

Analysis of Cooling Water System Problem using Sunrise Systems PIPENET Standard Module

PIPENET Standard Module was used with outstanding success in the design cooling water system by Davy Mckee.

The reason for this is that Sunrise Systems is in a position to offer engineering companies the best Standard fluid flow analysis software product available. This is the PIPENET Standard Module, which is ideally suited to problems such as that faced by Davy Mckee.

PIPENET Standard Module is easy to use; even the most complex problems can quickly be set up by users having little or no experience of the software. This means that useful results can be obtained right from the start.

PIPENET Standard Module analyses the flow of fluids in networks of pipes or ducts. Properties of fluids or gases can be modelled in simulations.

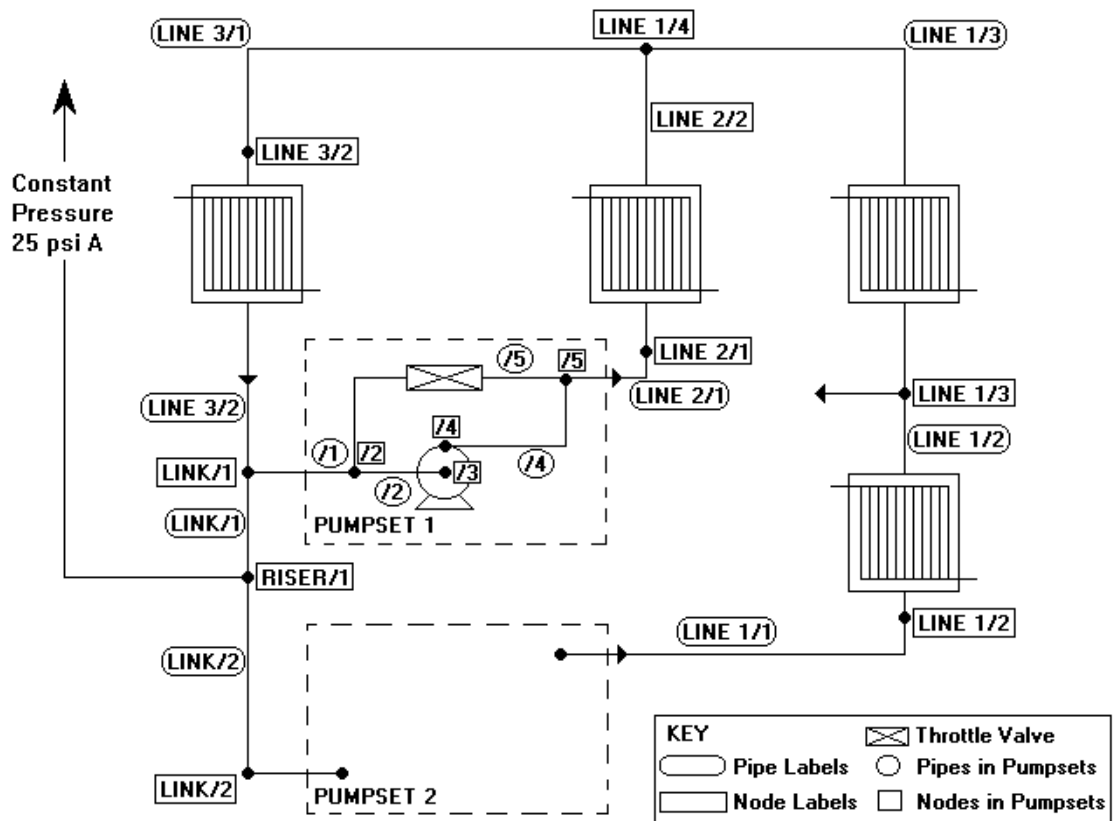
PIPENET Standard Module allows users to specify the units in which data is to be entered, and for the output results.

To reduce the time spent entering data, PIPENET Standard Module has been designed so that data for pipes, pumps and valves that is common to more than one problem or network (as is frequently the case) only needs to be entered once.

The engineer often wishes to experiment with different variables, such as valve and pump operating schedules when solving problems. PIPENET Standard Module is specially designed to facilitate this: basic network information need only be specified once, and may be modified quickly and easily for subsequent simulations. The following example illustrates how quickly one can appraise a proposed solution to the problem.

Problem - Cooling System

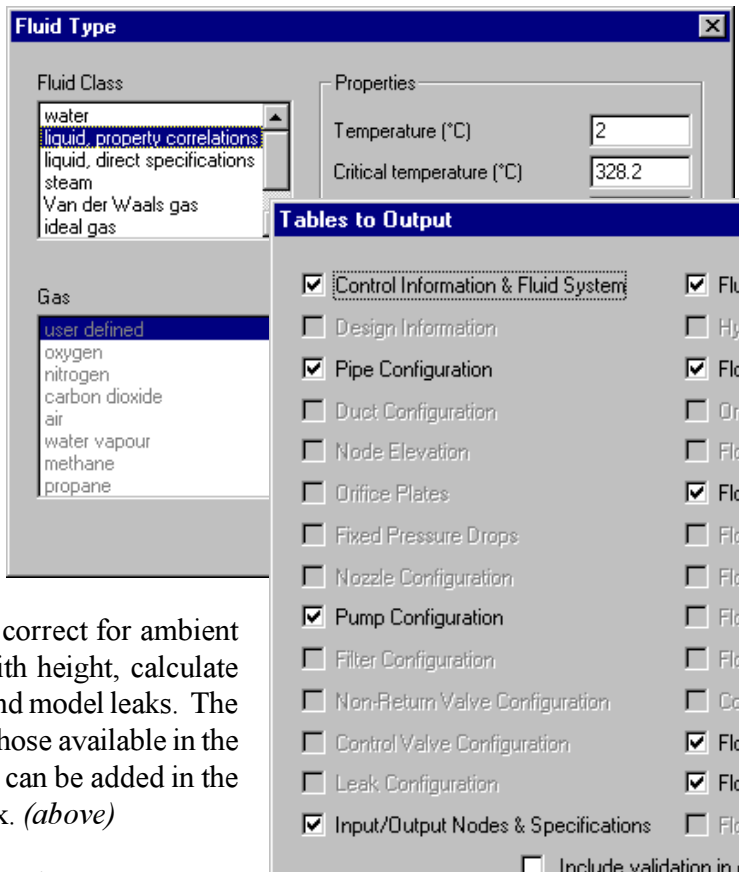
Davy Mckee was designing a closed loop cooling water system which circulated a glycol-water mixture through four heat exchangers. Two identical pump sets were used, each of which operated with local recycle and were controlled by a throttle valve. After passing through the heat exchangers the coolant streams were to be combined, chilled and returned to the recycle pump inlets. Davy Mckee wished to know the flowrates at the pumps required if the pressure was to be maintained at 25 psi A at the riser. The pressures and the flowrates in the pipes were of particular importance, as incorrect flowrates might result in insufficient heat being removed from the heat exchangers.



To facilitate data entry, the user interface is the Windows format, which customers consistently find straightforward to use. Data is entered into dialog boxes such as those shown below:

The **Network** may consist of pipes, ducts, pumps, fans, check valves, control valves, nozzles, filters, orifice plates and other components. Fittings can be defined or selected from a list Control valves can be set for pressure, differential pressure, flow or valve position.

PIPENET can check for cavitation, correct for ambient pressure decrease with height, calculate hydraulic gradients and model leaks. The fluid is chosen from those available in the database of fluids, or can be added in the Fluid Type dialog box. (above)



The **Results** of calculations are tabulated in the custom made Output Browser. The range of possible output results tables is extensive, making PIPENET Standard Module a valuable tool when analysing networks.

- Network data is quick and simple to enter.
- Windows format for data entry.
- Calculation time is short.
- Extensive component range.
- Tabulated results of calculations.
- Powerful analysis of networks.

Results of the Calculation

PIPENET Standard Module was used to investigate the pressures and flowrates in the pipes and fittings, and the power required by the pumps. The Output Browser gives the required flowrate as 92.02 cuft/min by PUMPSET1/3, and and 117.8 cuft/min by PUMPSET2/3. The pressures and flowrates for the pipes are shown below. PIPENET Standard Module allowed a thorough analysis of the problem.

Output Node	Inlet Pr. (psi A)	Outlet Pr. (psi A)	Drop in pr. (psi)	Pipe frict (Psi / ft)	Velocity (ft/sec)	Flowrate (lb/sec)
PUMPSET1/2	25.08	23.91	1.171	5.5202E-02	11.72	59.96
PUMPSET1/3	23.91	23.79	.1206	.1414	19.21	98.26
PUMPSET1/5	44.42	43.77	.6466	.1414	19.21	98.26
PUMPSET1/5	23.91	43.77	-19.87	2.3803E-02	-7.488	-38.30
RISER/1	25.08	25.00	7.8152E-02	1.5630E-02	7.820	90.69
LINK/2	25.00	24.60	.3953	1.5630E-02	7.820	90.69
LINE1/2	38.61	36.74	1.880	1.5630E-02	7.820	90.69
LINE1/3	36.74	33.39	3.347	1.4901E-02	7.874	90.69
LINE1/4	33.39	32.24	1.148	1.4366E-02	7.936	90.69
PUMPSET2/2	24.60	21.95	2.659	.1213	17.73	90.69
PUMPSET2/3	21.95	21.48	.4637	.2271	24.58	125.7
PUMPSET2/5	39.52	38.61	.9038	.2271	24.58	125.7
PUMPSET2/5	21.95	38.61	-16.67	2.0169E-02	-6.851	-35.04
LINE3/2	32.24	30.78	1.463	3.8309E-02	13.18	150.6
LINK/1	30.78	25.08	5.700	4.0665E-02	12.99	150.6
LINE2/1	43.77	40.67	3.104	5.5202E-02	11.72	59.96
LINE1/4	40.67	32.24	8.429	.1126	16.13	59.96

The Output Browser shows clearly that the pressure is highest at PUMPSET 1 with an inlet pressure of 44.42 psi A, and that the flowrate is highest (150.6 lb/sec) in LINE 3/1 and LINE 3/2. The friction in the pipes and fittings, and the resulting pressure drops are also given, suggesting to the engineer where possible improvements could be made in the network.

Sunrise Systems is the market leader in Fluid Flow Analysis software. PIPENET Standard Module is a unique product that has been chosen by Davy Mckee and many other companies because of its user-friendly interface and its unrivalled power.