

Pipe Stress Analysis

Pipe stress analysis is usually required by codes for certain high risk piping systems. Conducting a proper stress analysis would ensure compliance with the recommended piping codes as well as avoid disruptions in operations due to failure of piping systems. In some cases, failure to conduct a proper pipe stress analysis can lead to loss of life.

Among the services provided by *Vy Consult* in this area include :

- Ensure compliance of stress levels with codes (i.e. ASME, BS)
- Determine loading on pipe supports such that the structural engineer can designed the structure to take the loading due to the piping system. The loading can be due to pipe expansion, wind loads, operating pressure, occasional loads and seismic loads.
- Selection of proper piping support systems. This includes selection of spring hangers (including spring stiffness)
- Plot 3-D drawings of the piping systems for clash analysis

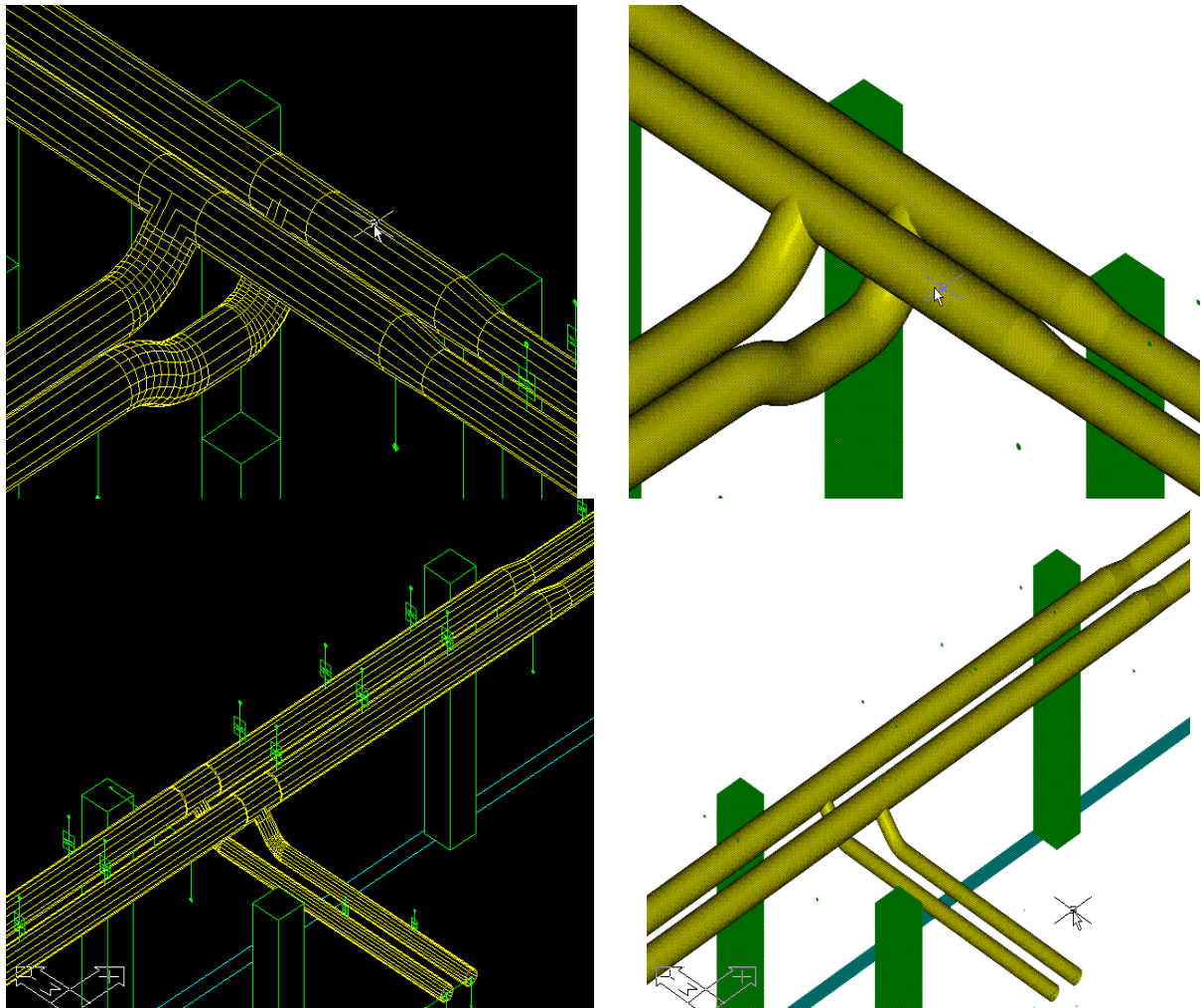


Figure 4 : 3-D drawings of a piping system

Transient and Dynamic Analysis of Piping System

Transient analysis is carried out to understand the behaviour of piping systems under transient conditions. Water hammer waves in long pipes can easily bend supports and piping. Valve closure times in these systems determine the magnitude of the load and its duration. A well designed piping system would have considered the steady-state and transient analysis. More often than not, it is the transient behaviour of the piping system that is not fully understood.

Among the services provided by *Vy Consult* in this area include :

- Analyse behaviour of piping systems for steady state flow conditions involving pumps, valves and orifices
- Analyse transients such as water hammer and steam hammers.
- Analysis of natural frequencies of a piping systems such that pulsations due to operation of piping system with rotating equipment can be avoided.
- Analysis of relief valve loads and displacements. Relief valves in high pressure systems can impose large forces on the restraints as well as cause large displacements in the piping systems. As such, the supports should be designed to take these large momentary dynamic forces.
- Dynamic analysis of piping systems. This is an analysis of the piping system as it is subjected to a series of shock spectra.
- Analyse system under earthquake loads

Vy Consult uses a fluid hammer analysis program called **Bos Fluids** for analysis of water hammer and transient forces.

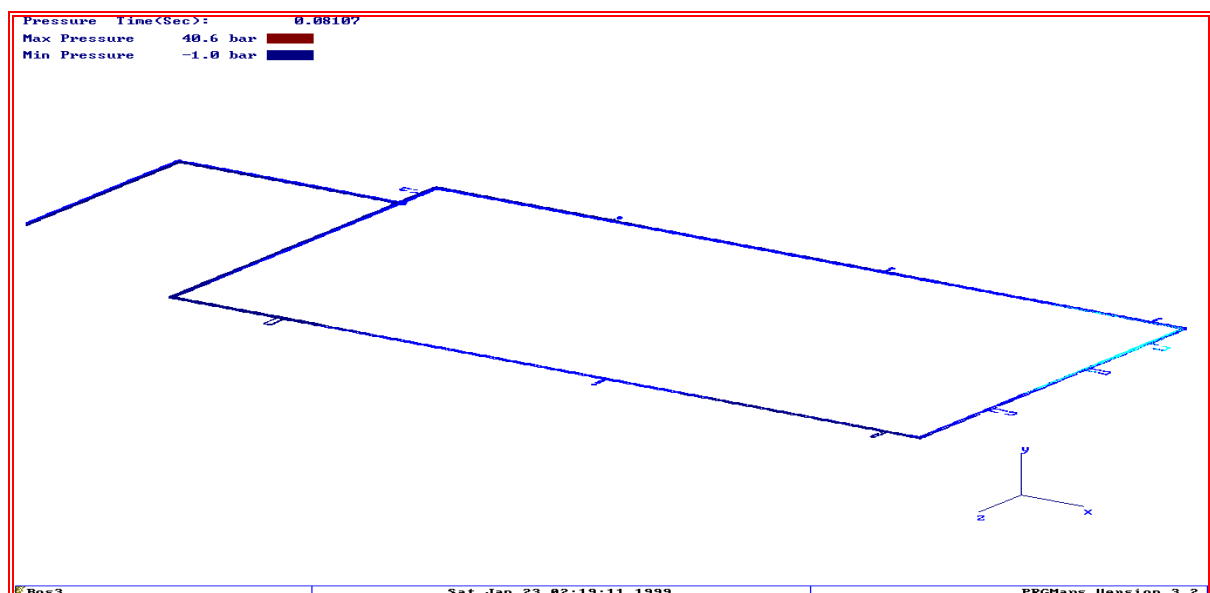


Figure 5 : Variation in pressures as the water hammer wave passes through the pipe system

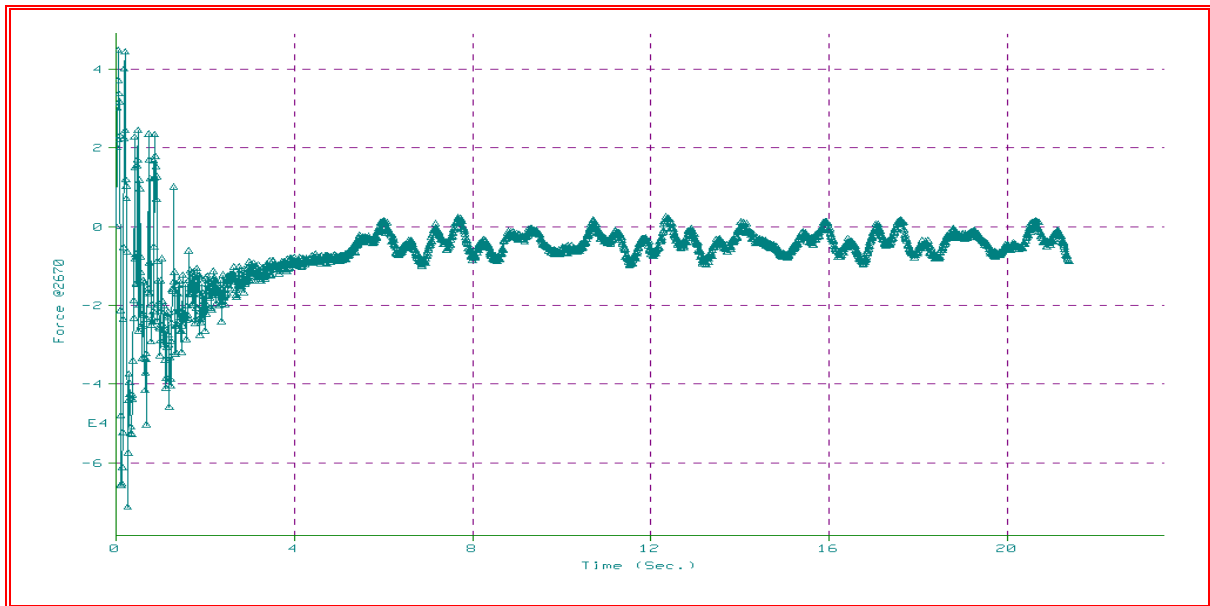


Figure 6 : The force-time history for a node on the piping system that was shown in the preceding figure.