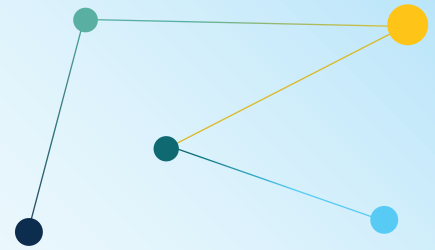


Design and Operate Your System with Greater Safety and Reliability

Impulse is a powerful fluid dynamic simulation tool used to calculate pressure transients in piping systems caused by waterhammer. Designed for use in liquid systems containing water, petroleum and refined products, chemical products, cryogenics, refrigerants, and more.



CAPABILITIES

- Experiment with operating conditions and scenarios
- Easily change system input data including transient valve positions, pump operation, control set points, pressures, temperatures and more
- Model a wide range of system components from handbook empirical sources or input manufacturer data
- Initiate transients based on time or triggered by a parameter criteria
- Reduce surge magnitudes by adjusting system component transients such as valve closures or pump speed
- Calculate transient unbalanced forces and define force sets as location pairs or single points
- Specify alerts that automatically highlight output values that are out of range for flow, pressure, velocity, pump best efficiency point and more
- Prevent transient pressure issues by properly sizing and locating surge equipment, such as check valves, surge tanks, gas accumulators, and relief valves
- Evaluate codes and industry standards applied in the model
- Compile database libraries of your frequently used piping components and select them from a drop down list

BENEFITS

- Understand the deviation from steady-state, or transient response, of your system
- Avoid damaging effects of waterhammer and other undesirable system transients
- Alleviate issues associated with inadequate system designs or operational procedures
- Validate the design of safety features
- Visualize the dynamic interaction of valves, pumps, and other components

APPLICATIONS

- Ensure pressure extremes are within design allowables
- Size and locate surge suppression equipment
- Determine imbalanced pipe forces for sizing structural supports
- Troubleshoot existing systems to determine the cause of operational problems
- Evaluate the effect of pressure surges due to vapor cavity collapse

ADD-ON MODULES

**SSL**

Settling Slurry

Models the effects of pumping fluids containing settling solids using the Wilson/GIW method

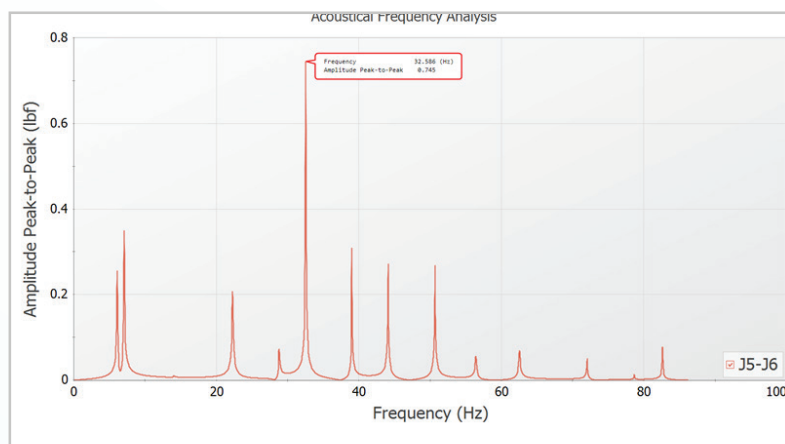
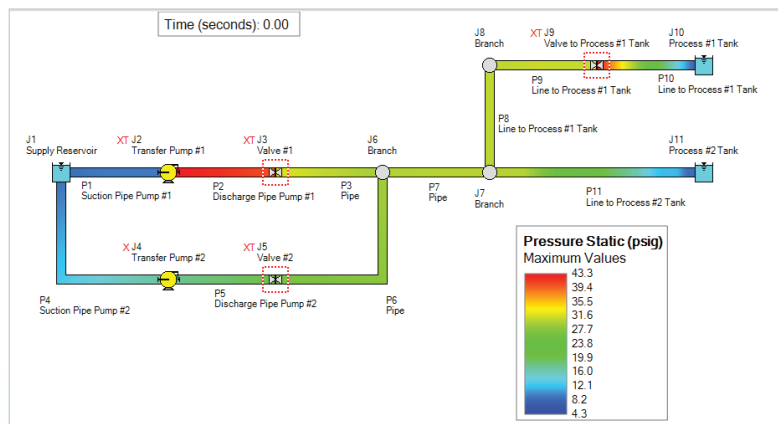
**PFA**

Pulsation Frequency Analysis

Helps identify pipe acoustical frequencies to avoid resonance from excitation, especially in systems with positive displacement pumps.

FEATURES

- Built-in steady-state solver to automatically initialize waterhammer transient
- Compound transient event logic to model complex control sequences
- Detailed pump inertial modeling for trips and startups using one quadrant or four quadrant methods
- Extensive cavitation modeling including liquid column separation
- Scenario Manager to track all design variants and operational possibilities in a single model file
- Comprehensive modeling of relief valves, check valves, surge tanks, and gas accumulators
- Integrated graphing and reporting
- Animation tools for visual interpretation of complex transient interactions
- Generates force imbalance files that can be automatically read into CAESAR II®, ROHR2, AutoPIPE and TRIFLEX® pipe stress dynamic models
- Built-in libraries of fluids (including NIST REFPROP and ASME Steam Tables) and fittings which can be extended and customized



DATA INTEGRATION

- Import piping layouts and dimensional data from GIS Shapefiles, CAESAR II® Neutral Files, and PCF files from a wide range of sources
- Import and export files in EPANET format
- Robust Excel integration to import and export data

How Does It Work?

Impulse incorporates a steady-state solver providing seamless transfer of initial conditions to the transient analysis. Steady-state solutions are determined using Newton-Raphson matrix iteration. The traditional Method of Characteristics is used to solve the transient mass and momentum equations of pipe flow.

INDUSTRIES



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LNG



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Chempute Software (Pty) Ltd
+27 31 764 6840
sales@chempute.com