Pratap Bose

HYDRAULIC ANALYSIS USING PIPENET SOFTWARE

- APPLICATION AND ADVANTAGES

CONTENTS

Who use PIPENET?

Across the globe for over 40 years	by companies large and small including many multinationals	which standardise on PIPENET and specify that it must be used by subcontractors

Why use PIPENET?

- PIPENET sets the standard- leads the way in automation of flow analysis
- PIPENET starts at the design phase
- PIPENET performs pipe sizing and pump / compressor selection calculations
- PIPENET carries out dynamic analysis to computing hydraulic loads for pipe stress analysis and support design
- PIPENET can be used in hydraulic analysis of
  - ✓ FF, CW, SW, PW, Make-up Water, Clarified Water
  - ✓ Service Air, Any Gas distribution network
  - ✓ PWDS, DFDS, CFDS
  - ✓ Steam Piping, Feed Water, Ventilation System
  - ✓ Loading Unloading System, Subsea and Cross-country pipeline

Pratap Bose

HYDRAULIC ANALYSIS USING PIPENET SOFTWARE

-CAPABILITIES AND FEW CREDENTIALS

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

Hydraulic Analysis of Fire Water Network

Project :
2 x 500 MW Neyveli New Thermal Power Project (NNTPP)
Flue Gas Desulphurization (FGD) System Package (NTA4)

Owner:
NLC INDIA LIMITED (NLCIL)

FGD CONTRACT REF. NO: 053707 / CO. CONTS / 0016K / NNTPP / NTA4 – FGD / e-conts / 2020, Dt.30.03.2022

EPC Contractor :
LARSEN & TOUBRO LIMITED

EPC Contractor's Engineer :
Larsen and Toubro Limited
Energy Products and Systems Engineering (EPSE)

Technology (QFGDM)
CHIYODA CORPORATION

Owners Consultant:
Tractebel Engineering Pvt. Ltd. (India)

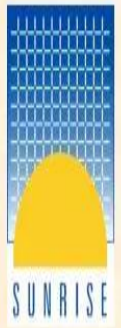
Vendor :
B & B UNICON

FGD Document Title:
Layout of MVW Spray System along with pressure drop calculation for Cable Galleries

VENDOR Doc No: - BBU-LT-NNTPP-FFS-004	REV.: 01
L&T Doc No EO22001-00-HT-M-GA-909	REV.: 01
NLCIL Doc No: NTA4-00-HT-M-GA-909	REV.: 01
Space for Stamping	

TRACTEBEL — TRACTEBEL ENGINEERING PVT. LTD.
APPROVAL STATUS:
1. APPROVED
2. APPROVED AS NOTED
3. COMMENTED
4. RECEIVED FOR INFORMATION/REFERENCE
THIS APPROVAL STATUS SHALL NOT RELIEVE THE CONTRACTOR FROM HIS CONTRACTUAL OBLIGATIONS.
DEPARTMENT: DEM | DATE: 30-Sep-2023 | SIGNATURE: | NAME: SATYAN GOEL

Rev No	Date	Reason of Revision	Prepared by	Reviewed by	Approved by
00	25-07-2023	ISSUED FOR APPROVAL	SB	SB	PB
01	19-09-2023	RE-SUBMISSION FOR APPROVAL	SB	SB	PB



PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

Hydraulic Analysis of Fire Water Network

Project Objective

- 2 x 500 MW NNTPP FGD Plant A/C LnT, Energy-Power Division
- Checking suitability of input pressure available at tapping point of FW network
- Pipe Sizing
- Actual availability of Pressure at MVW Spray Nozzles against design limits

Application Usage Advantage

- MVW Spray System in FGD Plant Cable Cellar Room
- Same analysis can be done for any type of pressurised water distribution application
- Optimum design of Water Pump and Pipe sizing

Salient Features

- Fluid- Water, Temp- 20 Deg C
- Pipe type- GI ERW as per IS:1239 Medium Gr.
- Max Velocity- 10 M/Sec
- No. of Pipe Segments- 439. Input Node- 1, Output Nodes-201
- No. of Iterations - 2

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS
LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

PIPENET Output – Sample Page

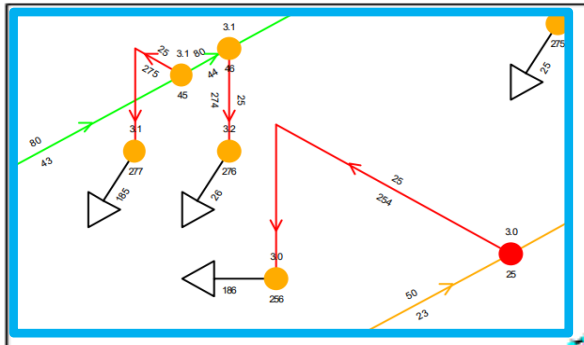
PIPENET® Spray Module Report

Project: PROJECT : NNTPP (2x500 MW) - FGD PACKAGE

SUNRISE

Flow in pipes

Label	Input node	Output node	Bore	Inlet pressure	Outlet pressure	Static head loss	Friction loss	Flow	Velocity
			(mm)	(Bar G)	(Bar G)	(Bar)	(Bar)	(l/min)	(m/sec)
1	1	2	150.0	7.3463475	5.85032	0.068525317	1.4275022	7850.9958	6.9976425
2	3	4	150.0	5.021195	3.519305	0.27410127	1.2277888	7850.9958	6.9976425
3	4	5	150.0	3.519305	3.3903	0	0.129005	7434.3576	6.6262898
4	5	6	150.0	3.3903	3.31613	0	0.07417	6854.3196	6.1092987
5	6	7	150.0	3.31613	3.250765	0	0.065365	6216.057	5.540411
6	7	8	150.0	3.250765	3.20193	0	0.048835	5612.7128	5.0026464
7	8	9	150.0	3.20193	3.17105	0	0.03088	3137.38346	2.7963698
8	9	10	100.0	3.17105	3.1058	0	0.06525	2221.7162	4.3506678
9	10	11	100.0	3.1058	3.08847	0	0.01733	1470.5963	2.8797238
10	11	12	80.00	3.08847	3.05918	0	0.02929	651.58965	2.1604939
11	12	13	65.00	3.05918	3.032575	0	0.026605	310.845617	1.4223592
12	13	14	65.00	3.032575	3.022065	0	0.01051	279.175574	1.2774442
13	14	15	50.00	3.022065	2.99219	0	0.029875	247.559091	1.9059833
14	15	16	50.00	2.99219	2.968955	0	0.023235	216.095368	1.6637409
15	16	17	40.00	2.968955	2.92177	0	0.047185	184.750948	2.2764039
16	17	18	40.00	2.92177	2.916475	0	0.005295	153.67134	1.8934573
17	18	19	40.00	2.916475	2.89089	0	0.025585	122.598116	1.5106895
18	19	20	32.00	2.89089	2.859365	0	0.031525	91.657983	1.5347201
19	20	21	25.00	2.859365	2.801475	0	0.05789	60.882582 6	1.7854484
20	21	22	25.00	2.801475	2.854605	-0.078314653	0.025184653	30.412034 8	0.8918663 3
21	12	23	65.00	3.05918	3.0215	0	0.03768	340.744033	1.5591676
22	23	24	65.00	3.0215	3.00881	0	0.01269	309.130429	1.414511
23	24	25	50.00	3.00881	2.987415	0	0.021395	277.581616	2.13713
24	25	26	50.00	2.987415	2.974975	0	0.01244	246.233884	1.8957804
25	26	27	50.00	2.974975	2.95199	0	0.022985	214.858507	1.6542182
26	27	28	40.00	2.95199	2.89798	0	0.05401	183.60151	2.2622411
27	28	29	40.00	2.89798	2.85961	0	0.03837	152.624426	1.8806578



Blow Up ‘A’

‘A’

PIPENET Output- Pressure Vs. Pipe Bore Diagram

PROJECT : NNTPP (2x500 MW) - FGD PACKAGE			
Prepared by Pratap Bose (B&B UNICON)	M-9830448290, talk2pratapbose@gmail.com		
PIPENET Schematic	Friday, August 16, 2024		Page 1 of 1
Pressure (Bar G)	< 3.000000	< 4.000000	< 5.000000
	< 6.000000	< 7.000000	> 7.000000
Pipe bore (mm)	< 50.000000	< 75.000000	< 100.000000
	< 125.000000	< 150.000000	> 150.000000

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS
LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

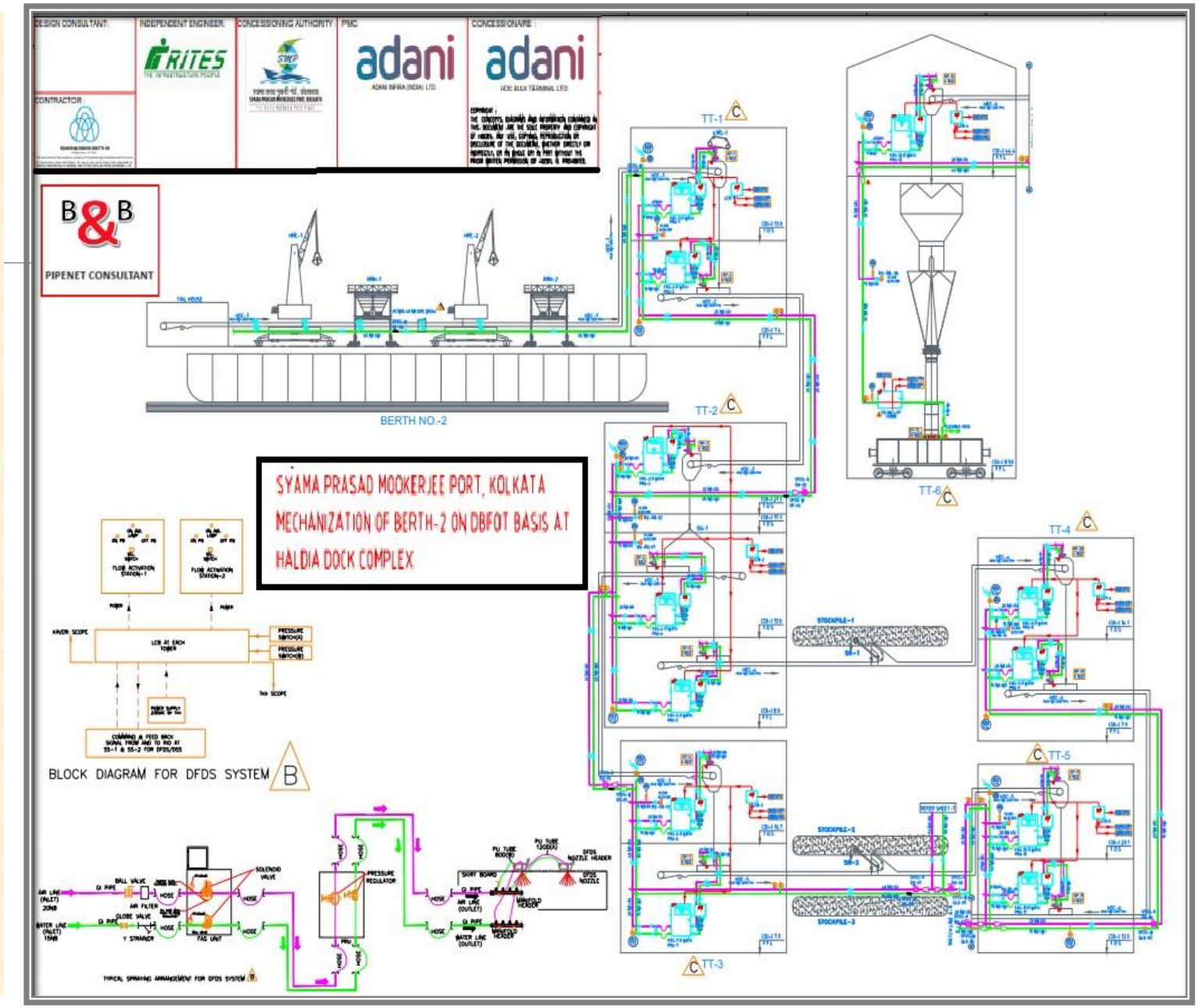
Tel.:
+44 1223 441311
Fax:
+44 1223 441297

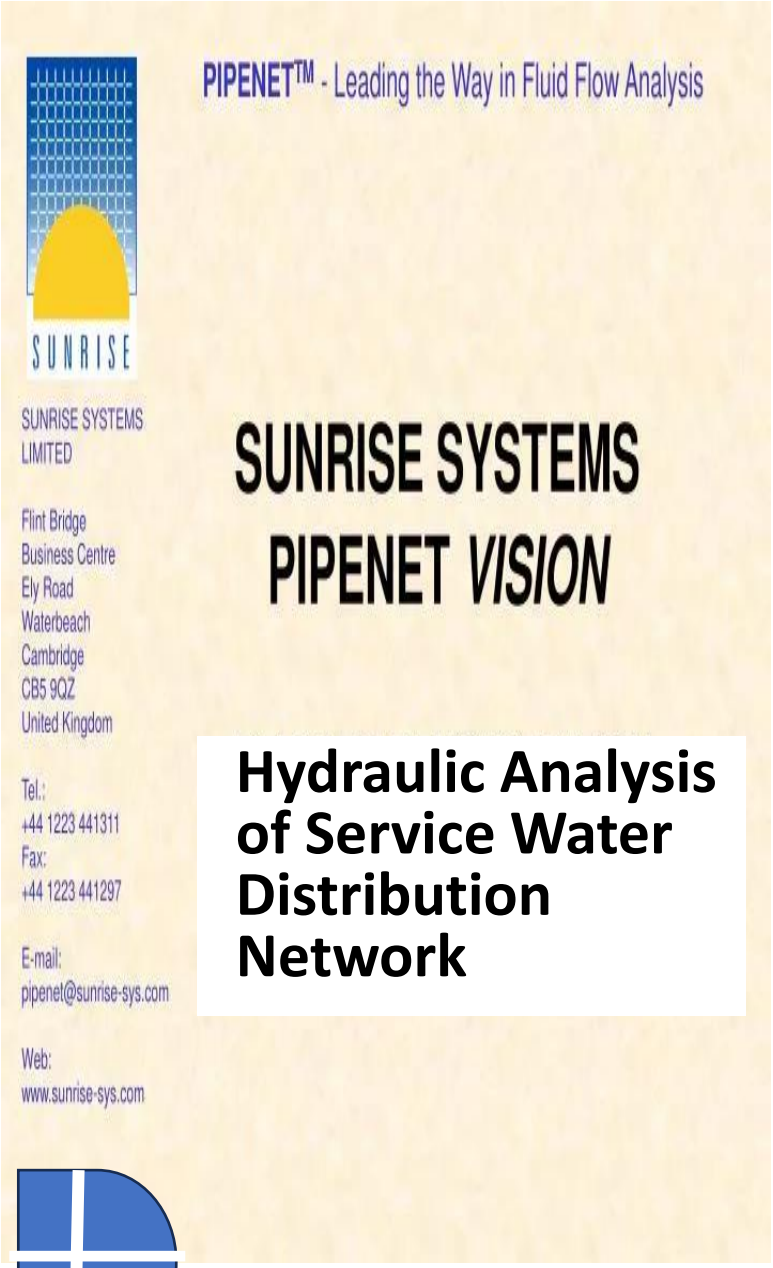
E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

Hydraulic Analysis of Service Water Distribution Network





Project Objective

- Shyamaprasad Mukherjee Port, Kolkata, Berth-2 A/C. ADANI
- Capacity Selection of DS Water Pump
- Pipe Sizing
- Actual availability of Pressure at Output Points against desired Water Flow

Application Usage Advantage

- Dry Fog Dust Suppression System in Coal Handling Plant
- Same analysis can be done for any type of pressurised water distribution application
- Optimum design of Water Pump and Pipe sizing

Salient Features

- Fluid- Water, Temp- 20 Deg C
- Pipe type- GI ERW as per IS:1239 Heavy Gr.
- Max Velocity- 2 M/Sec up to 65 NB; 2.5 M/Sec for 80 NB and above.
- No. of Pipe Segments- 54, Input Node- 1, Output Nodes-18
- No. of Iterations - 3

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

PIPENET Output – Sample Page

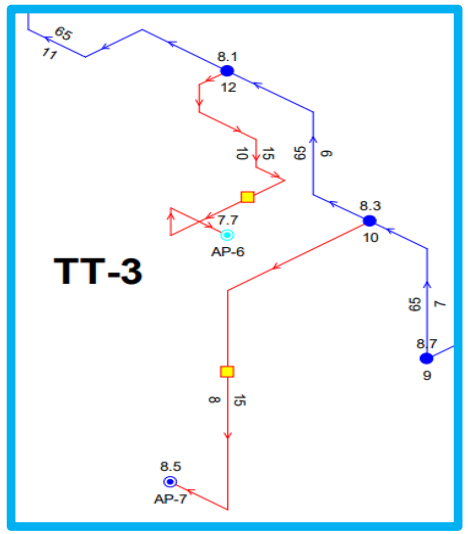
PIPENET® Standard Module Report

Project: Hydraulic Calculation- DFDS (Water) in TT 1-6, Silo, MH1, MH

Calculated Results

Flow in pipes

Label	Input node	Output node	Inlet pressure (kg/cm² G)	Outlet pressure (kg/cm² G)	Friction friction units	Velocity (m/sec)	Flow (m³/h)	Density (kg/m³)	Static head loss (kg/cm²)	Friction factor	Design-group
1	2	3	11.4996915	11.4128107	0.00244668159	1.3809776	24.000006	998.20331	0.0698742313	4.94067417E-03	Unset
2	3	4	11.4128107	11.3944813	0.00244668159	1.3809776	24.000006	998.20331	0	4.94067417E-03	Unset
4	4	5	11.3944813	11.3768861	0.00244668159	1.3809776	24.000006	998.20331	0	4.94067417E-03	Unset
5	7	8	11.3191355	11.0485548	0.00192503301	1.2152604	21.120021	998.20331	0.0798562669	5.01976302E-03	Unset
6	8	9	11.0485548	8.69857699	0.00344017015	1.4830402	18.431995	998.20331	0.349371141	5.09627303E-03	Unset
7	9	10	8.69857699	8.25738779	0.00344017015	1.4830402	18.431995	998.20331	0.419245369	5.09627303E-03	Unset
8	10	AP-7/0	8.25738779	8.52541327	0.000183230257	0.1194632 4	0.0719999917	998.20331	-0.771112031	9.20834485E-03	Unset
9	10	12	8.25738779	8.11541148	0.00341644761	1.4772471	18.359999	998.20331	0.106308658	5.09861764E-03	Unset
10	12	AP-6/0	8.11541148	7.68194735	0.000122126944	0.0796421692	0.0480000031	998.20331	-0.0683769259	1.38125150E-02	Unset
11	12	14	8.11541148	7.82344756	0.00339 96382	1.4733851	18.31199 92	998.20331	0.263026579	5.10018971E-03	Unset
12	14	15	7.82344756	7.78160993	0.00339 96382	1.4733851	18.31199 92	998.20331	-0.262527469	5.10018971E-03	Unset
13	15	16	7.78160993	8.09840771	0.00339 96382	1.4733851	18.31199 92	998.20331	-0.389299292	5.10018971E-03	Unset
14	16	AP-4/0	8.09840771	7.49224312	0.000183230257	0.1194632 4	0.0719999917	998.20331	0.103314037	9.20834485E-03	Unset
15	16	18	8.09840771	8.09621 41	0.00337 45437	1.4675919	18.239998 6	998.20331	0	5.10255899E-03	Unset
16	18	AP-5/0	8.09621 41	8.22427638	0.000183230257	0.1194632 4	0.0719999917	998.20331	-0.631363585	9.20834485E-03	Unset
17	18	20	8.09621 41	6.59677994	0.00334 952874	1.4617988	18.167999 8	998.20331	1.44739478	5.10494411E-03	Unset
18	20	AP-3/0	6.59677994	5.98506819	0.000122126944	0.0796421692	0.0480000031	998.20331	0.109802369	1.38125150E-02	Unset

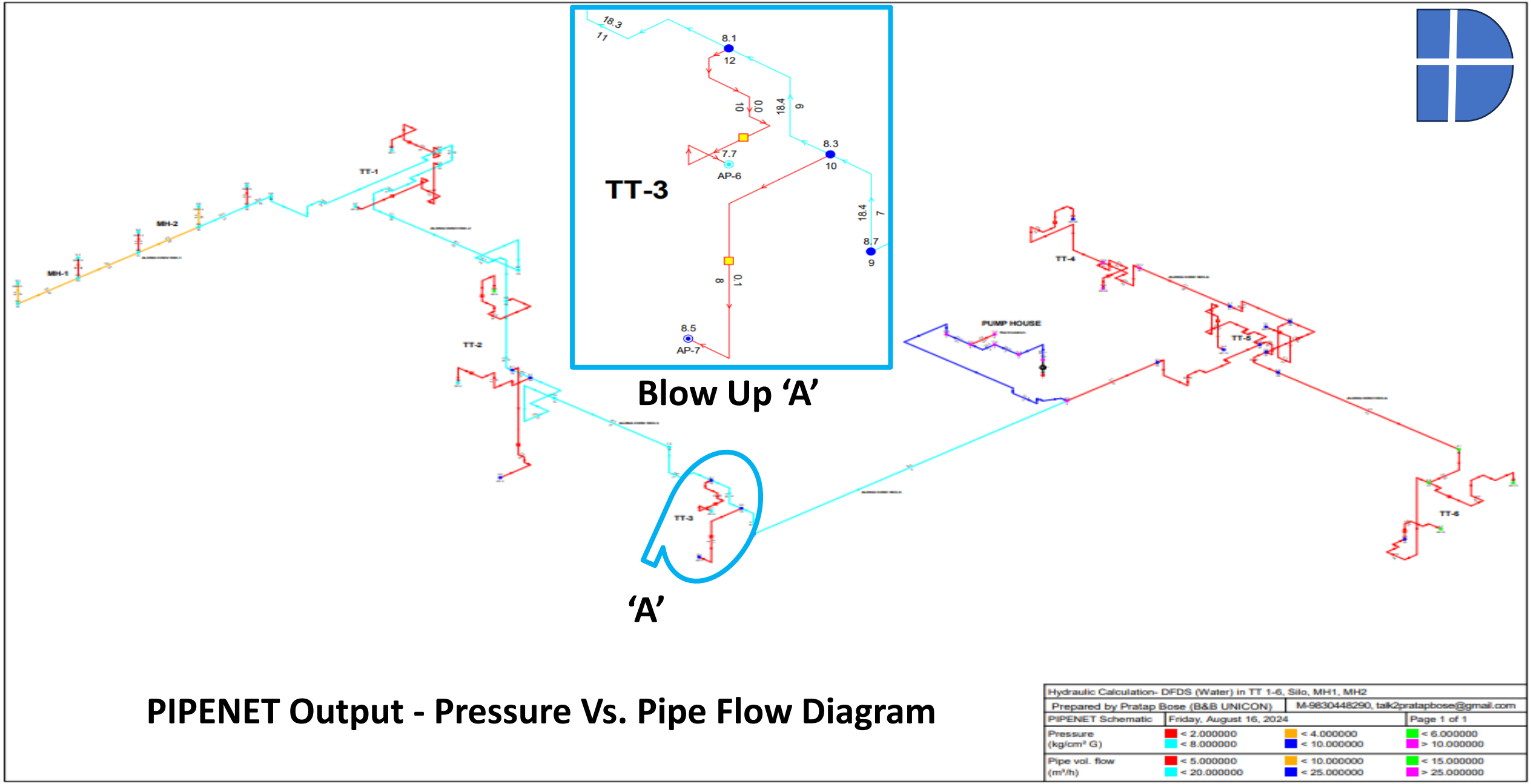


Blow Up ‘A’

‘A’

PIPENET Output- Pressure Vs. Pipe Bore Diagram

Hydraulic Calculation- DFDS (Water) in TT 1-6, Silo, MH1, MH2			
Prepared by Pratap Bose (B&S UNICON)	M-9830448290, talk2pratapbose@gmail.com		
PIPENET Schematic	Friday, August 16, 2024		Page 1 of 1
Pressure (kg/cm² G)	< 2.000000	< 4.000000	< 6.000000
	< 8.000000	< 10.000000	> 10.000000
Pipe bore (mm)	< 24.000000	< 36.000000	< 48.000000
	< 60.000000	< 72.000000	> 72.000000



PIPENET Output - Pressure Vs. Pipe Flow Diagram

Hydraulic Calculation- DFDS (Water) in TT 1-6, Silo, MH1, MH2			
Prepared by Pratap Bose (B&B UNICON)	M-9830448290, talk2pratapbose@gmail.com		
PIPENET Schematic	Friday, August 16, 2024		Page 1 of 1
Pressure (kg/cm² G)	< 2.000000 < 8.000000	< 4.000000 < 10.000000	< 6.000000 > 10.000000
Pipe vol. flow (m³/h)	< 5.000000 < 20.000000	< 10.000000 < 25.000000	< 15.000000 > 25.000000

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS
LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

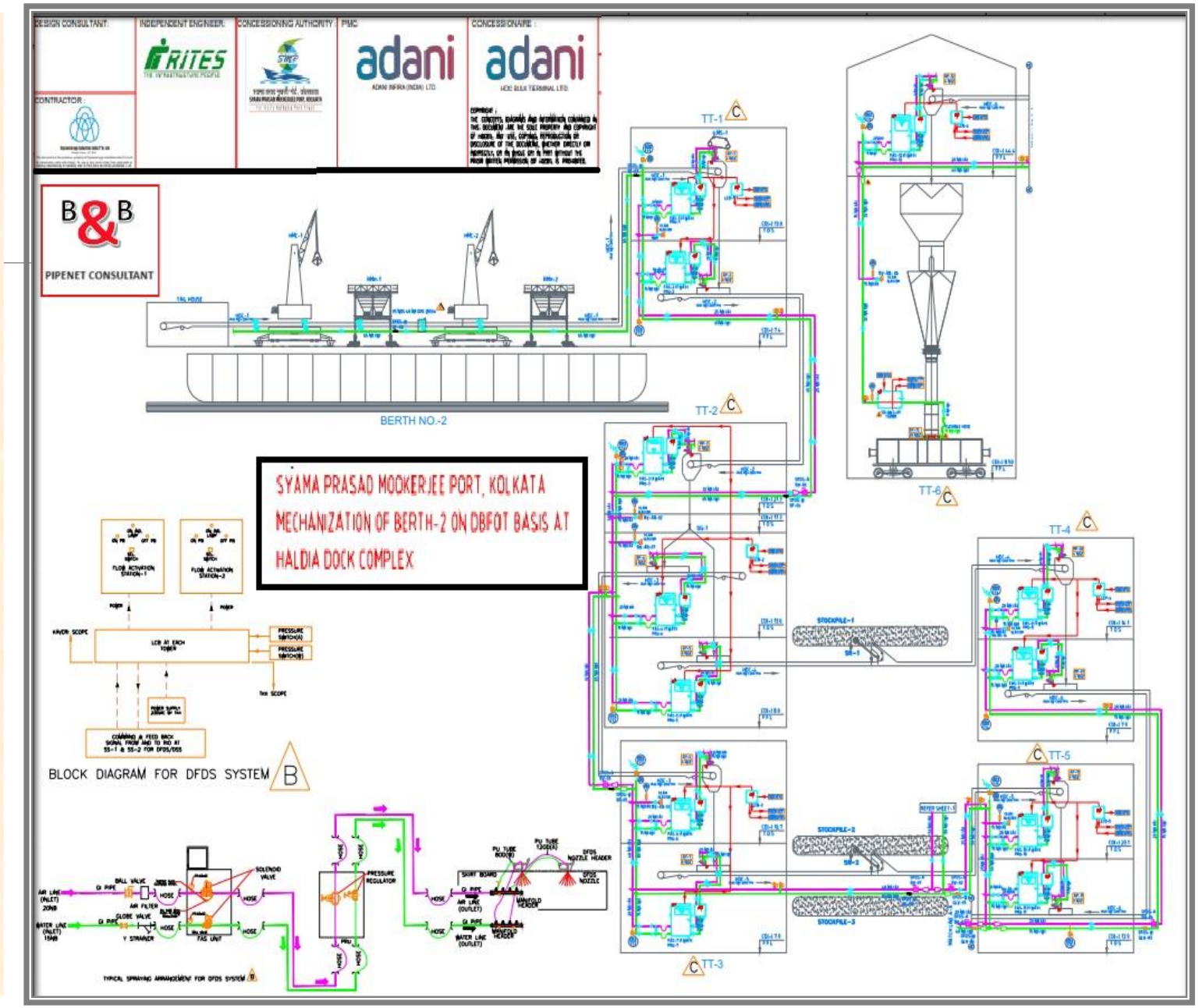
Tel.:
+44 1223 441311
Fax:
+44 1223 441297

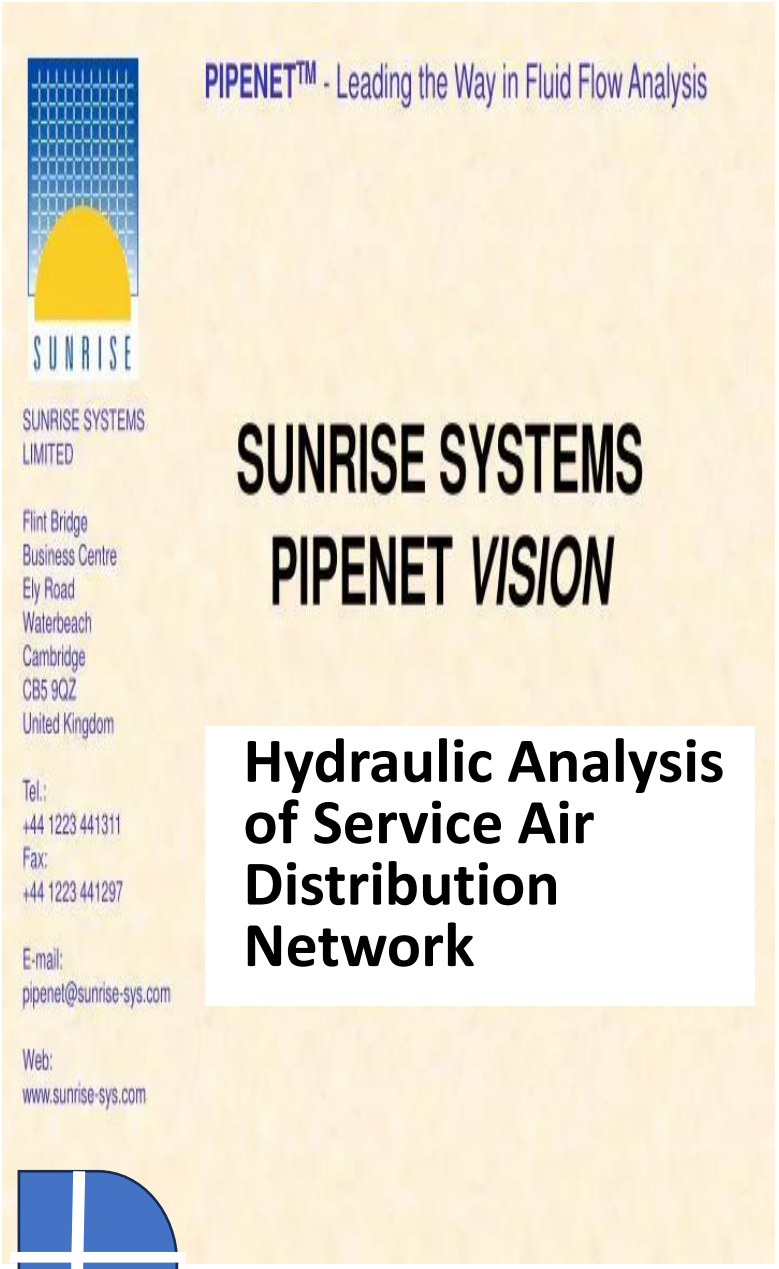
E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS PIPENET *VISION*

Hydraulic Analysis of Service Air Distribution Network





Project Objective

- Shyamaprasad Mukherjee Port, Kolkata, Berth-2 A/C. ADANI
- Capacity Selection of Air Compressor
- Pipe Sizing
- Actual availability of Pressure at Output Points against desired Air Flow

Application Usage Advantage

- Dry Fog Dust Suppression System in Coal Handling Plant
- This kind of analysis can be done for any type of service air application
- Optimum design of Air Compressor and Pipe sizing

Salient Features

- Fluid- Air, Temp- 30 Deg C
- Pipe type- GI ERW as per IS:1239 Heavy Gr.
- Max Velocity- 12 M/Sec
- No. of Pipe Segments- 66, Input Node- 1, Output Nodes-12
- No. of Iterations - 6

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

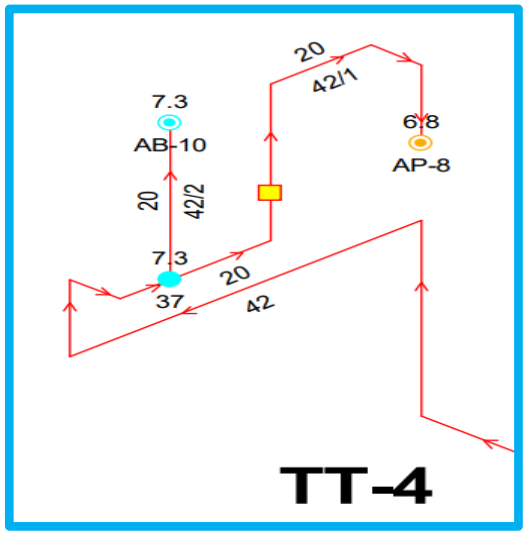
PIPENET Output – Sample Page

PIPENET® Standard Module Report

Project: Hydraulic Calculation- DFDS (Air) for TT 1-6,

Flow in pipes

Label	Input node	Output node	Inlet pressure	Outlet pressure	Friction	Velocity	Flow	Density	Static head loss	Friction factor	Design-group
			(Bar G)	(Bar G)	friction units	(m/sec)	(ft³/min)	(kg/m³)	(Bar)		
1	1	2	8	7.98818 19	0.00058 304688	5.46731 23	39.9942 59	10.3527 7	0.00121 90288	6.24564 197E-0 3	Unset
2	2	3	7.98818 19	7.98535 44	0.00053 195312	5.47176 17	40.0268 076	10.3443 51	0	5.69383 288E-0 3	Unset
3	3	4	7.98535 44	7.94803 44	0.00053 3125	5.48399 59	40.1163 037	10.3212 74	0.00081 138359	5.69383 148E-0 3	Unset
6	4	5	7.94803 44	7.48784 44	0.00076 3125	5.34987 5	22.8852 8	10.0352 62	0.00353 45432	6.73552 090E-0 3	Unset
7	5	6	7.48784 44	7.48328 88	0.00247 48438	8.87427 9	23.5112 443	9.76808 26	0.00095 814453	6.41823 327E-0 3	Unset
8	7	AP-7/0	7.46138 62	6.94841 12	0.00107 3125	3.74640 08	2.51885 458	9.44547 84	-0.0073 822589	8.13522 469E-0 3	Unset
9	7	8	7.46138 62	7.45049 31	0.00172 80469	7.40688 13	19.6235 66	9.73401 74	0.00095 516243	6.45569 293E-0 3	Unset
10	9	AP-6/0	7.44460 5	6.93557 94	0.00048 882812	2.49327 21	1.67632 605	9.42845 25	-0.0006 530526 7	8.38168 152E-0 3	Unset
11	9	10	7.44460 5	7.43306 62	0.00122 91406	6.23293 5	16.5133 482	9.71435 07	0.00251 16379	6.49737 939E-0 3	Unset
12	10	11	7.43306 62	7.32845 88	0.00123 76562	6.27607 73	16.6276 483	9.64757 35	-0.0025 041948	6.49737 054E-0 3	Unset
13	11	12	7.32845 88	7.27733 12	0.00287 44531	8.72420 12	16.7834 118	9.55803 68	-0.0036 677164	6.71715 615E-0 3	Unset
14	12	AP-4/0	7.27733 12	6.76267 88	0.00104 875	3.74321 75	2.51671 424	9.23287 68	0.00096 712059	8.14722 851E-0 3	Unset
15	12	13	7.27733 12	7.27595 38	0.00211 9375	7.48412 7	14.3977 86	9.52785 11	0	6.75124 675E-0 3	Unset
16	13	AP-5/0	7.27595 38	6.76573 12	0.00104 94531	3.74429 66	2.51743 968	9.23384	-0.0059 11651	8.14702 548E-0 3	Unset
17	13	14	7.27595 38	7.27269 31	0.00147 25781	6.21765 47	11.9613 768	9.52518 46	0.00093 42627	6.79842 476E-0 3	Unset
18	15	AP-3/0	7.24505 5	6.73649 75	0.00047 71875	2.49135 8	1.67503 917	9.19926 93	0.00102 38524	8.39967 560E-0 3	Unset
19	15	16	7.24505 5	7.24332 31	0.00080 140625	4.56189 92	8.77607 351	9.49053 57	0.00093 078011	6.89769 210E-0 3	Unset
20	17	18	7.23029 69	7.18304 12	0.00054 445312	3.74741 1	7.20918 016	9.44739 44	-0.0112 50616	6.97694 346E-0 3	Unset



Blow Up ‘A’

‘A’

TT-1

TT-2

TT-3

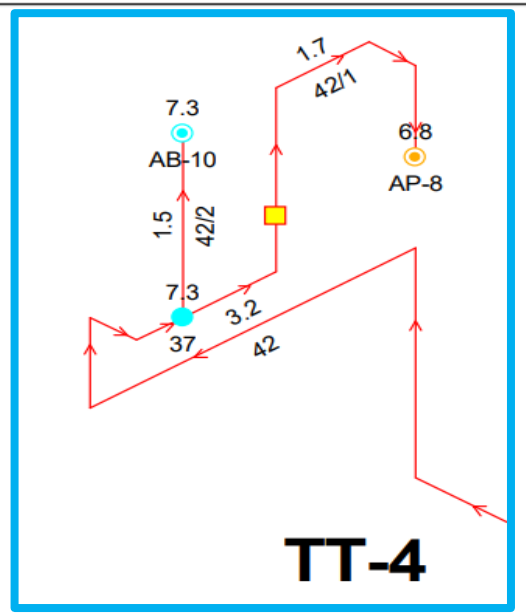
TT-4

TT-5

TT-6

PIPENET Output- Pressure Vs. Pipe Bore Diagram

Hydraulic Calculation- DFDS (Air) for TT 1-6,			
Prepared by Pratap Bose (B&B UNICON)	M-9830448290, talk2pratapbose@gmail.com		
PIPENET Schematic	Friday, August 16, 2024		Page 1 of 1
Pressure (Bar G)	< 6.750000	< 7.000000	< 7.250000
	< 7.500000	< 7.750000	> 7.750000
Pipe bore (mm)	< 30.000000	< 40.000000	< 50.000000
	< 60.000000	< 70.000000	> 70.000000



Blow Up ‘A’

‘A’

PIPENET Output - Pressure Vs. Pipe Flow Diagram

Hydraulic Calculation- DFDS (Air) for TT 1-6,			
PIPENET Schematic	Friday, August 16, 2024		Page 1 of 1
Pressure (Bar G)	< 6.750000 < 7.500000	< 7.000000 < 7.750000	< 7.250000 > 7.750000
Pipe vol. flow (ft³/min)	< 7.500000 < 30.000000	< 15.000000 < 37.500000	< 22.500000 > 37.500000

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS
LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

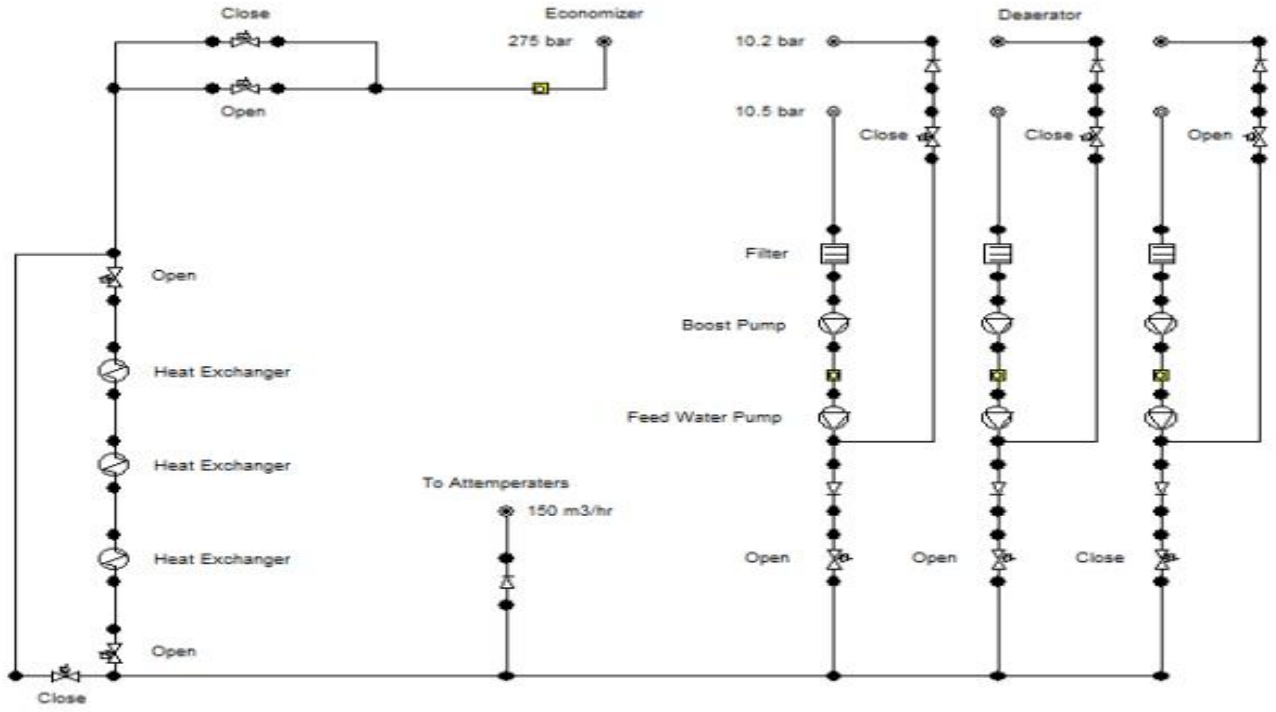
SUNRISE SYSTEMS
PIPENET *VISION*

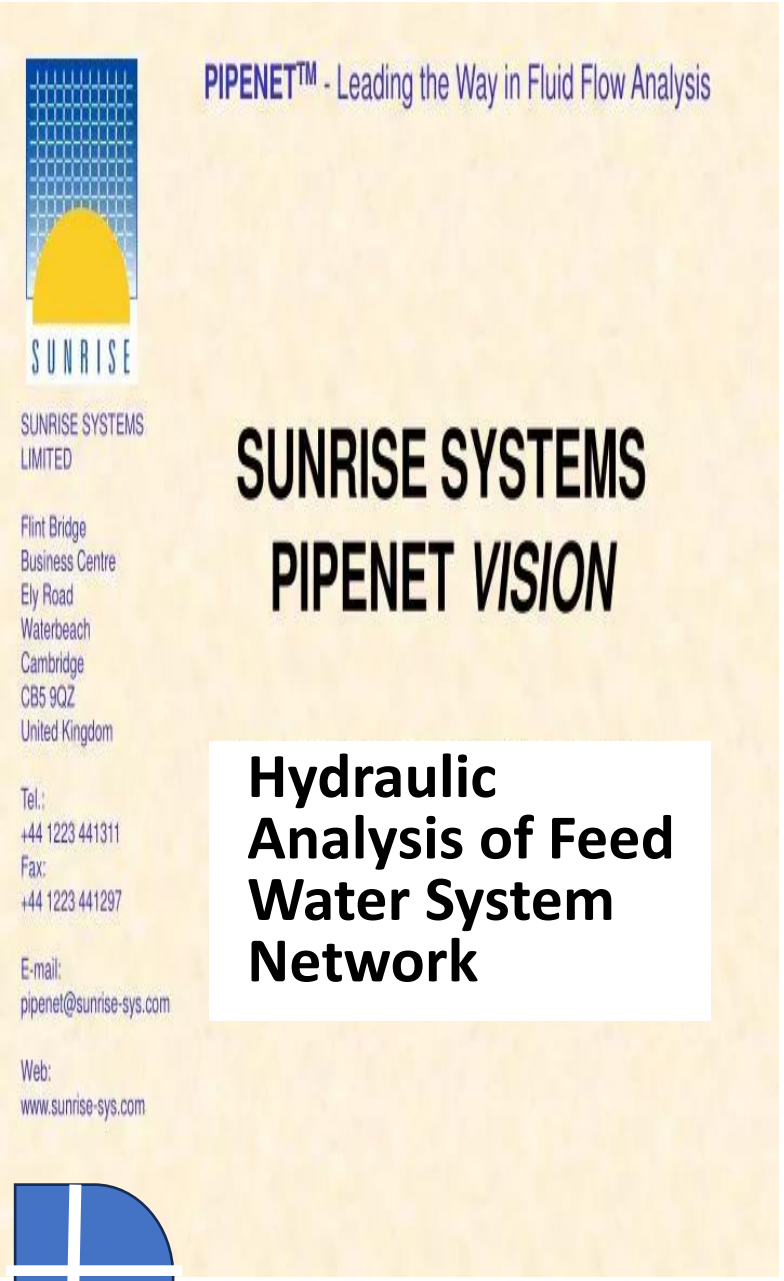
Hydraulic Analysis of Feed Water System Network

The Network

In this system, water is pumped from the bottom of the water storage section of the deaerator. While some of the water is distributed to the attemperators, the remaining water passes through three high-pressure heat exchangers, and arrives at the economizer. There are three 50% capacity parallel-pump sets. Normally, two of them are in operation, and one is on standby. Each pump set comprises of a boost pump and a feed water pump, and has a bypass line for returning to the top of the trayed section of the deaerator, to maintain a minimum flow rate. There is also a bypass line for the heat exchangers. Four orifice plates are used to measure the flow rate. Some system parameters for this example are listed below.

Unit type:	600MW supercritical,
System:	Feed water system;
Pressure:	10.5 Bar A (bottom of the water storage section of the deaerator), 10.2 Bar A (top of the trayed section of the deaerator), 275 Bar A (economizer side);
Temperature:	180 °C (before heat exchangers).





Project Objective

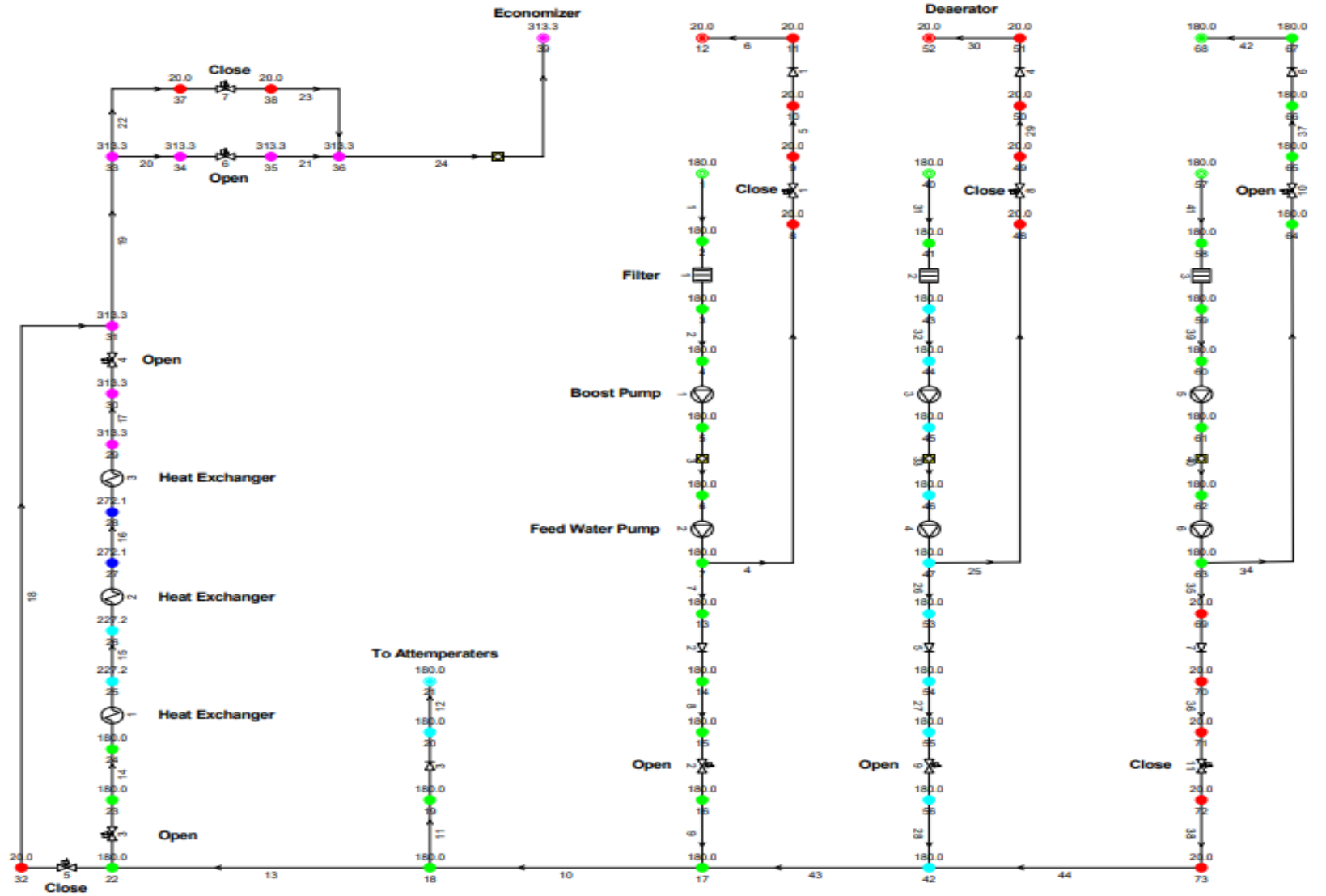
- 600 MW Supercritical Unit – A sample case study
- Temperature Output at all Nodes
- Pressure Output at all Nodes

Application Usage Advantage

- Feed Water System in Thermal Power Plant
- This kind of analysis can be done for any type of steam pipe application
- This analysis can be used for Optimum design of Pumps, Heat Exchanger, Pipe sizing, Orifice Plates etc.

Salient Features

- Fluid- Water, Variable Temperature Option
- Temperature – 180 Deg C before Heat Exchanger; Ambient- 20 Deg C
- No. of Pumps - 6, Heat Exchanger - 3
- No. of Iterations - 5



PIPENET Output – Temperature Result

Sample Feed Water System			
PIPENET Schematic	Wednesday, August 14, 2024		Page 1 of 1
Outflow Temperature (°C)	< 60.000000	< 120.000000	< 180.000000
	< 240.000000	< 300.000000	> 300.000000

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS
LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

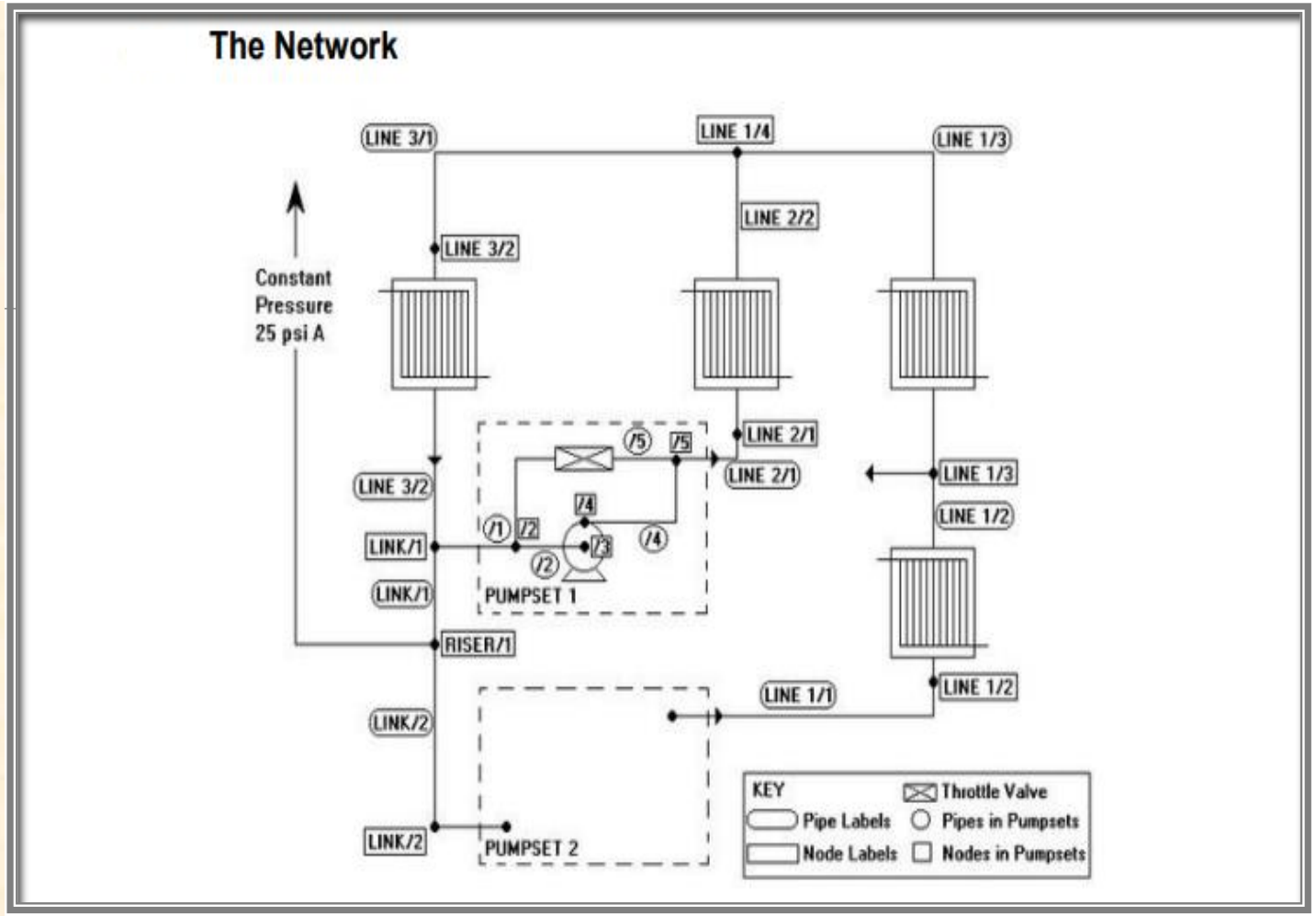
Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

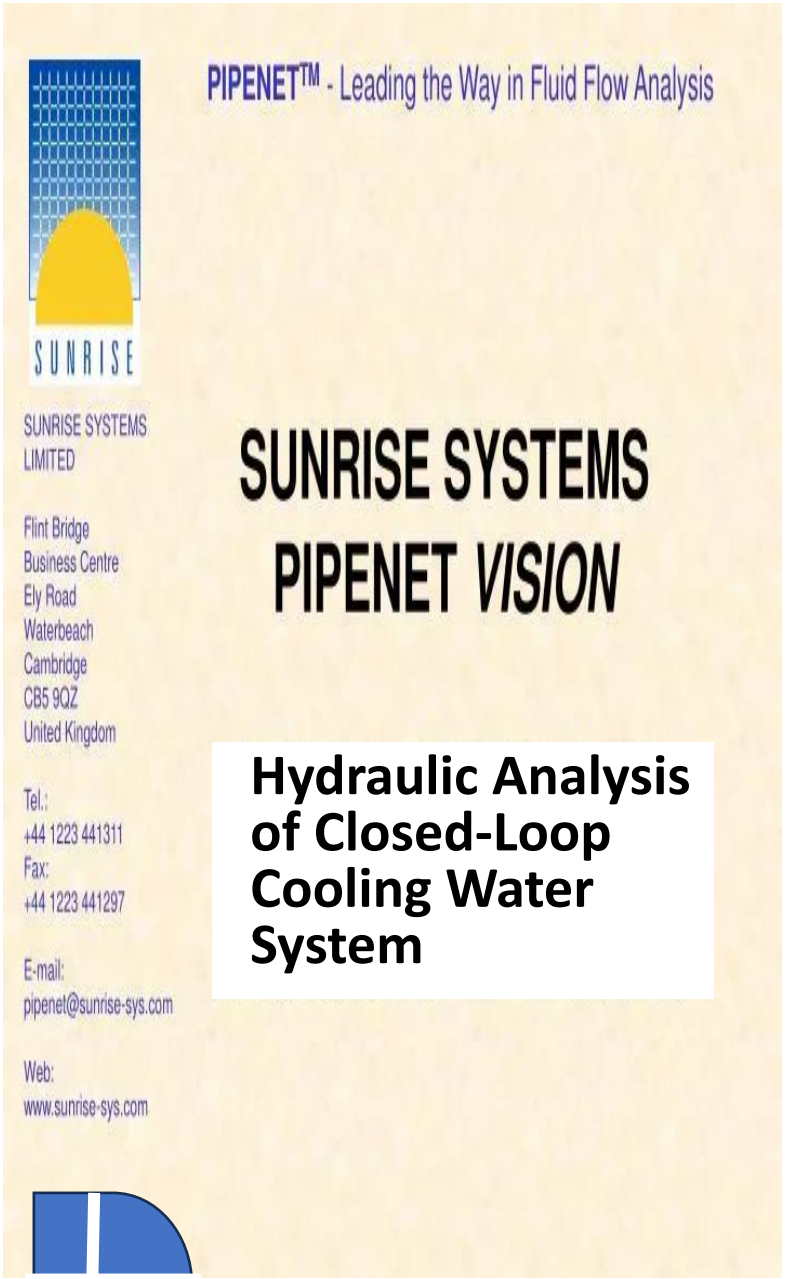
Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

Hydraulic Analysis of Closed-Loop Cooling Water System



In this case study of a sample closed-loop colling water system the network is a closed loop with a single opening to the atmosphere , where a riser to an expansion tank connects to the loop. The pressure at that point is 25 psi A. The network consists of four heat exchangers, two pumps and a piping network with varying fluid temperature. Here the fluid, the coolant, is a glycol-water mixture at 2 Deg C. Default system temperature is 2 Deg C . However, temperature varies in different pipe segments.
Pipenet is run to analyse the network for Pressure Vs. Pipe mass flow with variable fluid temperature in the network.



Project Objective

- Closed-Loop Cooling Water System – A sample case study
- To determine Pressure Output at all Nodes vis-à-vis pipe mass flow with variable fluid temperature in the network.

Application Usage Advantage

- Closed-Loop Cooling Water System in any kind of plant
- This kind of analysis can be done for any type of coolant application
- This analysis can be used for Optimum design of Pumps, Heat Exchanger, Pipe sizing etc.

Salient Features

- Fluid- Glycol-water mixture at 2 Deg C with Variable Temperature Option
- Temperature – System Default 2 Deg C. Temperature in Pipe LINE1/2 is 20°C, and the temperature in Pipes LINE1/3, LINE2/2 and LINE3/1 is 40°C.
- No. of Iterations - 7

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS
LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

SUNRISE SYSTEMS
PIPENET *VISION*

PIPENET Output – Sample Page

PIPENET® Standard Module Report

Project: Closed loop cooling water system- 2

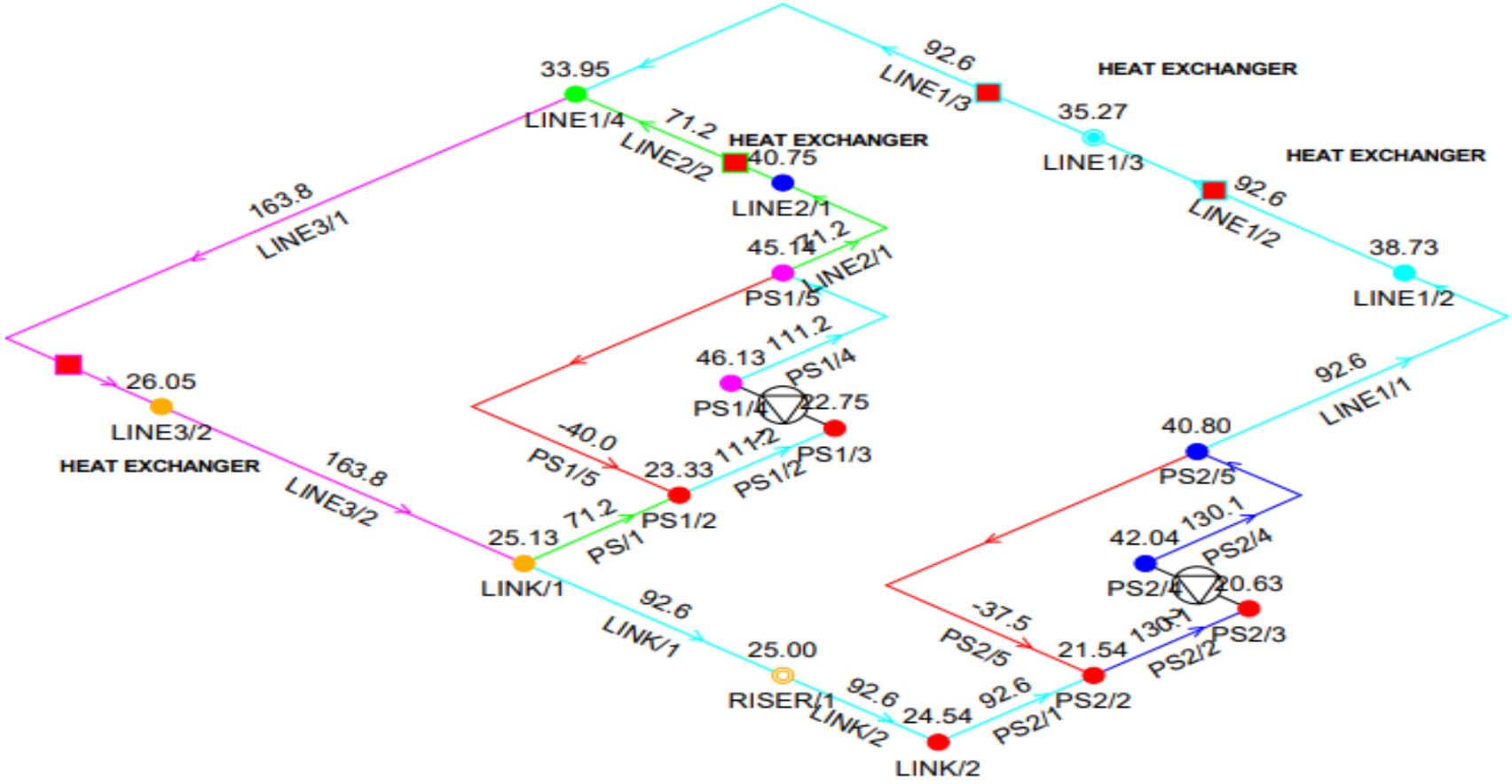
Calculated Results

Fluid properties

Pipe	Input node	Output node	Temperature	Density	Viscosity
			(°C)	(lb/ft³)	(cP)
PS/1	LINK/1	PS1/2	1.99999	64.0636606	23.0201744
LINK/1	LINK/1	RISER/1	1.99999	64.0636606	23.0201744
LINK/2	RISER/1	LINK/2	1.99999	64.0636606	23.0201744
PS1/2	PS1/2	PS1/3	1.99999	64.0636606	23.0201744
PS1/4	PS1/4	PS1/5	1.99999	64.0636606	23.0201744
PS1/5	PS1/2	PS1/5	1.99999	64.0636606	23.0201744
PS2/1	LINK/2	PS2/2	1.99999	64.0636606	23.0201744
PS2/2	PS2/2	PS2/3	1.99999	64.0636606	23.0201744
PS2/4	PS2/4	PS2/5	1.99999	64.0636606	23.0201744
PS2/5	PS2/2	PS2/5	1.99999	64.0636606	23.0201744
LINE1/1	PS2/5	LINE1/2	1.99999	64.0636606	23.0201744
LINE1/2	LINE1/2	LINE1/3	19.99999	63.6292806	14.4378841
LINE1/3	LINE1/3	LINE1/4	39.99999	63.1285334	8.88157729
LINE3/1	LINE1/4	LINE3/2	39.99999	63.1285334	8.88157729
LINE3/2	LINE3/2	LINK/1	1.99999	64.0636606	23.0201744
LINE2/1	PS1/5	LINE2/1	1.99999	64.0636606	23.0201744
LINE2/2	LINE2/1	LINE1/4	39.99999	63.1285334	8.88157729

Flow in pipes

Label	Input node	Output node	Inlet pressure (psi A)	Outlet pressure (psi A)	Friction friction units	Velocity (ft/sec)	Flow (lb/sec)	Density (lb/ft³)	Static head loss (psi)	Friction factor	Design-group
PS/1	LINK/1	PS1/2	25.1285948	23.3268559	0.115211736	13.9283554	71.2307881	64.0636606	0	6.84872037E-03	Unset
LINK/1	LINK/1	RISER/1	25.1285948	25.0000098	0.00572 18183	7.98347278	92.5820489	64.0636606	0	7.00585358E-03	Unset
LINK/2	RISER/1	LINK/2	25.0000098	24.5409972	0.00572 18183	7.98347278	92.5820489	64.0636606	0	7.00585358E-03	Unset
PS1/2	PS1/2	PS1/3	23.3268559	22.7491918	0.25558 5569	21.7427011	111.209664	64.0636606	-0.444886553	6.23303372E-03	Unset
PS1/4	PS1/4	PS1/5	46.1275672	45.1382097	0.25558 5569	21.7427011	111.209664	64.0636606	0.222443376	6.23303372E-03	Unset



Closed loop cooling water system- 2			
PIPENET Schematic	Tuesday, August 20, 2024		Page 1 of 1
Pressure (psi A)	< 25 < 40	< 30 < 45	< 35 > 45
Pipe mass flow (lb/sec)	< 0 < 120	< 40 < 160	< 80 > 160

PIPENET Output – Pressure Vs. Pipe Mass Flow

PIPENET™ - Leading the Way in Fluid Flow Analysis

SUNRISE SYSTEMS
LIMITED

Flint Bridge
Business Centre
Ely Road
Waterbeach
Cambridge
CB5 9QZ
United Kingdom

Tel.:
+44 1223 441311
Fax:
+44 1223 441297

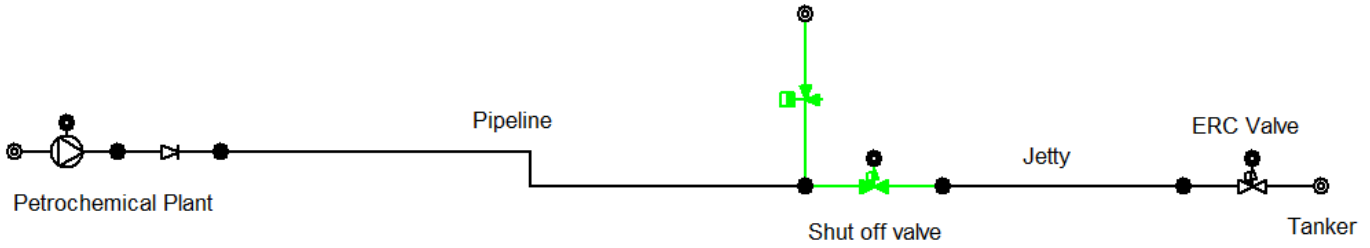
E-mail:
pipenet@sunrise-sys.com

Web:
www.sunrise-sys.com

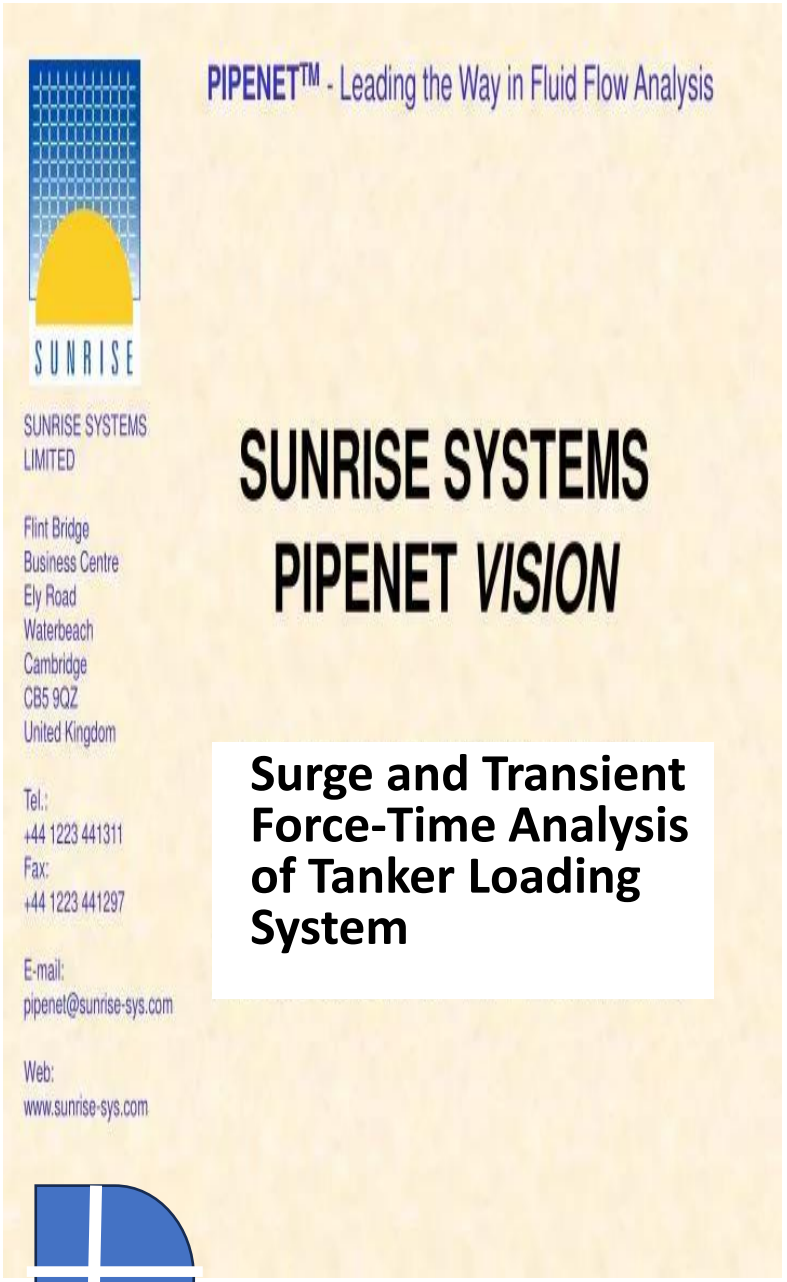
SUNRISE SYSTEMS
PIPENET *VISION*

Surge and Transient Force-Time Analysis of Tanker Loading System

A picture of a tanker being loaded



The Network with Surge Relief Valve



Project Objective

- Tanker Loading System – A sample case study
- To establish whether the pressure surges experienced by the existing valves (due to valve closures) are below the allowable limit.
- To study hydraulic transient forces

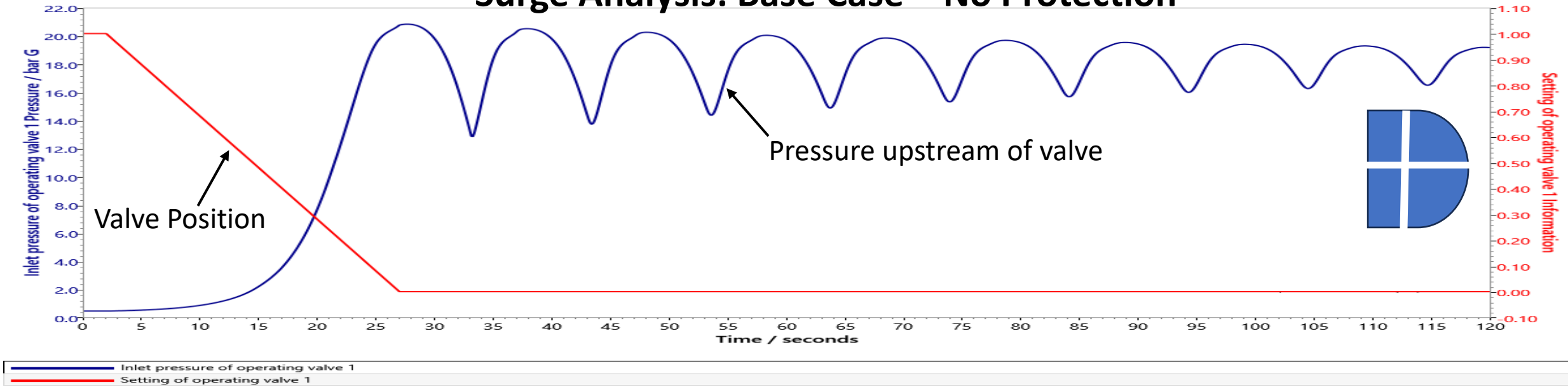
Application Advantage

- Any kind of pipeline in any kind of plant where frequent valve closure is part of the operation.
- This analysis can be used for Optimum design of Accumulator sizing, Surge Relief Valve and to calculate the force-time history in a form that can be read by pipe stress analysis programs

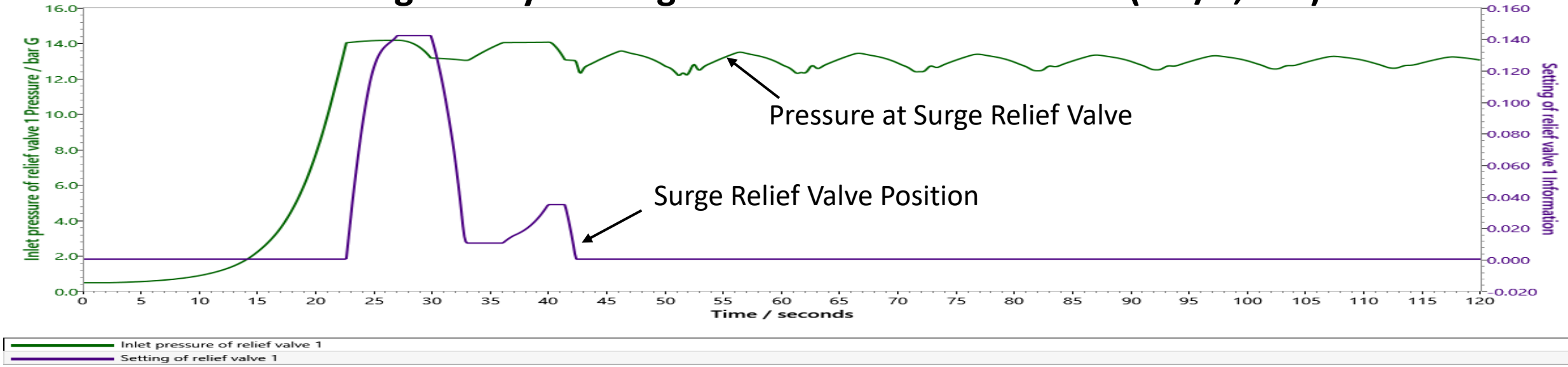
Salient Features

- Fluid- Lube Oil having density-867 Kg/M3, Viscosity- 33.8 cP, Bulk Modulus- 1.230025 GPa
- Case study will be for planned shutdown as well as emergency shutdown
- Simulation Time – 120 Sec, Time step – 0.068 Sec

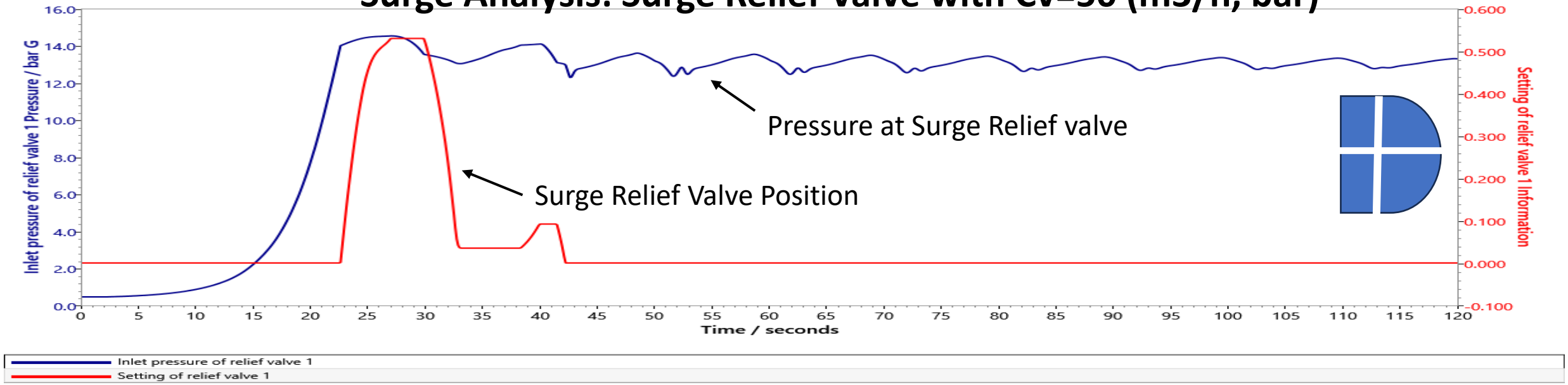
Surge Analysis: Base Case – No Protection



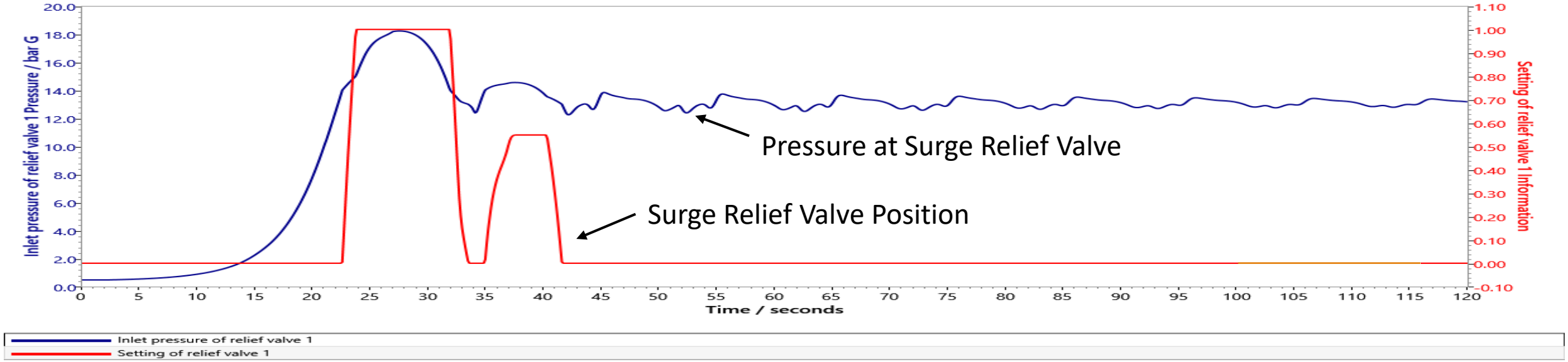
Surge Analysis: Surge Relief Valve with Cv=200 (m3/h, bar)



Surge Analysis: Surge Relief Valve with Cv=50 (m3/h, bar)



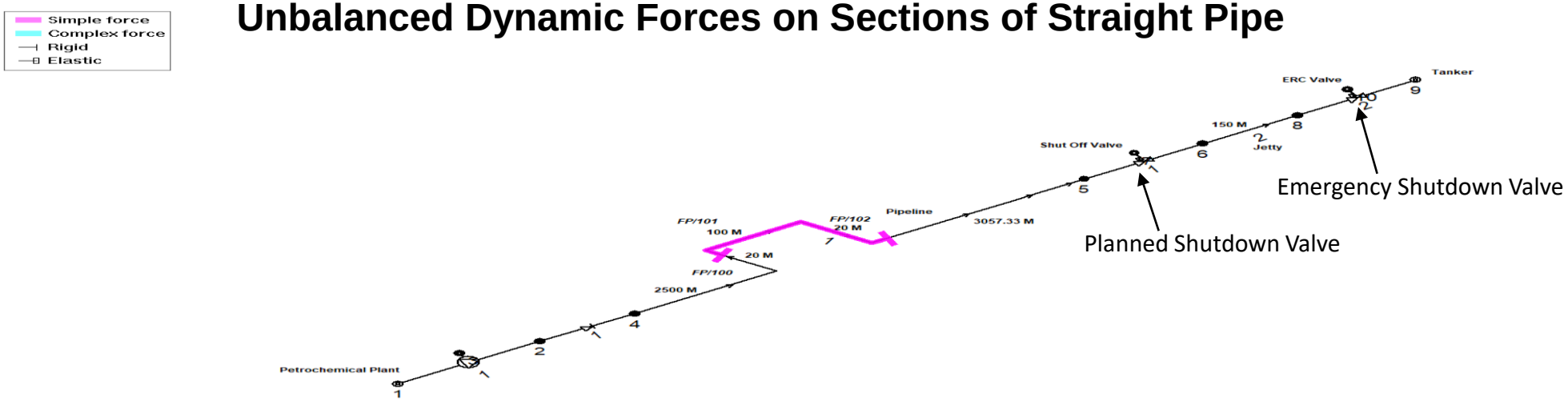
Surge Analysis: Surge Relief Valve with Cv=10 (m3/h, bar)



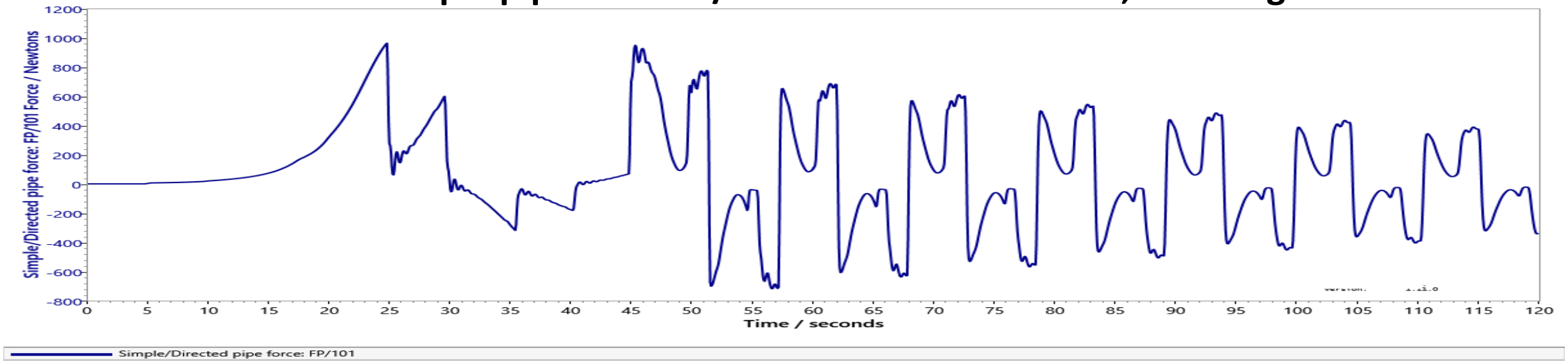
PIPENET Transient (Standard) Module - Tanker Loading System - Test - [Tanker Loading System - Pipe Stress Analysis]

File Edit View Libraries Options Colouration Calculation Output Tools Window Help

Unbalanced Dynamic Forces on Sections of Straight Pipe



Simple pipe force FP/101: Planned shutdown, two-stage



Simple pipe force FP/101: Emergency shutdown