Application Bulletin
PIPENET® LNG Applications

LNG Applications of PIPENET

PIPENET Software has 3 modules:

Transient Module

Spray/Sprinkler Module

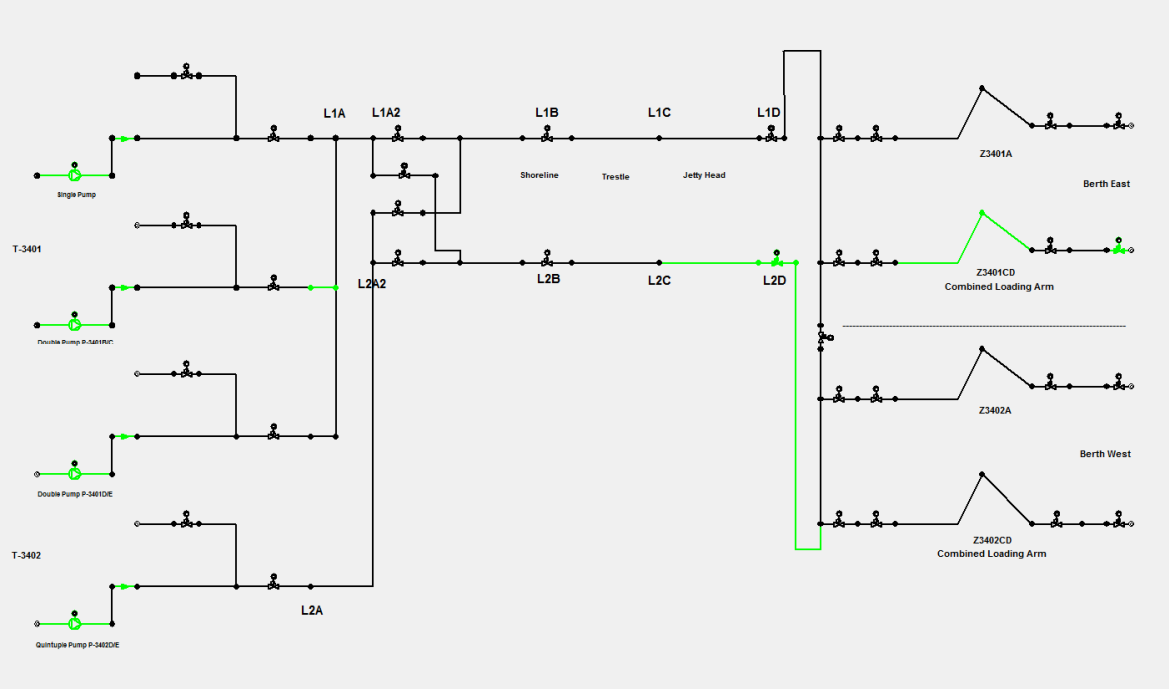
Standard module

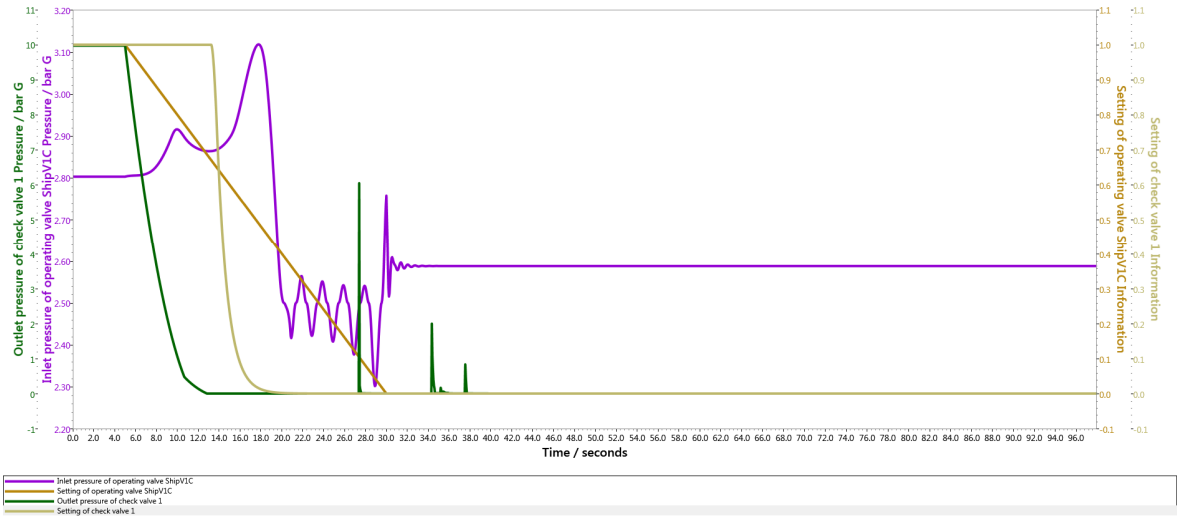
They all have applications in the design of LNG production, both in offshore platforms and in LNG production/loading/regasification. Applications include the design of loading systems, firewater systems and cooling water systems.

AAA. PIPENET Transient module:

1. LNG Loading System, Australia:

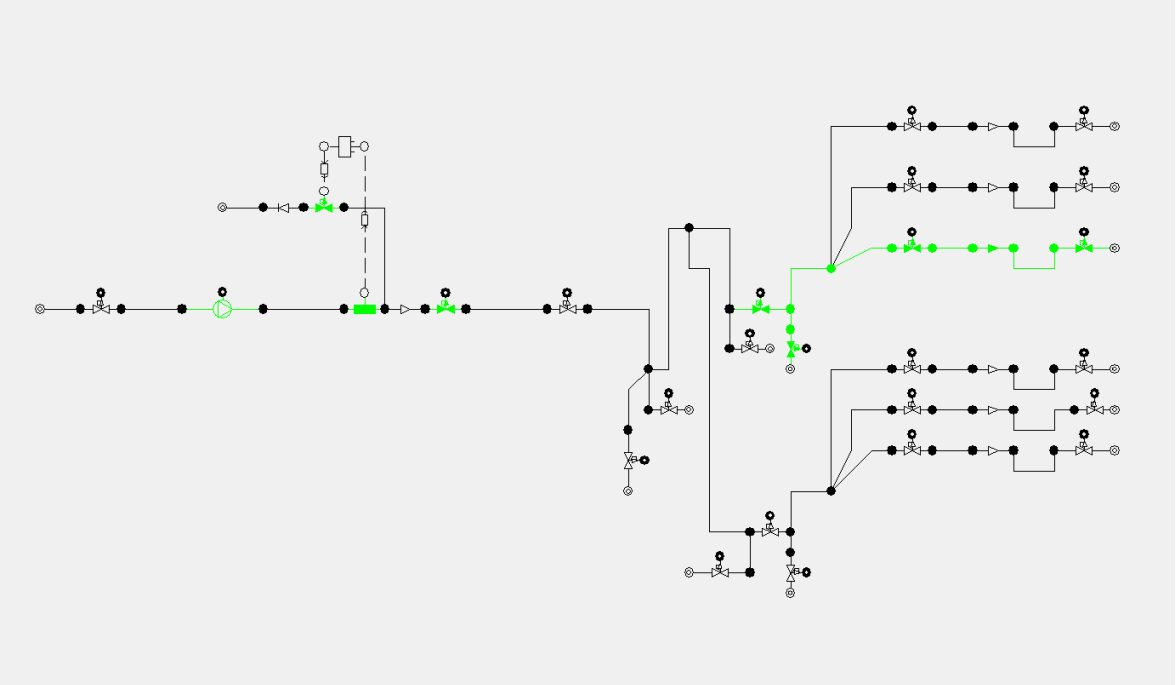
This is a system with 4 LNG pumps and 4 loading lines. This study considered the closure of the ship (LNG tanker) valves and the simultaneous shutdown of all LNG pumps. Two of the valves remained closed throughout. The other two valves closed simultaneously in 25 seconds (from 5 to 30). All 4 LNG pumps stopped in 10 seconds (from 5 to 15).

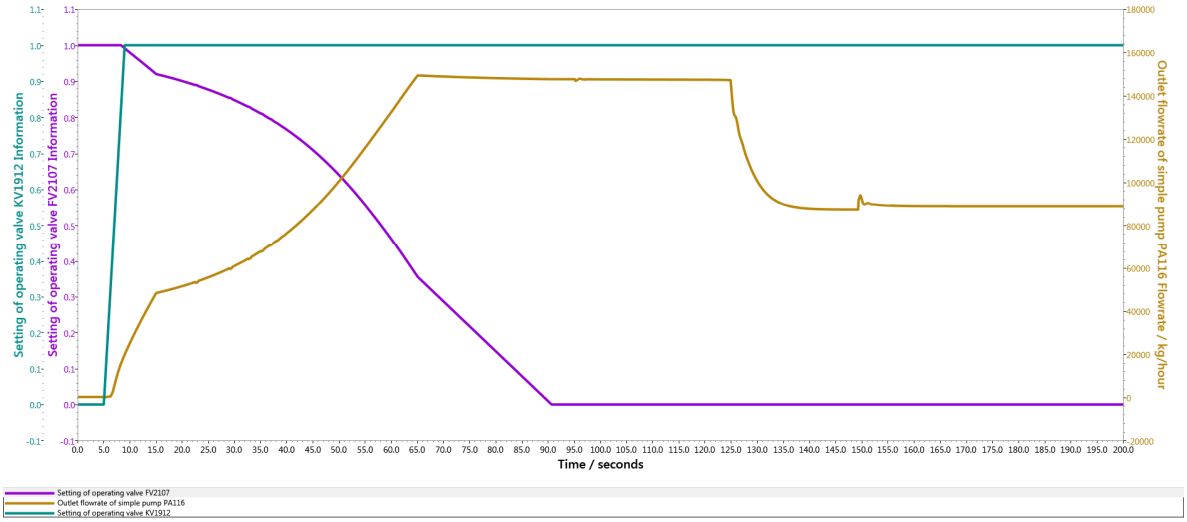

L1A
L1A2
L1B
L1C
L1D
Shoreline
Trestle
Jetty Head
Z3401A
Berth East
Single Pump
T-3401
L2A2
L2B
L2C
L2D
Z3401CD
Combined Loading Arm
Z3402A
Berth West
Double Pump P-3401D/E
T-3402
Z3402CD
Combined Loading Arm
L2A
Quintuple Pump P-3402D/E


Outlet pressure of check valve 1 Pressure / bar G
Inlet pressure of operating valve ShipV1C Pressure / bar G
Setting of operating valve ShipV1C Information
Setting of check valve 1 Information
Time / seconds
Inlet pressure of operating valve ShipV1C
Setting of operating valve ShipV1C
Outlet pressure of check valve 1
Setting of check valve 1

2. LNG Pump Startup:

This is an interesting scenario which considers pump start up with the piping system fully primed. The pump starts and runs up during the time 5 – 15 seconds. The main valve downstream of the pump starts during the time 5 – 65 seconds. Some of the valves in the loading arms open during the time 5 – 15 seconds, while others remain closed.

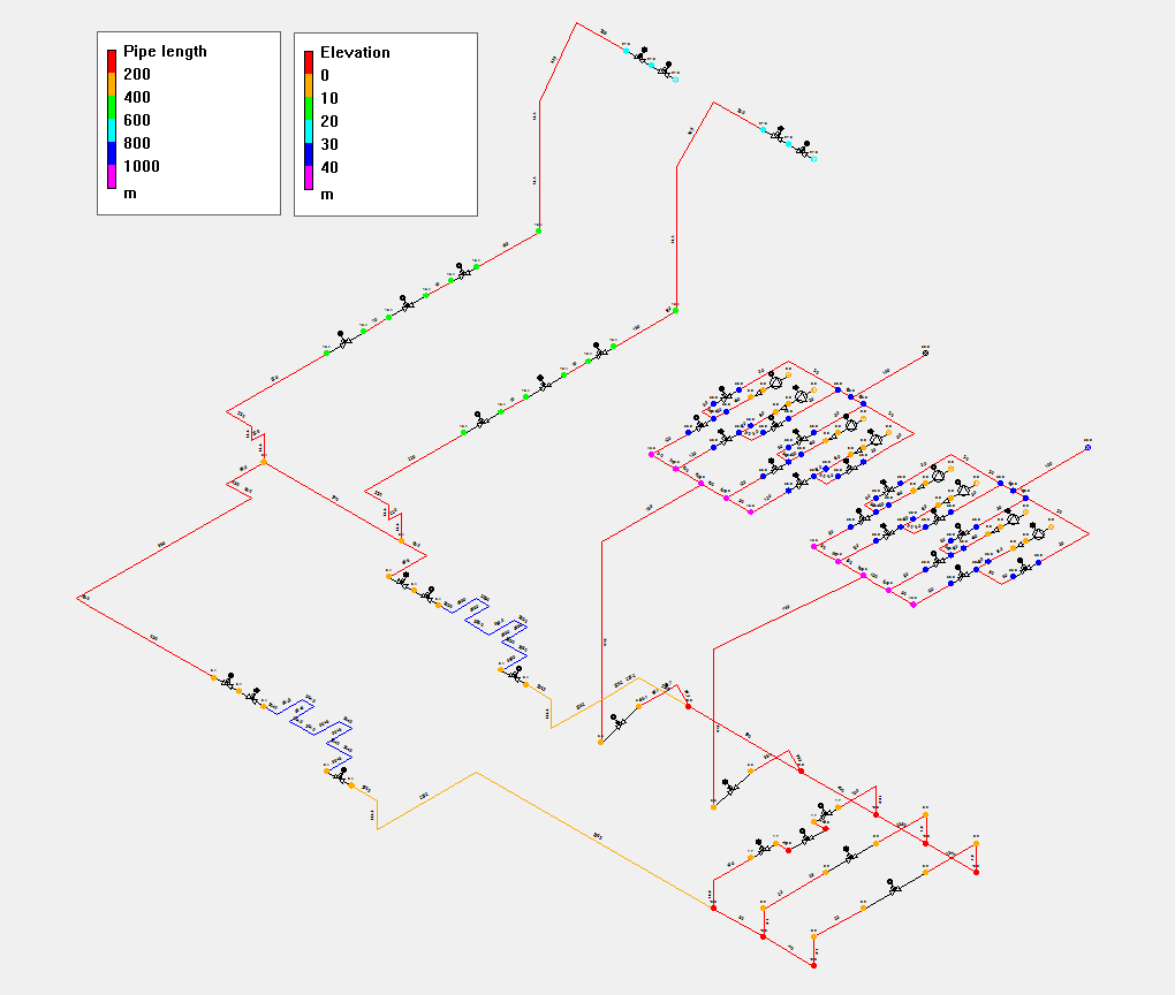




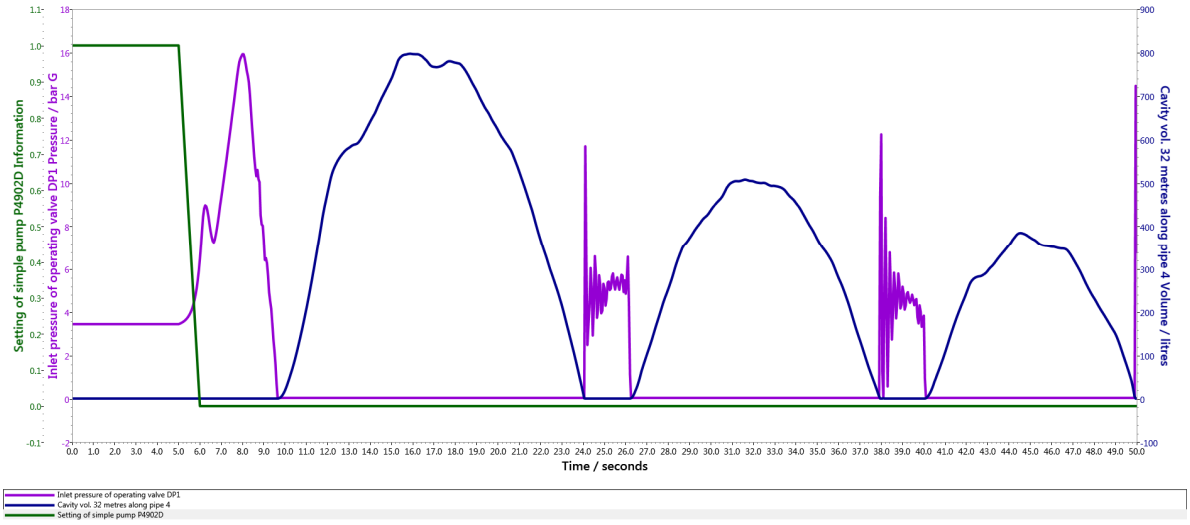
3. Yemen LNG Loading System:

The facility has two tanks with a total capacity of 280,000 m3. The jetty can handle 70,000 to 205,000 m3 of LNG capacity ships. The facility has 8 LNG pumps with a capacity of 1650 m3/hr each. The valves on the loading lines close in 5 seconds (from 5 to 10). The pumps stop in 1 seconds (from 5 to 6). The bypass valves around the pump open in 10 seconds (from 5 to 15)

Seri Balhaf, a Yemen LNG carrier at the Yemen LNG Plant in Balhaf

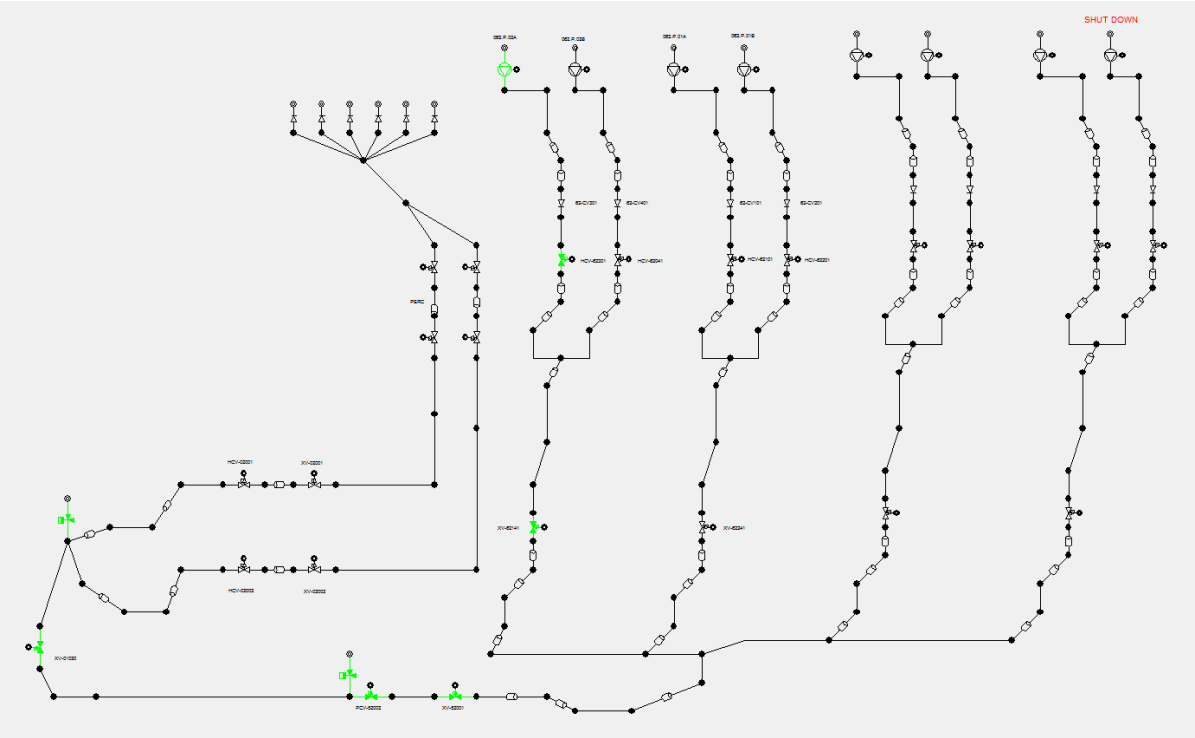


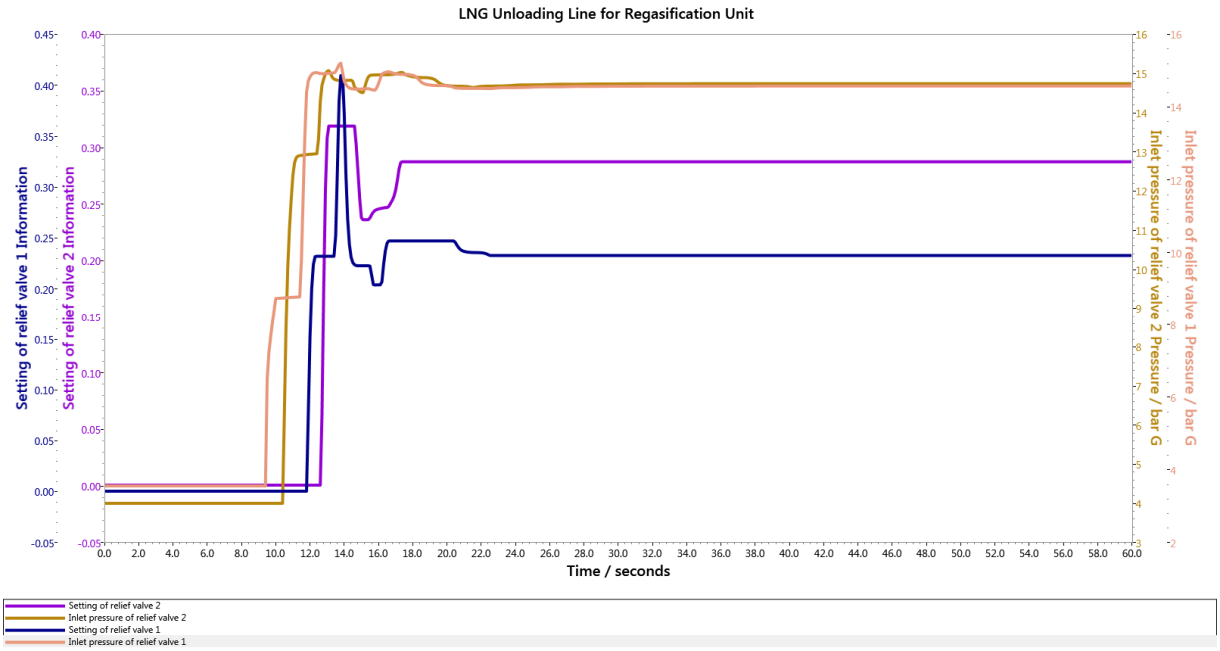
Typical graph:



4. LNG Unloading System for Regasification:

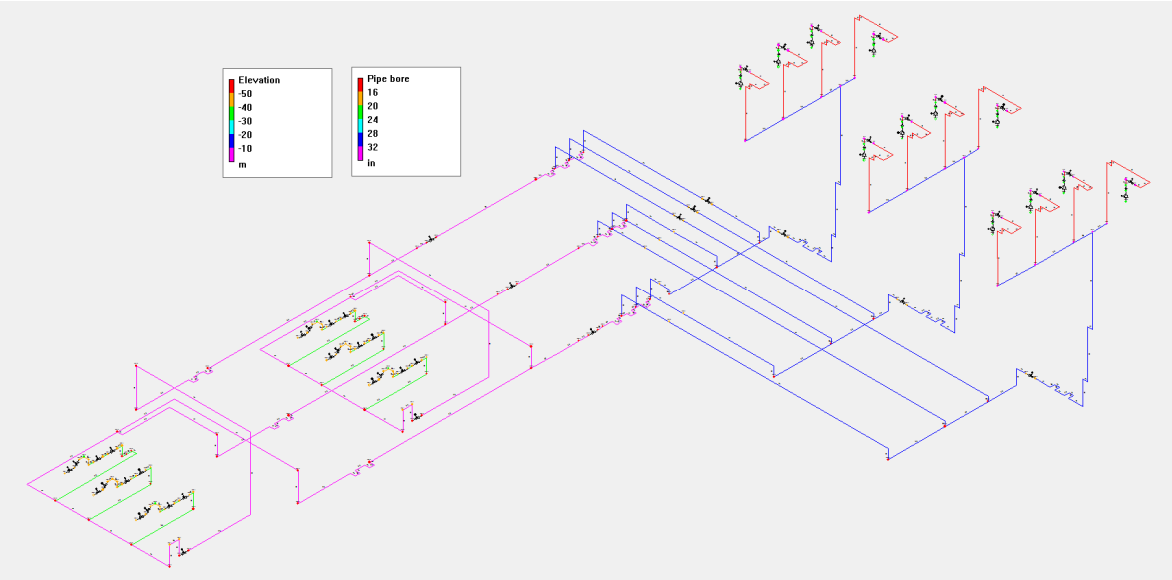
The system had 7 lead pumps and 1 standby pump on the ship for unloading purposes. The system has two surge relief valves. One unloading line is shut down. The valves in the other line close in 5 seconds.

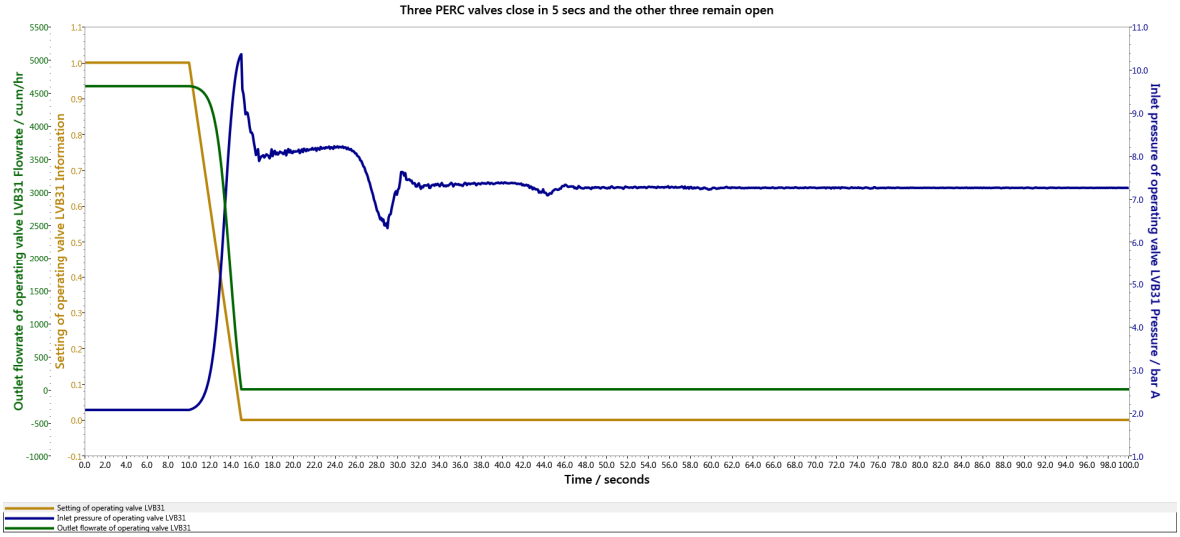




5. LNG Loading System PERC Valve Closure:

In this LNG loading system the effect of the PERC (Powered Emergency Release Coupling) valve closure is considered. The system has 12 LNG pumps and 6 PERC valves. Three of the PERC valves close in 5 seconds and the other three remain open.

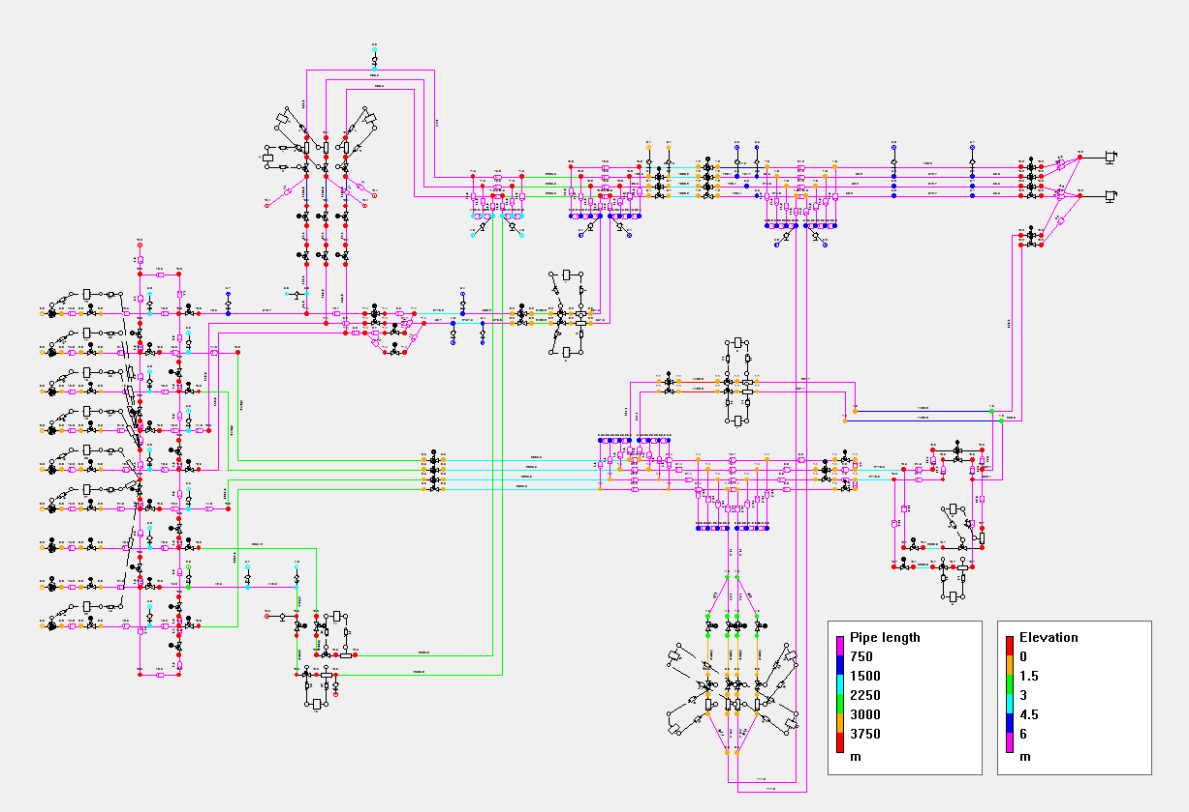


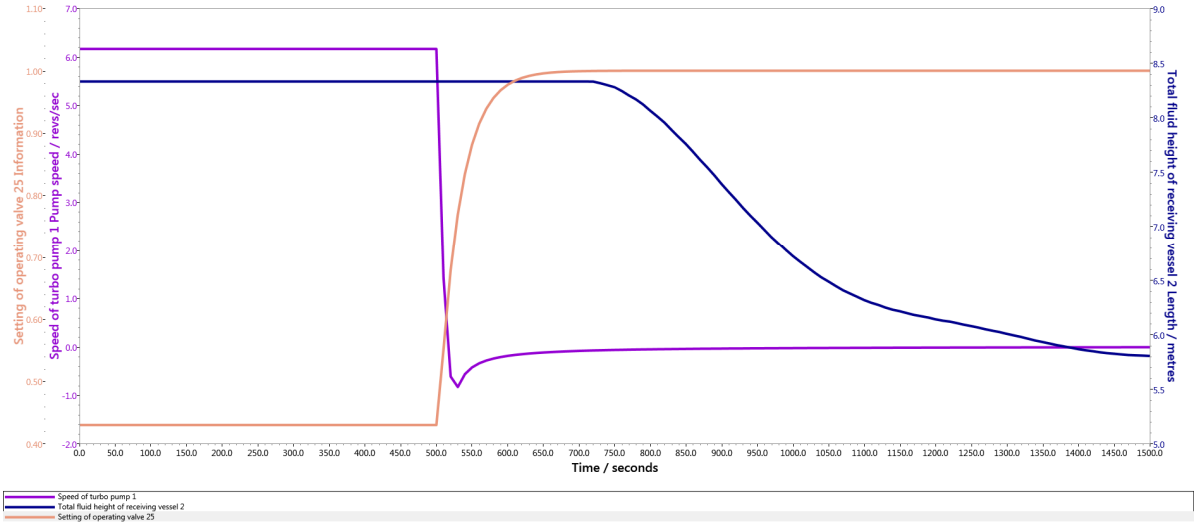


6. LNG Plant Cooling Water System:

This shows the cooling water system on one of the largest facilities in the world. The system has 7 variable speed lead pumps and 2 standby variable speed pumps. The design flowrate of each pump is 42,840 m3/hr. The main manifold is 3.5 m diameter and is made of GRP pipes. The minimum design pressure is -0.3 barg and the maximum is 6 barg. The system had a number of PID controllers in order to regulate the speed of the pumps and position flow control valves.

In this scenario the complete simultaneous shutdown of all the pumps due to power failure was considered. In order to protect the pipes from collapsing 190 vacuum breakers were installed.

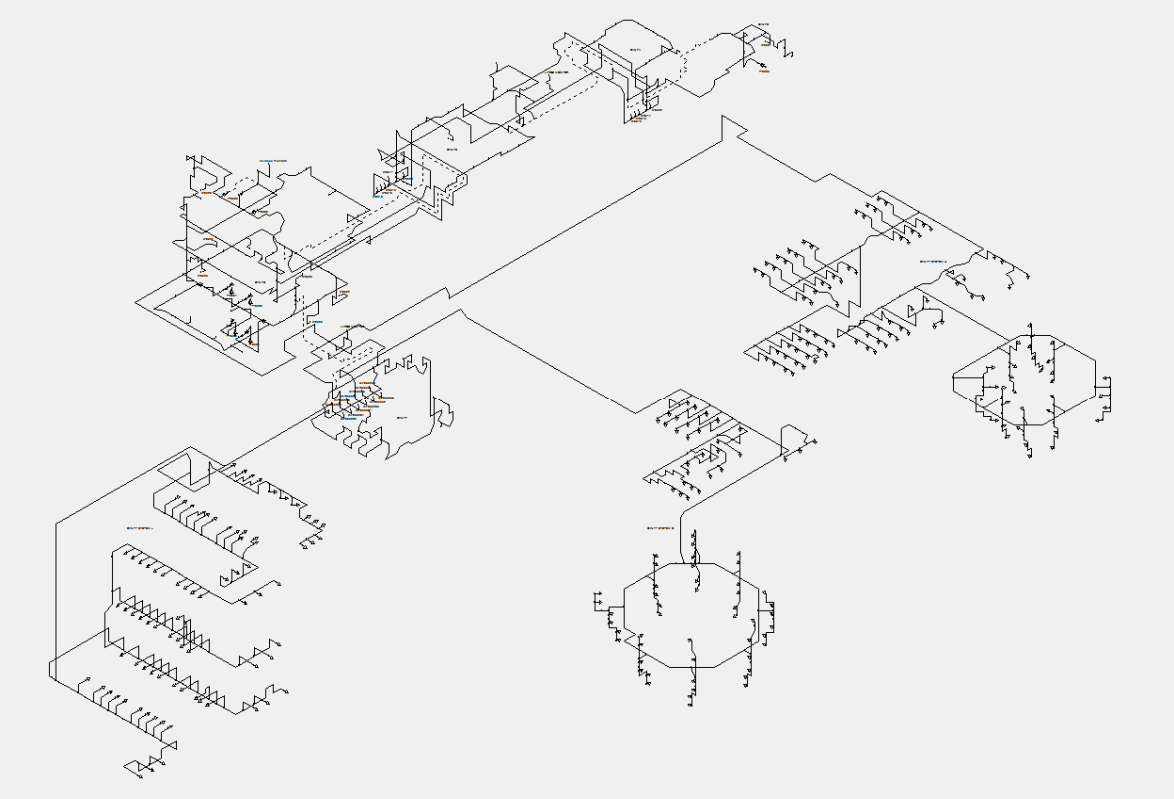

Pipe length
750
1500
2250
3000
3750
m
Elevation
0
1.5
3
4.5
6
m

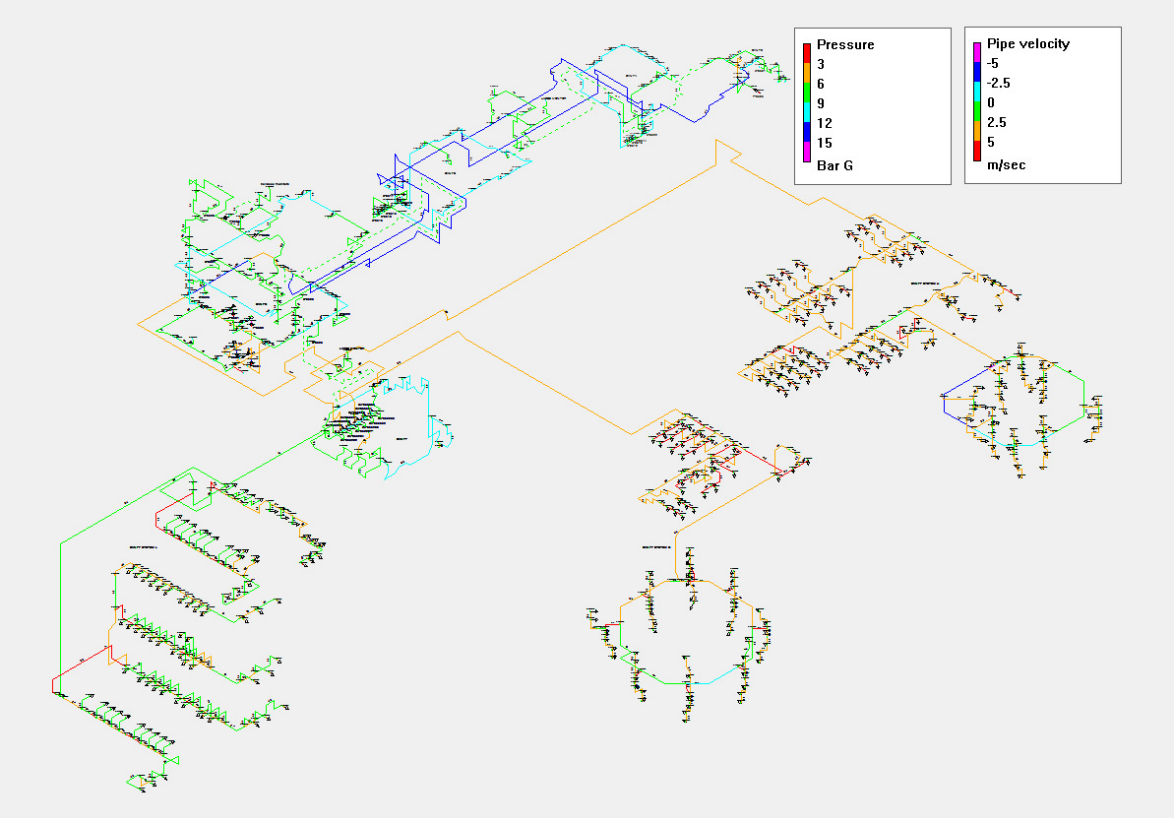

Setting of operating valve 25 Information
Speed of turbo pump 1 Pump speed / revs/sec
Total fluid height of receiving vessel 2 Length / metres
Time / seconds
Speed of turbo pump 1
Total fluid height of receiving vessel 2
Setting of operating valve 25

BBB. PIPENET Spray/Sprinkler module:

1. Offshore Platform Complex from Dan F Field Denmark:

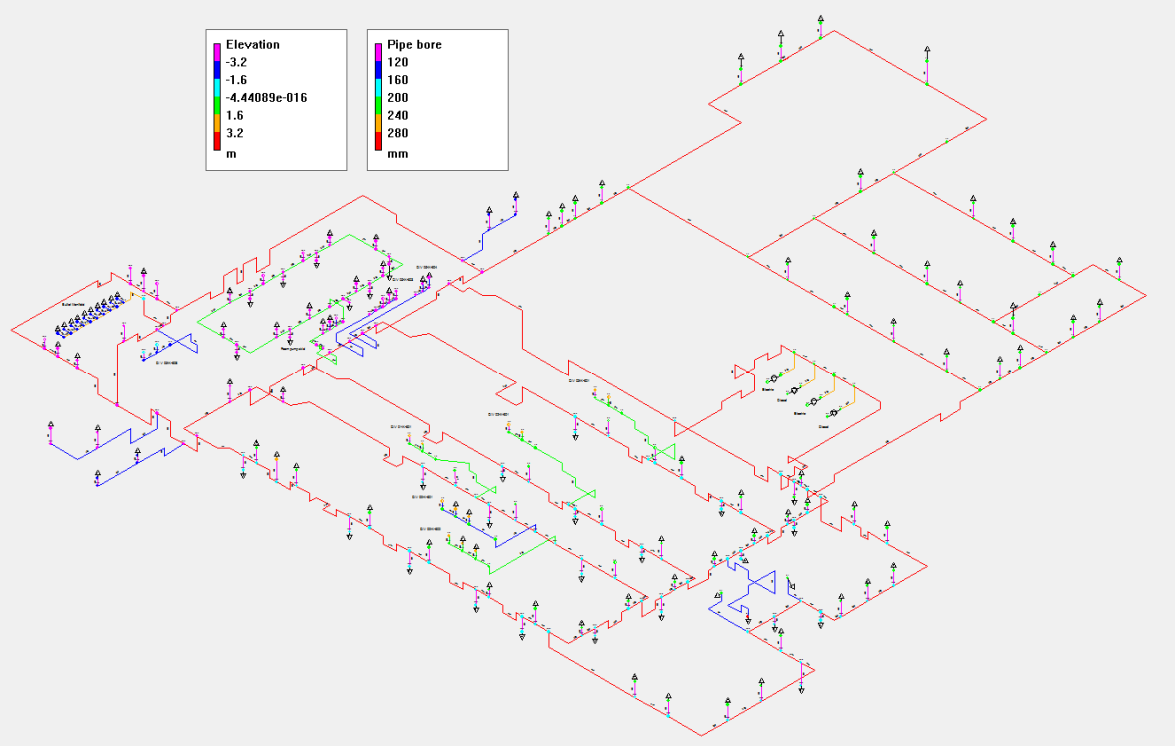
This fire protection system covered 6 offshore gas platforms which were bridge-connected. This shows a steady state calculation which is used for design and verification of operation.




Pressure
3
6
9
12
15
Bar G
Pipe velocity
-5
-2.5
0
2.5
5
m/sec

2. Onshore Gas Processing Plant for Receiving Gas from Offshore Platform:

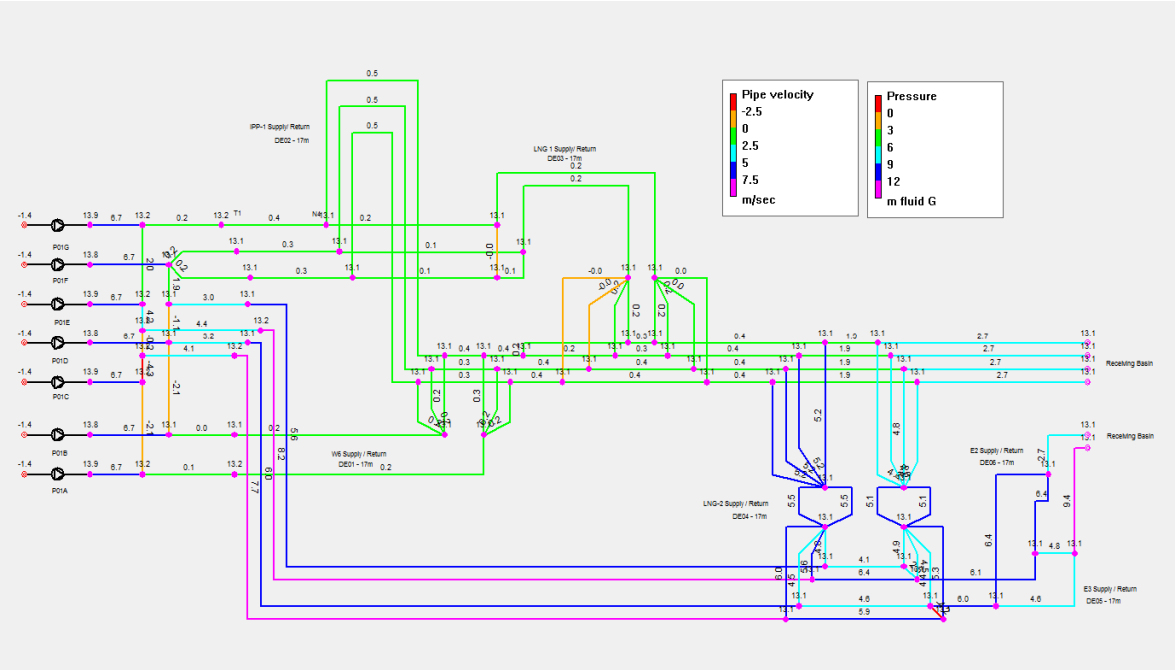
This shows the fire protection system on onshore gas reception facilities. The system had two diesel pumps and 2 electric pumps.



CCC. Standard Module :

LNG Plant Cooling Water System.

This is the steady state version of example 6 which was shown under PIPENET Transient module applications. The purpose of this calculation was to select the pumps and size the pipes.



If you have any questions about this case study, or any other of PIPENET's capabilities, please email us at Pipenet@sunrise-sys.com.