

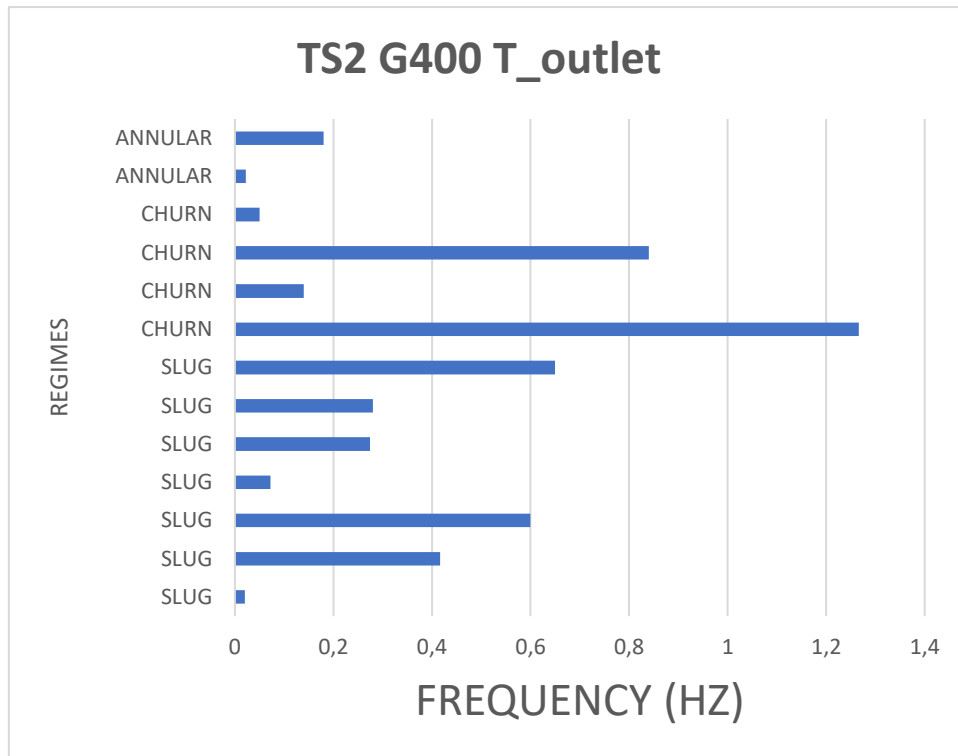
TS2 G400 T_inlet



The frequency range in which the Bubbly regime is observed is 0.01-0.59 Hz.

The frequency range in which the Bubbly-Slug regime is observed is 0.01-0.7 Hz.

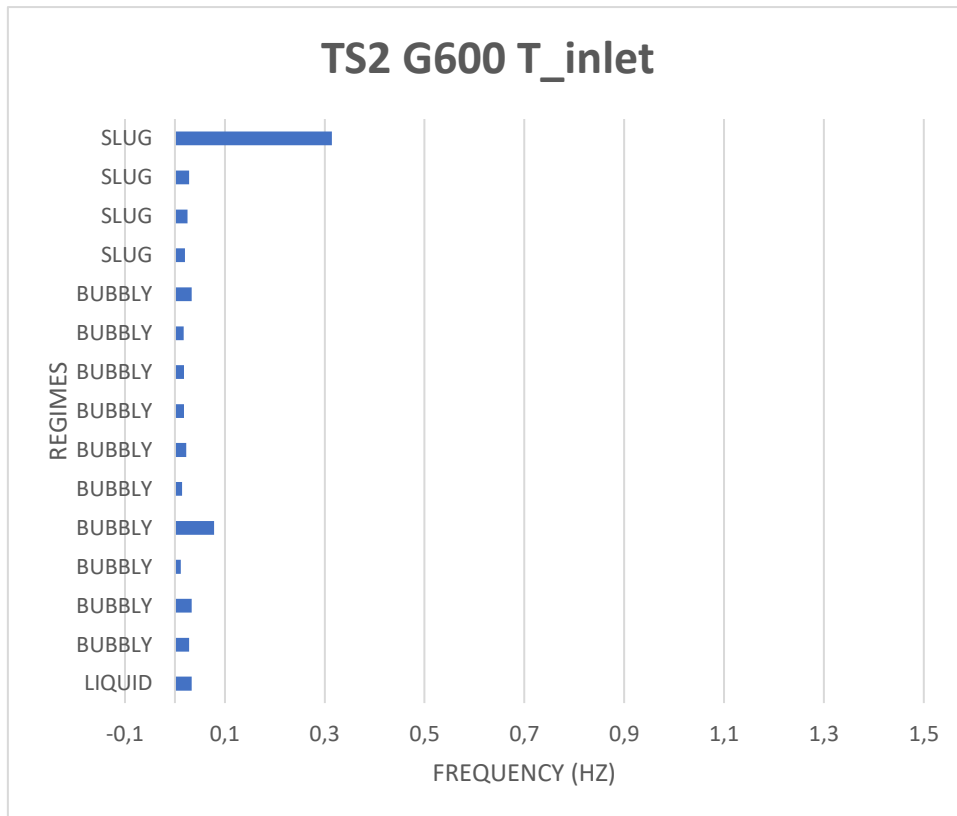
TS2 G400 T_outlet



The frequency range in which the slug regime is observed is 0.02-0.65 Hz

The frequency range in which the Churn regime is observed is 0.05-1.26 Hz.

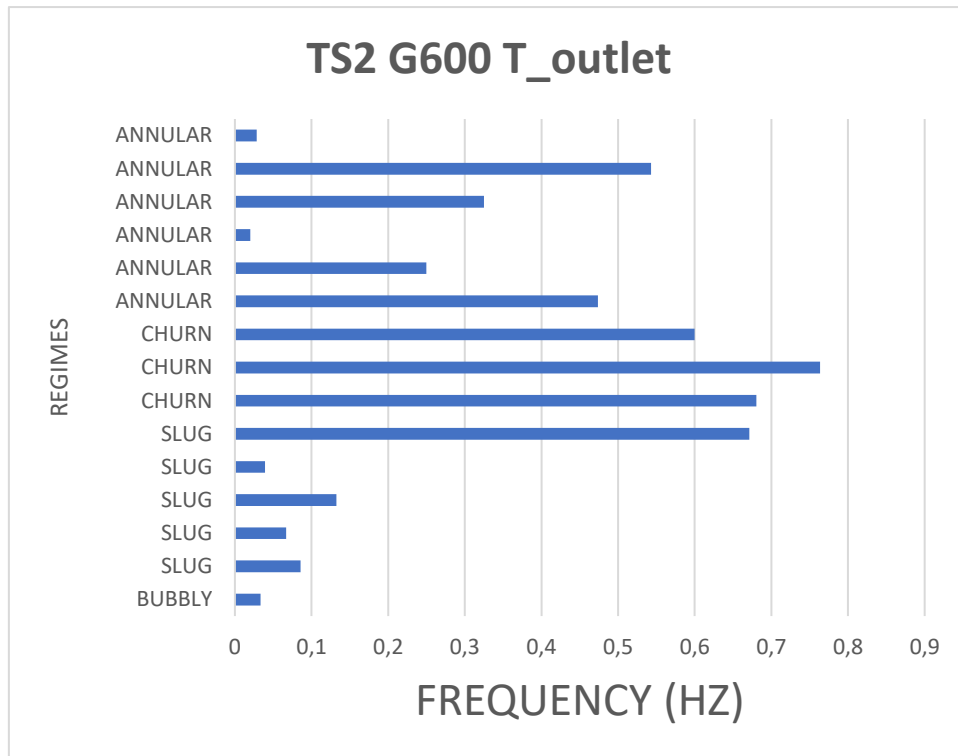
TS2 G600 T_inlet



The frequency range in which the Bubbly regime is observed is 0.01-0.07 Hz.

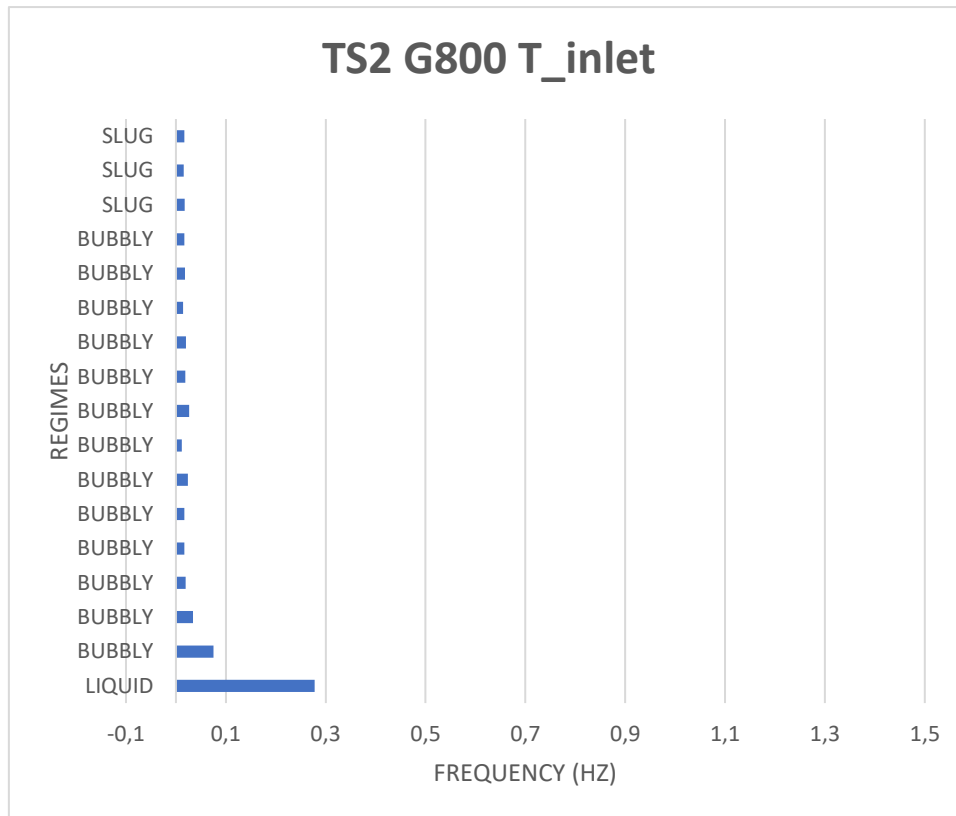
The frequency range in which the slug regime is observed is 0.02-0.31 Hz.

TS2 G600 T_outlet



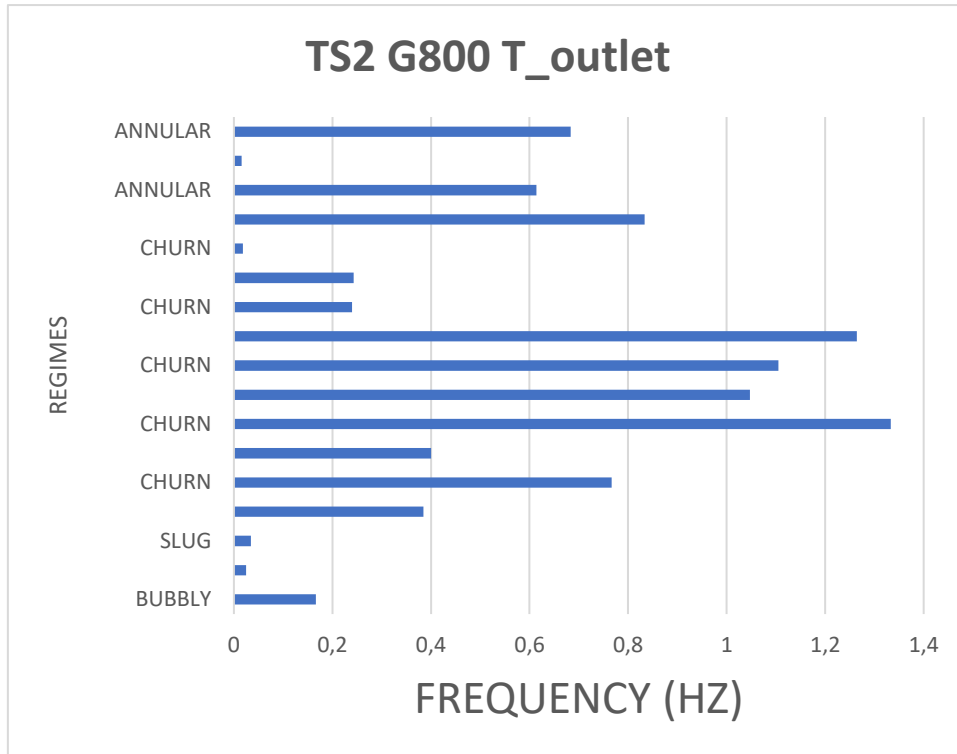
The frequency range in which the annular regime is observed is 0.02-0.54 Hz.

The frequency range in which the slug regime is observed is 0.03-0.67 Hz

TS2 G800 T_inlet

The frequency range in which the Bubbly regime is observed is 0.01-0.07 Hz.

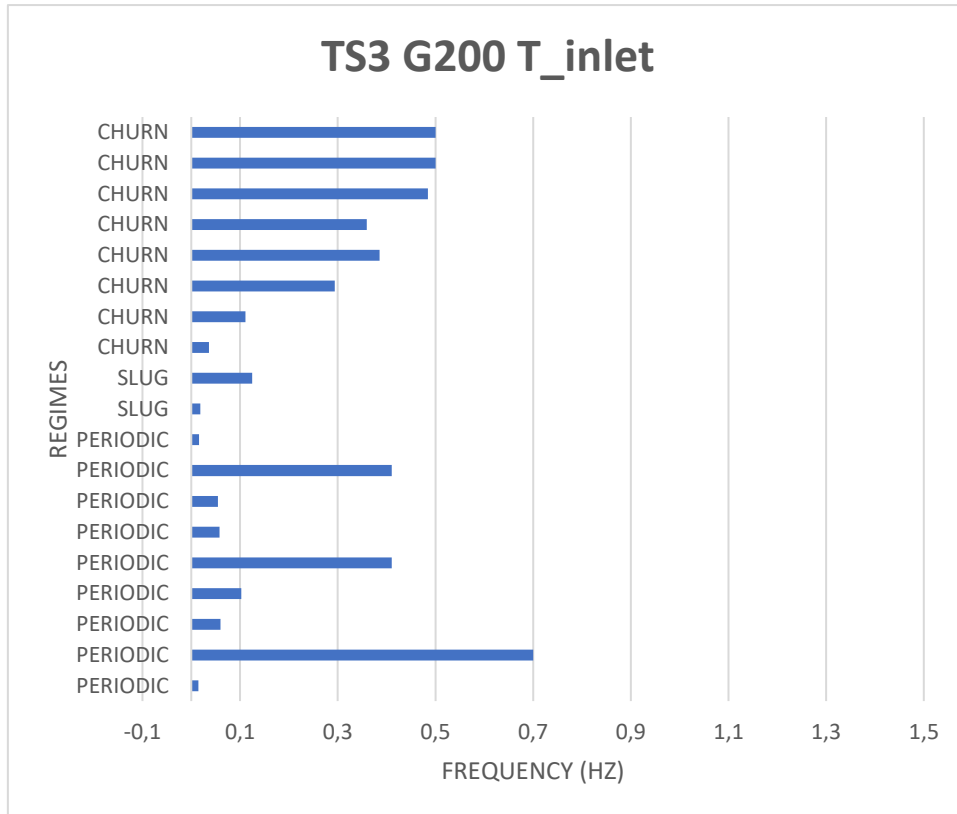
TS2 G800 T_outlet



The frequency range in which the annular regime is observed is 0.015-0.83 Hz.

The frequency range in which the Churn regime is observed is 0.018-1.33 Hz.

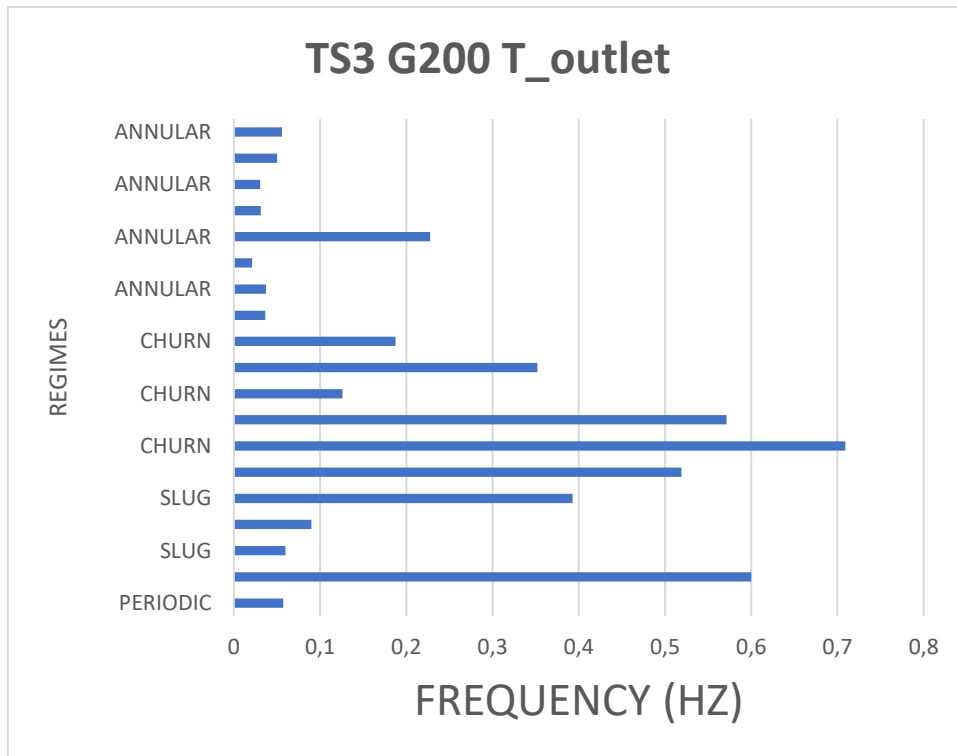
TS3 G200 T_inlet



The frequency range in which the Churn regime is observed is 0.03-0.5 Hz.

The frequency range in which the periodic regimen is observed is 0.014-0.41 Hz.

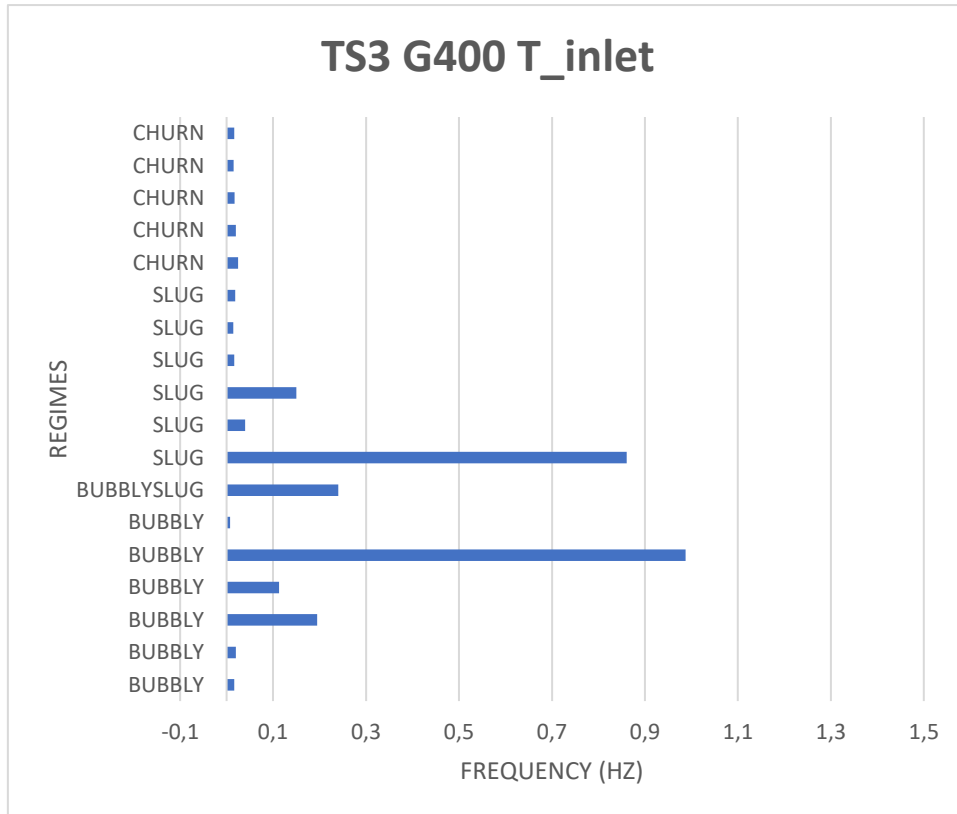
The frequency range in which the slug regime is observed is 0.01-0.12 Hz

TS3 G200 T_outlet

The frequency range in which the annular regime is observed is 0.02-0.22 Hz.

The frequency range in which the Churn regime is observed is 0.012-0.71 Hz.

TS3 G400 T_inlet

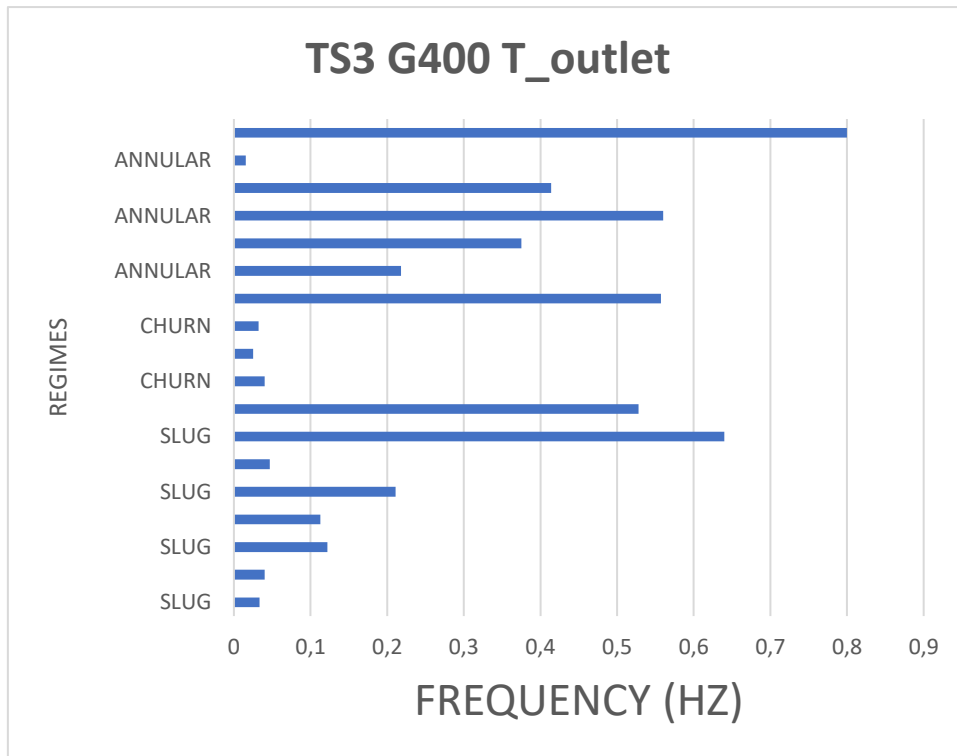


The frequency range in which the Bubbly regime is observed is 0.01-0.24 Hz.

The frequency range in which the Churn regime is observed is 0.015-0.024 Hz.

The frequency range in which the slug regime is observed is 0.014-0.86 Hz

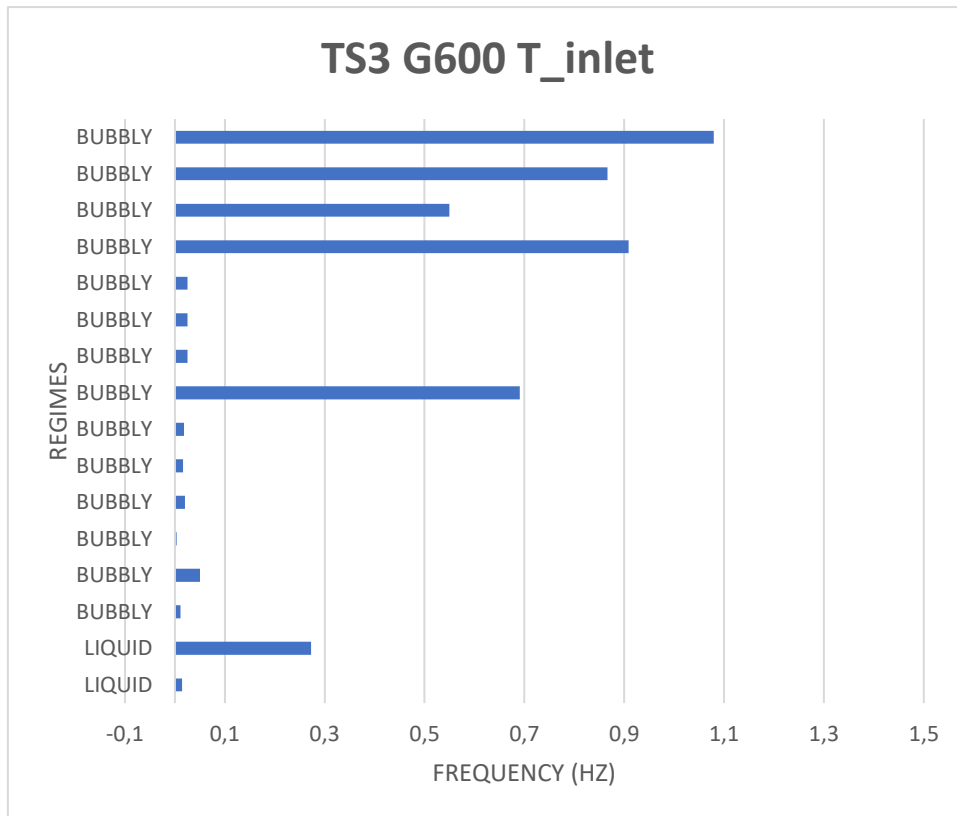
TS3 G400 T_outlet



The frequency range in which the annular regime is observed is 0.015-0.8 Hz.

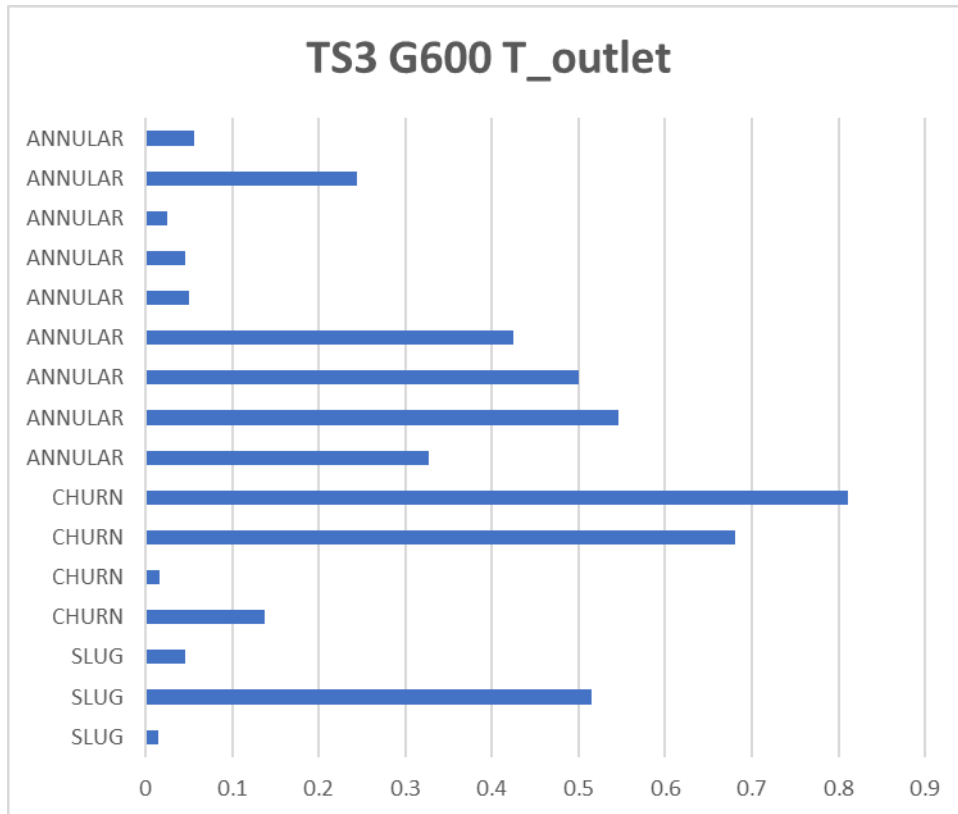
The frequency range in which the slug regime is observed is 0.03-0.63 Hz

TS3 G600 T_inlet



The frequency range in which the Bubbly regime is observed is 0.03-1.07 Hz.

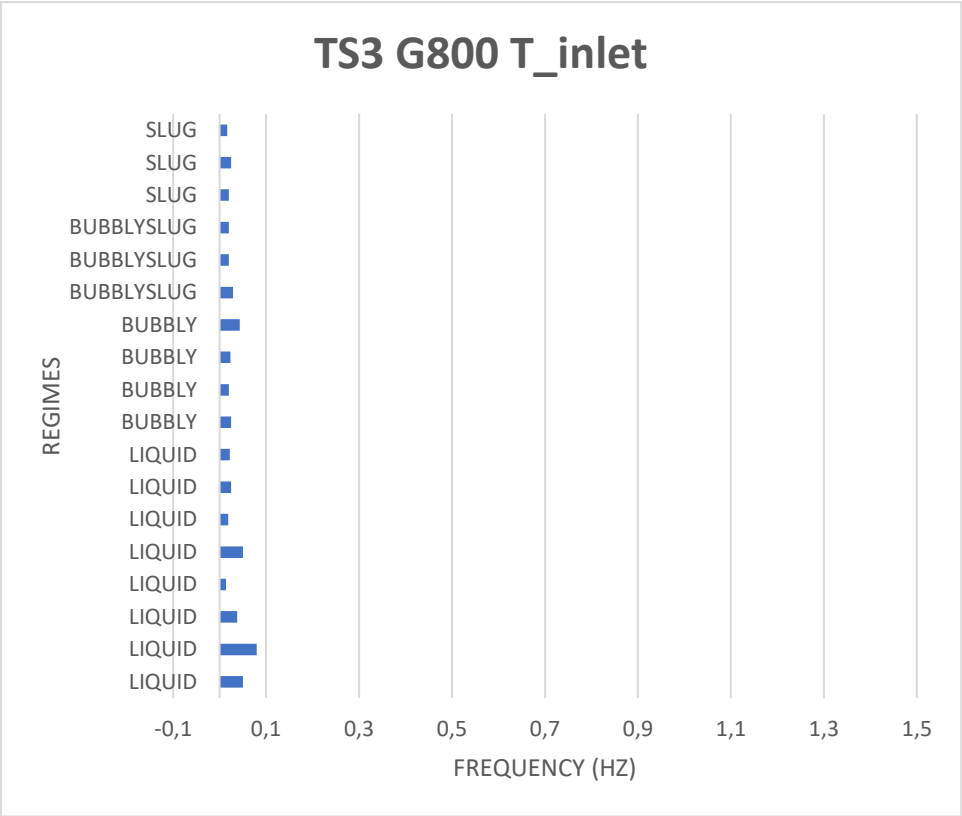
TS3 G600 T_outlet



The frequency range in which the annular regime is observed is 0.025-0.54 Hz.

The frequency range in which the Churn regime is observed is 0.0-0.8 Hz.

TS3 G800 T_inlet

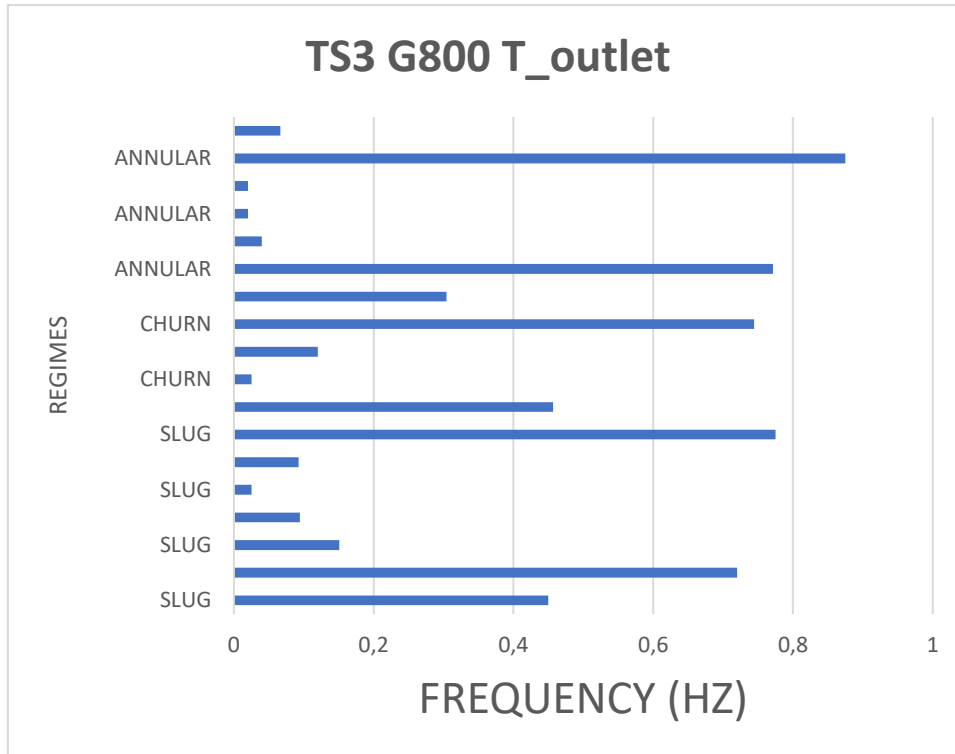


The frequency range in which the Bubbly regime is observed is 0.02-0.04 Hz.

The frequency range in which the liquid regime is observed is 0.13-0.08 Hz.

The frequency range in which the slug regime is observed is 0.016-0.024 Hz

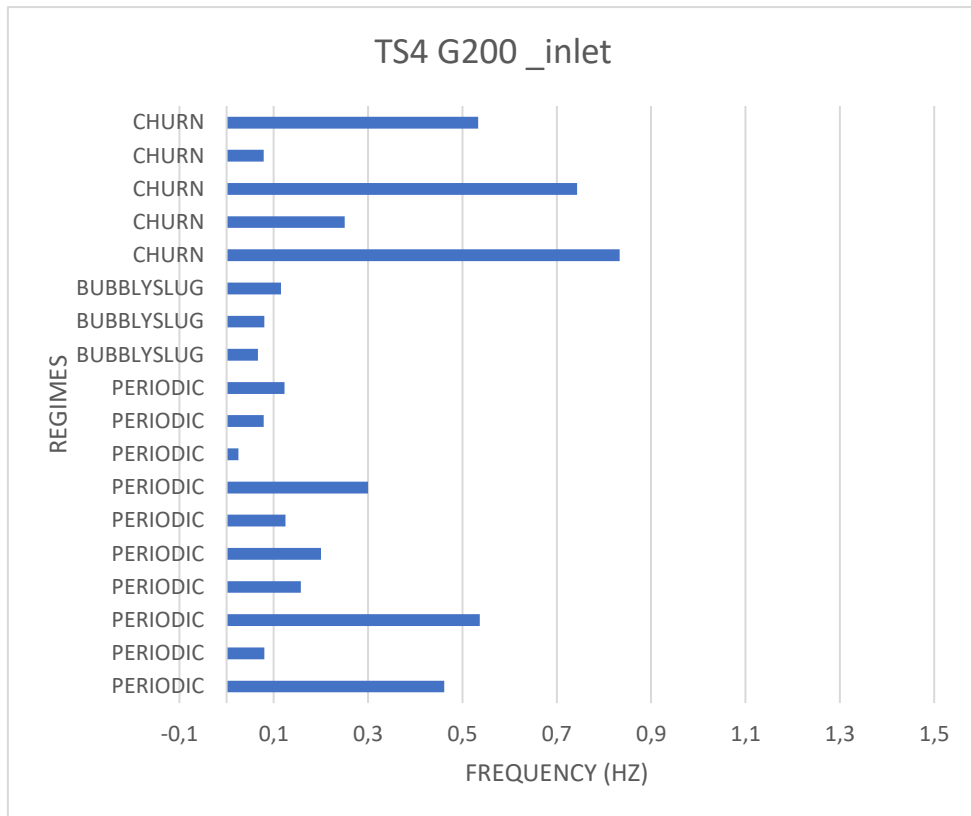
TS3 G800 T_outlet



The frequency range in which the annular regime is observed is 0.02-0.87 Hz.

The frequency range in which the slug regime is observed is 0.02-0.74 Hz.

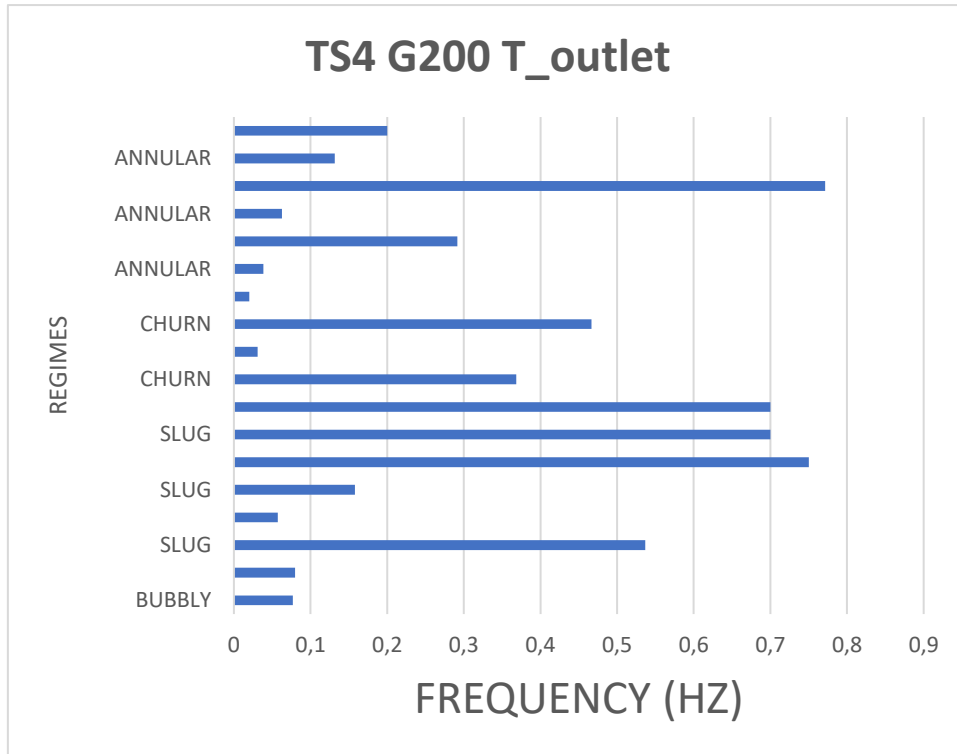
The frequency range in which the Churn regime is observed is 0.02-0.74Hz.

TS4 G200 T_inlet

The frequency range in which the Periodic regimen is observed is 0.12-0.46 Hz.

The frequency range in which the Churn regime is observed is 0.83-0.53 Hz.

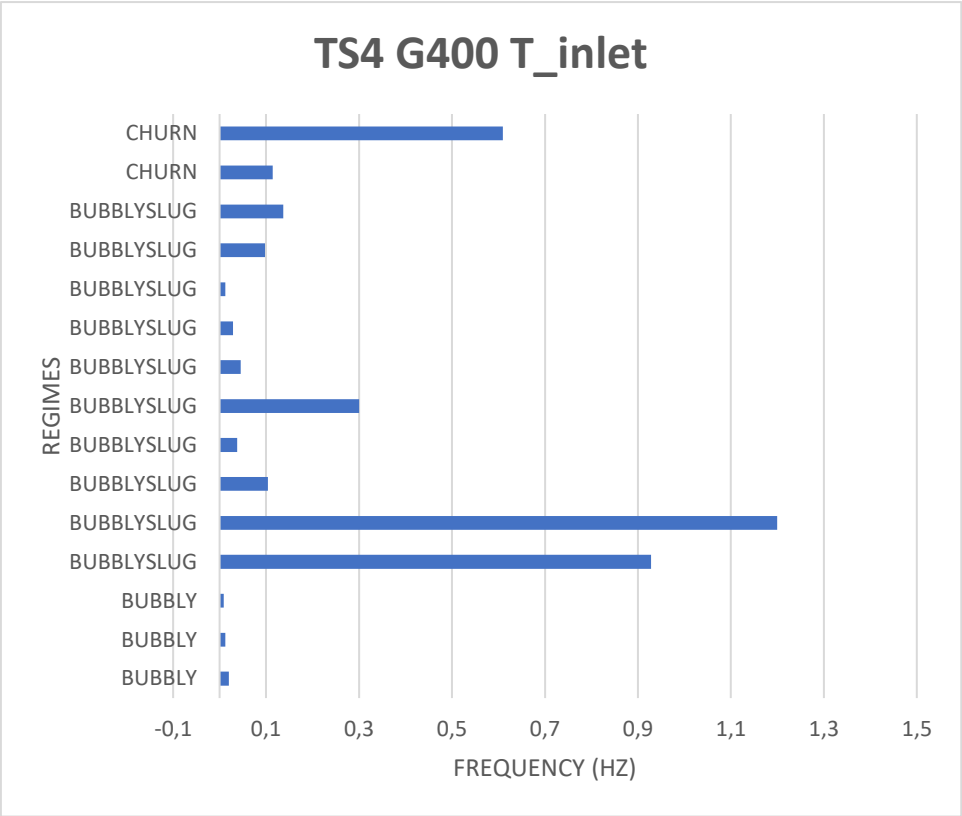
TS4 G200 T_outlet



The frequency range in which the annular regime is observed is 0.02-0.77 Hz.

The frequency range in which the slug regime is observed is 0.05-0.75 Hz.

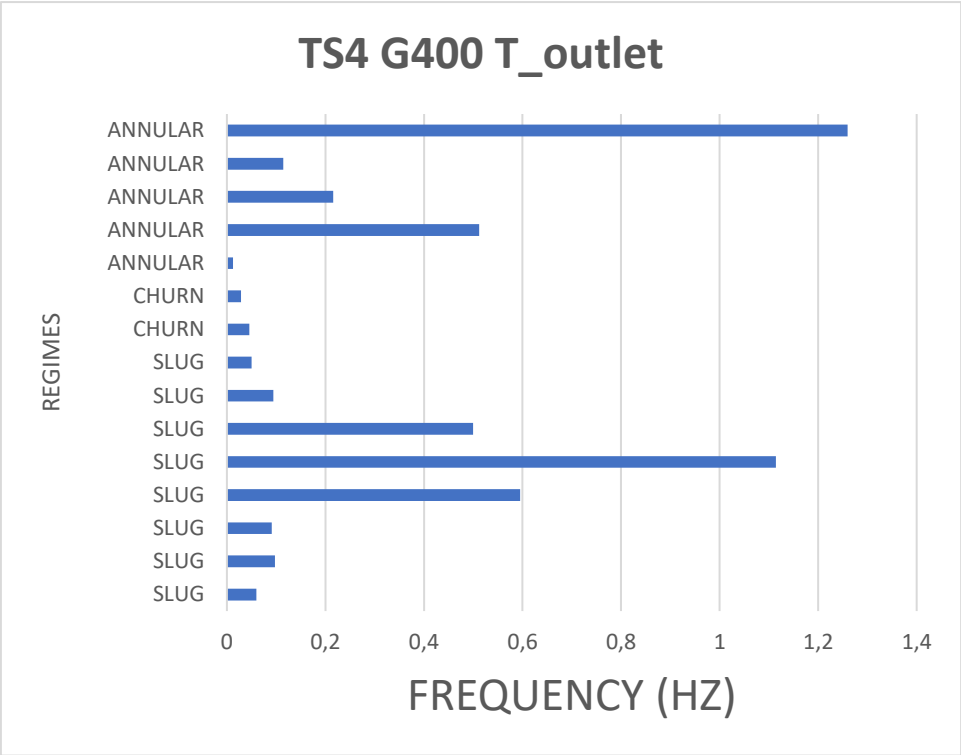
TS4 G400 T_inlet



The frequency range in which the Bubbly-Slug regime is observed is 0.12-1.2 Hz.

The frequency range in which the Churn regime is observed is 0.11-0.61 Hz.

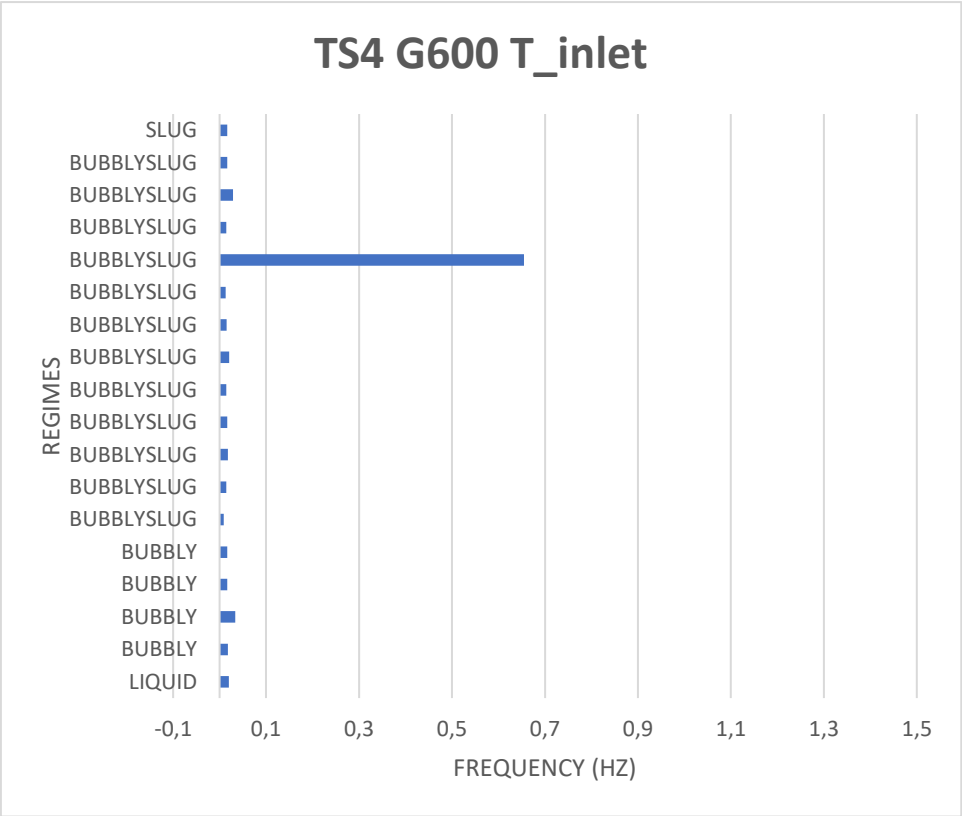
TS4 G400 T_outlet



The frequency range in which the annular regime is observed is 0.01-1.26 Hz.

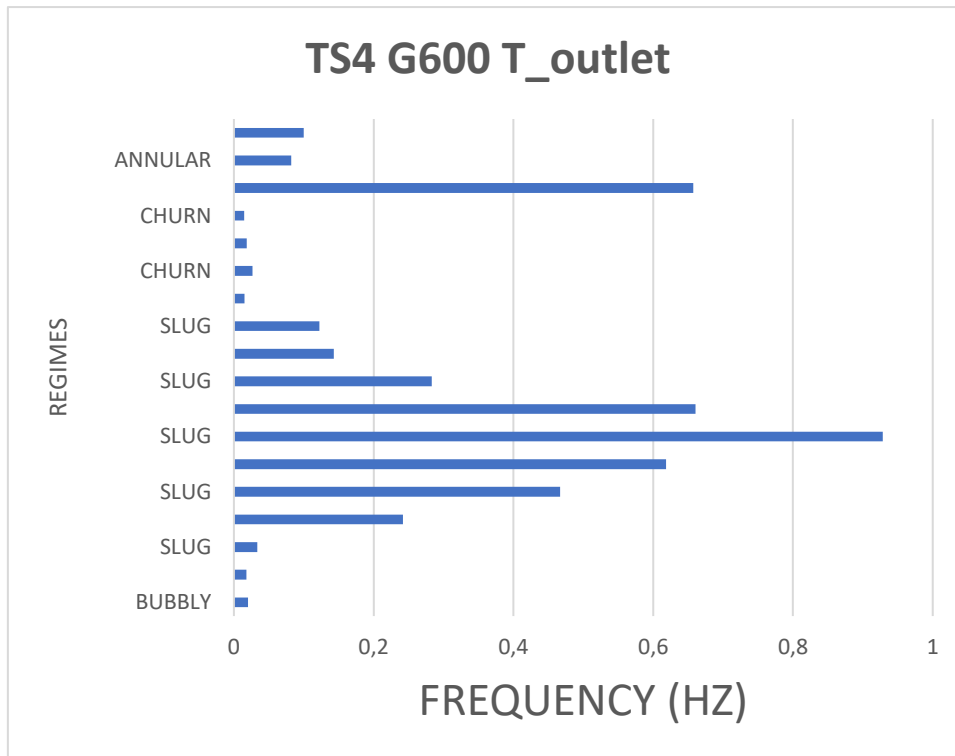
The frequency range in which the slug regime is observed is 0.05-1.11 Hz.

TS4 G600 T_inlet



The frequency range in which the Bubbly-Slug regime is observed is 0.01-0.66 Hz.

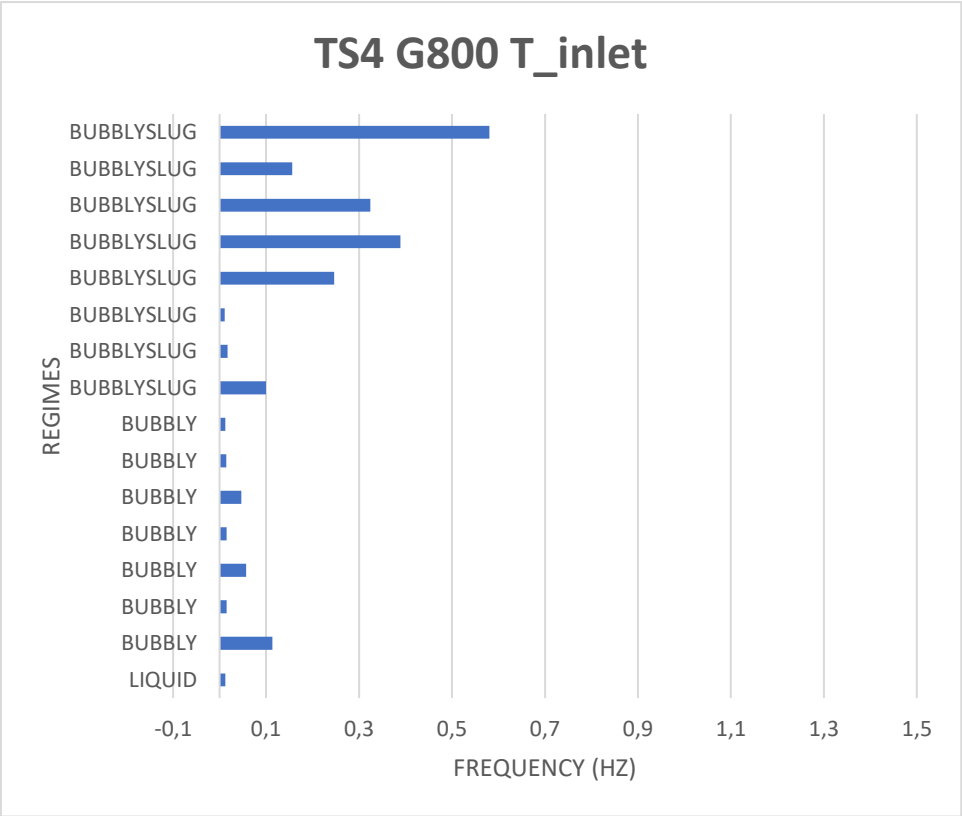
TS4 G600 T_outlet



The frequency range in which the annular regime is observed is 0.08-0.65 Hz.

The frequency range in which the slug regime is observed is 0.03-0.92 Hz.

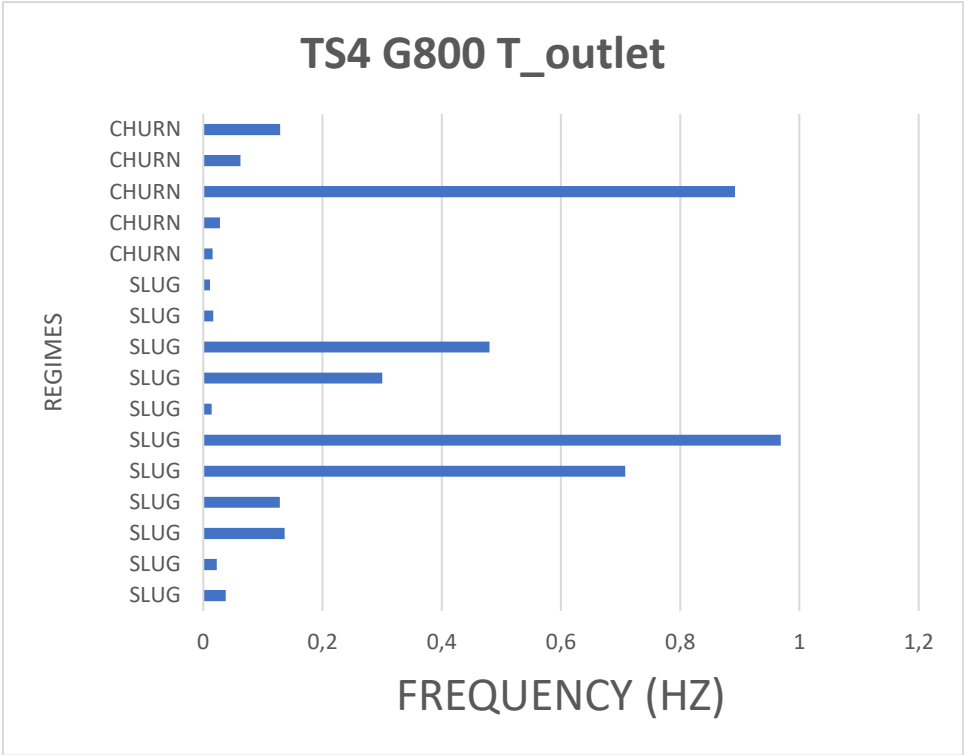
TS4 G800 T_inlet



The frequency range in which the Bubbly-Slug regime is observed is 0.01-0.58 Hz.

The frequency range in which the Bubbly-Slug regime is observed is 0.01-0.11 Hz.

TS4 G800 T_outlet



The frequency range in which the Churn regime is observed is 0.01-0.89 Hz.

The frequency range in which the slug regime is observed is 0.01-0.96 Hz.

DISCUSSION

The frequency range of the dominant regimes is indicated in the charts above. The visual documents, which were not included in the report and amounting to approximately 500 pages, were meticulously examined.

Due to the width of the frequency range in which each regime occurs, any regime could not be matched with a specific and fixed frequency range, no correlation was found. The method used in the project to obtain the frequencies of the data could have been more effective. Different filtering methods and smooth methods could have been used.

Despite the large amount of data, the desired operations were carried out with special algorithms. Another reason why the correlation could not be revealed (even if it is very unlikely) may be due to the low precision of the borders of the regime maps.

The project can be reconsidered for the same purpose, with various and more data. Another reason why the correlation could not be established may be due to the low number of data.

The overall aim of the project is compatible in terms of solving and improving an existing problem.

REFERENCES

- 1- Karayiannis, T. G., & Mahmoud, M. M. (2017). Flow boiling in microchannels: Fundamentals and applications. *Applied Thermal Engineering*, 115, 1372-1397.
- 2- Lee, V. Y., & Karayiannis, T. G. (2020). Effect of inlet subcooling on flow boiling in microchannels. *Applied Thermal Engineering*, 181, 115966.
- 3- Vlachou, M. C., Lioumbas, J. S., & Karapantsios, T. D. (2015). Heat transfer enhancement in boiling over modified surfaces: a critical review. *Interfacial Phenomena and Heat Transfer*, 3(4).
- 4- Harirchian, T., & Garimella, S. V. (2009). Effects of channel dimension, heat flux, and mass flux on flow boiling regimes in microchannels. *International Journal of Multiphase Flow*, 35(4), 349-362.
- 5- Özdemir, M. R., Mahmoud, M. M., & Karayiannis, T. G. (2020). Flow Boiling of Water in a Rectangular Metallic Microchannel. *Heat Transfer Engineering*, 1-25.
- 6- Kennedy, J. E., Roach Jr, G. M., Dowling, M. F., Abdel-Khalik, S. I., Ghiaasiaan, S. M., Jeter, S. M., & Quershi, Z. H. (2000). The onset of flow instability in uniformly heated horizontal microchannels. *J. Heat Transfer*, 122(1), 118-125.
- 7- Mosyak, A., Rodes, L., & Hetsroni, G. (2012). Boiling incipience in parallel microchannels with low mass flux subcooled water flow. *International journal of multiphase flow*, 47, 150-159.
- 8- Qu, W., & Mudawar, I. (2004). Transport phenomena in two-phase micro-channel heat sinks. *J. Electron. Packag.*, 126(2), 213-224.
- 9- Koşar, A., Özdemir, M. R., & Keskinöz, M. (2010). Pressure drop across micro-pin heat sinks under unstable boiling conditions. *International Journal of Thermal Sciences*, 49(7), 1253-1263.
- 10- Kaya, A., Özdemir, M. R., Keskinöz, M., & Koşar, A. (2014). The effects of inlet restriction and tube size on boiling instabilities and detection of resulting premature critical heat flux in microtubes using data analysis. *Applied thermal engineering*, 65(1-2), 575-587.
- 11- Ozdemir, M.R. (2016) Single-Phase Flow and Flow Boiling of Water in Rectengular Metallic Microchannels. PhD thesis, Brunel University, London.

APPENDIX

```
clc;
clear;
load("interval.mat");
%482.satırdaki klasörü değiştir.
diary on %GÜNLÜK OLUŞTURULUYOR
tic %ZAMAN SAYACI BAŞLANGICI
files = dir('*xlsx'); %MEVCUT KLASÖRDEKİ .XLSX UZANTILI DOSYALAR OKUNUYOR
ind12 = 0; %HER BİR GRAFİK DOSYASI İÇİN BAŞLANGIÇ İNDİSİ OLUŞTURULUYOR.
list = zeros; %ÇIKTI VERİLERİN BİR LİSTESİ İÇİN BOŞ BİR MATRİS OLUŞTURULUYOR
list_str = ["", ""];
for k = 1:numel(files) %XLSX UZANTILI DOSYA KADAR DONGU OLUSTURULUYOR
    str = files(k).name; %SIRADAKI EXCEL DOSYASININ ADI ALINIYOR
    str1 = str(3); %SIRADAKI EXCEL DOSYASININ TS NUMARASI (TS NUMARASI
3.ELEMAN)
    str1 = string(str1); %TS DEGERI STRINGE CEVRILIYOR (İSİMLENDİRME İÇİN)
    TS = str2double(str1); %TS DEGERI DOUBLE VERSİYONA CEVRILIYOR (DÖNGÜLER
İÇERİSİNDE NUMERİK DOLANDIRMAK İÇİN)
    str2 = str(7:9); %SIRADAKI EXCEL DOSYASINDAKİ G DEGERI OKUNUYOR.
    str2 = string(str2); %G DEGERI STRINGE CEVRILIYOR (İSİMLENDİRME İÇİN)
    G = str2double(str2); %G DEGERI DOUBLE VERSİYONA CEVRILIYOR (DÖNGÜLER
İÇERİSİNDE NUMERİK DOLANDIRMAK İÇİN)
    str3 = str(14:15); %SIRADAKI EXCEL DOSYASINDAKİ GIRIS SICAKLIK (T_inlet)
DEGERI OKUNUYOR
    str3 = string(str3); %T_inlet DEGERI STRINGE CEVRILIYOR (İSİMLENDİRME
İCİN)
    TT = str2double(str3); %T_inlet DEGERI DOUBLE VERSİYONA CEVRILIYOR
(DÖNGÜLER İÇERİSİNDE NUMERİK DOLANDIRMAK İÇİN)
    fprintf('%s dosyasi isleme alindi\n',files(k).name); % KULLANICI
BILDIRIMLERI I
    [~,sheets] = xlsfinfo(files(k).name); % SIRADAKI EXCEL DOSYASININ SAYFA
SAYISI OKUNUYOR
    fprintf('%s dosyasinin sayfa sayisi okundu : %d
\n',files(k).name,size(sheets,2)); % KULLANICI BILDIRIMLERI II
    ind13 = 0; %AYNI TS VE G DEĞERİNDEKİ VERİ SAYISI OKUNUYOR
    for iii = 1:numel(sheets) % SIRADAKI EXCEL DOSYASININ ICERDIGI SAYFA
SAYISI KADAR DONGU OLUSTURULUYOR.
        [AA,BB] = xlsread(files(k).name,char(sheets(iii))); % SIRADAKI EXCEL
DOSYASININ SIRADAKI SAYFASINDAKİ
        ...TUM DEGERLER (BUNLAR STRING VE DOUBLE OLARAK OKUNUYOR)
        n = size(BB,2); %SIRADAKI EXCEL DOSYASININ SIRADAKI SAYFASININ
SUTUN SAYISI OKUNUYOR.
        ...BU DEGERIN OKUNMA SEBEBI DEGERLER:

...[T_inlet,T_outlet,Pressure_Difference,[],T_inlet,T_outlet_Pressure_Differe
nce] SEKLİNDE.
        d = 0; % VERİ TAKIMI SAYISI İCİN İNDİS OLUSTURULUYOR.
        for iiii = 1:4:((n)) % VERİ TAKIMINA UYGUN SEKİLDE FOR DONGUSU
YAZILIYOR
            d = d + 1; %YENİ İNDİS DEGERI OLUSTURMA
            BBC = BB(1,iiii); %BB MATRİSİNİN İLK SATIRI CHAR OLDUGU İCİN,KW
DEGERLERİNİN ICERDIGI
            ...O STRING SATIRI ICERİSİNDE BULUNAN KW DEGERI İCİN
OLUSTURULUYOR.
```

```

        BBC = char(BBC); %STRING OLAN SATIR, TEK TEK INCELENMESI ICIN
CHAR VERSIYONA DONUSTURULUYOR.
        BBC = BBC(7:end); %KW DEGERININ OKUNMASI ICIN DUZENLEMELER.
        BBC = BBC(1:end-4); %KW DEGERININ OKUNMASI ICIN DUZENLEMELER.
        BBC = str2double(BBC);%KW DEGERI DOUBLE VERSIYONA CEVRILIYOR.
        if TS == 4 %TS-4 ICIN KW DEGERINE KARSILIK Q DEGERI
        YAZDIRILIYOR.
                FR = ((BBC*10^(-3))/(154.5*10^(-6)));
        elseif TS == 3 %TS-3 ICIN KW DEGERINE KARSILIK Q DEGERI
        YAZDIRILIYOR.
                FR = ((BBC*10^(-3))/(130.2*10^(-6)));
        elseif TS == 2 %TS-2 ICIN KW DEGERINE KARSILIK Q DEGERI
        YAZDIRILIYOR.
                FR = ((BBC*10^(-3))/(146.3*10^(-6)));
        elseif TS == 1 %TS-1 ICIN KW DEGERINE KARSILIK Q DEGERI
        YAZDIRILIYOR.
                FR = ((BBC*10^(-3))/(110.4*10^(-6)));
        end
        fr = floor(FR); %FR DEGERI DUZENLENIYOR.

        oek = '';
        iek = '';
        if TT == 88
                if TS == 1
                        if G == 200
                                if fr < 64.2
                                        iek = "LIQUID";
                                elseif fr < 253.54
                                        iek = "PERIODIC";
                                elseif fr < 336.24
                                        iek = "BUBBLYSLUG";
                                elseif fr < 842.2
                                        iek = "SLUG";
                                end
                        elseif G == 400
                                if fr < 80.52
                                        iek = "LIQUID";
                                elseif fr < 142.55
                                        iek = "PERIODIC";
                                elseif fr < 244.83
                                        iek = "BUBBLY";
                                elseif fr < 486.398
                                        iek = "BUBBLYSLUG";
                                elseif fr < 750.816
                                        iek = "SLUG";
                                end
                        elseif G == 600
                                if fr < 328.618
                                        iek = "LIQUID";
                                elseif fr < 642.002
                                        iek = "BUBBLY";
                                elseif fr < 750.816
                                        iek = "BUBBLYSLUG";
                                elseif fr < 857.454
                                        iek = "SLUG";
                                end
                        elseif G == 800

```

```

        if fr < 293.798
            iek = "LIQUID";
        elseif fr < 546.246
            iek = "BUBBLY";
        elseif fr < 650.707
            iek = "BUBBLYSLUG";
        elseif fr < 865.071
            iek = "SLUG";
        end
    end
elseif TS == 2
    if G == 200
        if fr < 112.63
            iek = "LIQUID";
        elseif fr < 177.98
            iek = "BUBBLY";
        elseif fr < 403.24
            iek = "BUBBLYSLUG";
        elseif fr < 1047.1
            iek = "SLUG";
        end
    elseif G == 400
        if fr < 112.63
            iek = "LIQUID";
        elseif fr < 198.841
            iek = "BUBBLY";
        elseif fr < 636.848
            iek = "BUBBLYSLUG";
        elseif fr < 1148.55
            iek = "SLUG";
        end
    elseif G == 600
        if fr < 107.068
            iek = "LIQUID";
        elseif fr < 554.809
            iek = "BUBBLY";
        elseif fr < 1090.15
            iek = "SLUG";
        end
    elseif G == 800
        if fr < 139.05
            iek = "LIQUID";
        elseif fr < 728.621
            iek = "BUBBLY";
        elseif fr < 956.663
            iek = "SLUG";
        end
    end
end
elseif TS == 3
    if G == 200
        if fr < 11.5756
            iek = "LIQUID";
        elseif fr < 369.132
            iek = "PERIODIC";
        elseif fr < 495.177
            iek = "SLUG";
        elseif fr < 1200

```

```

        iek = "CHURN";
    end
elseif G == 400
    if fr < 63.0225
        iek = "LIQUID";
    elseif fr < 225.08
        iek = "BUBBLY";
    elseif fr < 273.955
        iek = "BUBBLYSLUG";
    elseif fr < 625.08
        iek = "SLUG";
    elseif fr < 1200
        iek = "CHURN";
    end
elseif G == 600
    if fr < 153.055
        iek = "LIQUID";
    elseif fr < 900
        iek = "BUBBLY";
    end
elseif G == 800
    if fr < 478.457
        iek = "LIQUID";
    elseif fr < 739.55
        iek = "BUBBLY";
    elseif fr < 974.92
        iek = "BUBBLYSLUG";
    elseif fr < 1200
        iek = "SLUG";
    end
end
elseif TS == 4
    if G == 200
        if fr < 41.9251
            iek = "LIQUID";
        elseif fr < 441.711
            iek = "PERIODIC";
        elseif fr < 627.38
            iek = "BUBBLYSLUG";
        elseif fr < 1200
            iek = "CHURN";
        end
    elseif G == 400
        if fr < 118.289
            iek = "LIQUID";
        elseif fr < 200.642
            iek = "BUBBLY";
        elseif fr < 775.615
            iek = "BUBBLYSLUG";
        elseif fr < 1099.04
            iek = "CHURN";
        end
    elseif G == 600
        if fr < 107.807
            iek = "LIQUID";
        elseif fr < 232.086
            iek = "BUBBLY";

```

```

elseif fr < 1009.2
    iek = "BUBBLYSLUG";
elseif fr < 1184.39
    iek = "SLUG";
end
elseif G == 800
    if fr < 142.246
        iek = "LIQUID";
    elseif fr < 453.69
        iek = "BUBBLY";
    elseif fr < 1346.1
        iek = "BUBBLYSLUG";
    end
end
end
end
if TT == 88
    if TS == 1
        if G == 200
            if fr < 48.966
                oek = "LIQUID";
            elseif fr < 65.288
                oek = "BUBBLY";
            elseif fr < 136.02
                oek = "PERIODIC";
            elseif fr < 151.25
                oek = "BUBBLYSLUG";
            elseif fr < 207.84
                oek = "SLUG";
            elseif fr < 492.93
                oek = "CHURN";
            elseif fr < 842.22
                oek = "ANNULAR";
            end
        elseif G == 400
            if fr < 79.4342
                oek = "LIQUID";
            elseif fr < 100.109
                oek = "BUBBLY";
            elseif fr < 143.634
                oek = "BUBBLYSLUG";
            elseif fr < 206.746
                oek = "SLUG";
            elseif fr < 380.849
                oek = "CHURN";
            elseif fr < 750.816
                oek = "ANNULAR";
            end
        elseif G == 600
            if fr < 106.638
                oek = "LIQUID";
            elseif fr < 164.309
                oek = "BUBBLY";
            elseif fr < 206.746
                oek = "BUBBLYSLUG";
            elseif fr < 295.974
                oek = "SLUG";
            end
        end
    end
end

```

```

elseif fr < 485.31
    oek = "CHURN";
elseif fr < 857.454
    oek = "ANNULAR";
end
elseif G == 800
    if fr < 136.017
        oek = "LIQUID";
    elseif fr < 206.746
        oek = "BUBBLY";
    elseif fr < 250.272
        oek = "BUBBLYSLUG";
    elseif fr < 547.334
        oek = "CHURN";
    elseif fr < 865.071
        oek = "ANNULAR";
    end
end
elseif TS == 2
    if G == 200
        if fr < 6.9525
            oek = "LIQUID";
        elseif fr < 33.372
            oek = "BUBBLY";
        elseif fr < 211.36
            oek = "SLUG";
        elseif fr < 403.24
            oek = "CHURN";
        elseif fr < 1048.4
            oek = "ANNULAR";
        end
    elseif G == 400
        if fr < 33.372
            oek = "LIQUID";
        elseif fr < 80.6489
            oek = "BUBBLY";
        elseif fr < 307.3
            oek = "SLUG";
        elseif fr < 546.466
            oek = "CHURN";
        elseif fr < 1148.55
            oek = "ANNULAR";
        end
    elseif G == 600
        if fr < 26.4195
            oek = "LIQUID";
        elseif fr < 108.459
            oek = "BUBBLY";
        elseif fr < 262.804
            oek = "SLUG";
        elseif fr < 446.35
            oek = "CHURN";
        elseif fr < 1090.15
            oek = "ANNULAR";
        end
    elseif G == 800
        if fr < 57.0104

```



```

        oek = "LIQUID";
elseif fr < 169.641
    oek = "BUBBLY";
elseif fr < 268.366
    oek = "SLUG";
elseif fr < 670.22
    oek = "CHURN";
elseif fr < 958.053
    oek = "ANNULAR";
end
end
elseif TS == 3
    if G == 200
        if fr < 11.5756
            oek = "LIQUID";
        elseif fr < 97.7492
            oek = "PERIODIC";
        elseif fr < 230.225
            oek = "SLUG";
        elseif fr < 493.891
            oek = "CHURN";
        elseif fr < 1200
            oek = "ANNULAR";
        end
    elseif G == 400
        if fr < 34.7267
            oek = "LIQUID";
        elseif fr < 320.257
            oek = "SLUG";
        elseif fr < 469.453
            oek = "CHURN";
        elseif fr < 1200
            oek = "ANNULAR";
        end
    elseif G == 600
        if fr < 37.299
            oek = "LIQUID";
        elseif fr < 189.068
            oek = "SLUG";
        elseif fr < 357.556
            oek = "CHURN";
        elseif fr < 1200
            oek = "ANNULAR";
        end
    elseif G == 800
        if fr < 63.0225
            oek = "LIQUID";
        elseif fr < 478.457
            oek = "SLUG";
        elseif fr < 680.386
            oek = "CHURN";
        elseif fr < 1200
            oek = "ANNULAR";
        end
    end
end
elseif TS == 4
    if G == 200

```

```

        if fr < 41.9251
            oek = "LIQUID";
        elseif fr < 73.369
            oek = "BUBBLY";
        elseif fr < 278.503
            oek = "SLUG";
        elseif fr < 495.615
            oek = "CHURN";
        elseif fr < 1200
            oek = "ANNULAR";
        end
    elseif G == 400
        if fr < 80.8556
            oek = "LIQUID";
        elseif fr < 119.786
            oek = "BUBBLY";
        elseif fr < 479.144
            oek = "SLUG";
        elseif fr < 618.396
            oek = "CHURN";
        elseif fr < 1099.04
            oek = "ANNULAR";
        end
    elseif G == 600
        if fr < 71.8717
            oek = "LIQUID";
        elseif fr < 109.305
            oek = "BUBBLY";
        elseif fr < 146.738
            oek = "BUBBLYSLUG";
        elseif fr < 554.011
            oek = "SLUG";
        elseif fr < 868.449
            oek = "CHURN";
        elseif fr < 1185.88
            oek = "ANNULAR";
        end
    elseif G == 800
        if fr < 74.8663
            oek = "LIQUID";
        elseif fr < 104.813
            oek = "BUBBLY";
        elseif fr < 634.866
            oek = "SLUG";
        elseif fr < 1046.63
            oek = "CHURN";
        elseif fr < 1344
            oek = "ANNULAR";
        end
    end
end
end

ind12 = ind12 + 1; %REJIM
ind13 = ind13 + 1; %REJIM
list(ind12,1:7) = [ind12,TS,G,TT,ind13,BBC,fr]; %GRAFİK LİSTESİ
İÇİN LİSTE DOLDURULUYOR.

```

```

list_str(ind12,1:2) = [iek,oek];
AFN =
sprintf('TS%dG%dTi%dQ%dTi00%s00',double(TS),double(G),TT,fr,iek); % T_inlet
MATRISI ICIN BASLIK YAZILIYOR.
BFN =
sprintf('TS%dG%dTi%dQ%dTo00%s00',double(TS),double(G),TT,fr,oek); % T_outlet
MATRISI ICIN BASLIK YAZILIYOR.
CFN =
sprintf('TS%dG%dTi%dQ%dDp00%s00%s00',double(TS),double(G),TT,fr,iek,oek); %
Pressure_Difference MATRISI ICIN BASLIK YAZILIYOR.
fprintf('%s dosyasinin %d. sayfasindaki %d.aki okundu : %5.3f
\n',files(k).name,iii,d,fr); %KULLANICI BILDIRIMLERI III.
eval(sprintf('%s = AA(:,iiii);',AFN)); %T_inlet MATRISI
OLUSTURULUYOR.
eval(sprintf('%s =
%s(interval(ind12,1):interval(ind12,2),:);',AFN,AFN)); %T_inlet MATRISI
ISTENILEN ARALIKLARDA YENIDEN DUZENLENIYOR

eval(sprintf('%s(isnan(%s)) = [];',AFN,AFN)); %T_inlet MATRISI
ICERISINDEKI NaN DEGERLERI SILINIYOR.

eval(sprintf('std_inlet = std(%s);',AFN));
eval(sprintf('min_ti = min(%s);',AFN));
eval(sprintf('max_ti = max(%s);',AFN));
eval(sprintf('mean_ti = mean(%s);',AFN));
eval(sprintf('diff_ti = max_ti - min_ti;'))

fprintf('%s matrisi olusturuldu \n',AFN); % KULLANICI
BILDIRIMLERI IV
eval(sprintf('%s = AA(:,iiii+1);',BFN)); %T_outlet MATRISI
OLUSTURULUYOR.
eval(sprintf('%s =
%s(interval(ind12,1):interval(ind12,2),:);',BFN,BFN)); %T_outlet MATRISI
ISTENILEN ARALIKLARDA YENIDEN DUZENLENIYOR

eval(sprintf('%s(isnan(%s)) = [];',BFN,BFN)); %T_outlet MATRISI
ICERISINDEKI NaN DEGERLERI SILINIYOR.

eval(sprintf('std_outlet = std(%s);',BFN));
eval(sprintf('min_to = min(%s);',BFN));
eval(sprintf('max_to = max(%s);',BFN));
eval(sprintf('mean_to = mean(%s);',BFN));

eval(sprintf('diff_to = max_to - min_to;'))
fprintf('%s matrisi olusturuldu \n',BFN); % KULLANICI
BILDIRIMLERI V
eval(sprintf('%s = AA(:,iiii+2);',CFN)); %Pressure_Difference
MATRISI OLUSTURULUYOR.
eval(sprintf('%s =
%s(interval(ind12,1):interval(ind12,2),:);',CFN,CFN)); %Pressure_Difference
ISTENILEN ARALIKLARDA YENIDEN DUZENLENIYOR

eval(sprintf('%s(isnan(%s)) = [];',CFN,CFN));
%Pressure_Difference MATRISI ICERISINDEKI NaN DEGERLERI SILINIYOR.

eval(sprintf('std_dp = std(%s);',CFN));

```



```

        ylabel(M_mean)
        hold on
        ylabel(M_min)
        hold on
        ylabel(M_max)
        xlabel('Time (mS)')
        if i == 0
            ylabel('kPa')
        else
            ylabel('Temperature (C)')
        end
        title(sprintf('%s\nMax : %5.4f\nMin : %5.4f\n Mean : %5.4f',matriceslist(DD+i),M_max,M_min,M_mean))
        subplot(2,3,i+4)
        plot(f(2:end),K(2:end),'-r')
        axis([-0.1 freq*4 0 1.2*max(K(2:end))])
        grid
        title(sprintf('FFT %s\nFreq = %5.5f\n%d',matriceslist(DD+i),freq,freq*numel(s)/1000))
        %DATA = [MAX MIN MEAN FREQ] 1-dp 2-Ti 3-To
        DATA(DD+i,:) = [M_max,M_min,M_mean,freq];
    end
    exportgraphics(aa, sprintf('C:\\Users\\TARIK-WS\\Desktop\\ÇALIŞMA ALANIM\\ATALAR VE ÇIKTILARI\\JPGS\\%s.jpg',matriceslist(DD+i)),Resolution=600,ContentType="image")
    saveas(aa,sprintf('C:\\Users\\TARIK-WS\\Desktop\\ÇALIŞMA ALANIM\\ATALAR VE ÇIKTILARI\\JPGS\\%s.fig',matriceslist(DD+i)));
end

```
