



SOUTHWEST RESEARCH INSTITUTE

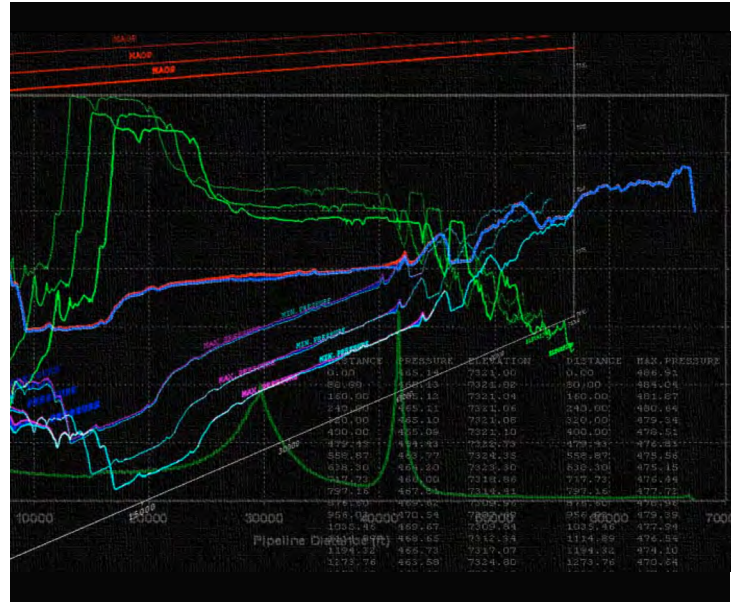


# Fluid Pipeline Modeling Services

Southwest Research Institute® (SwRI®) has been involved in pipeline modeling for nearly 60 years. In the 1950s, SwRI developed a unique analog resistance simulator for the gas transmission and compression industry. SwRI has expanded its capabilities using commercially available software while generating and validating its own computational tools as well, and now uses pipeline simulations to help customers all over the world with different needs and applications.

SwRI has used pipeline simulations as an optimization tool in many liquid and gas processes. Simulation of an entire pipeline's operating conditions and process before proceeding with the detailed engineering is a very common strategy used on new systems. Simulation analyses usually include detailed validation and tuning against real conditions.

Transient and steady-state flow modeling of pipeline systems and other fluid transient responses are performed at SwRI with a variety of one- and three-dimensional fluid dynamic codes.



Example of crude oil pipeline batching

## Pipeline Modeling

SwRI modeling capabilities include:

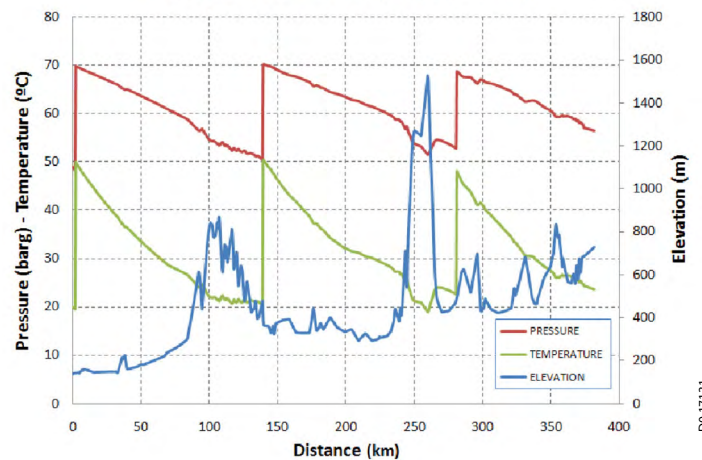
- Design or modification of new installations
- Evaluation and optimization of transmission lines
- Gathering systems and valve manifolds
- Pump and compressor stations
- Pipeline networks

## Pipeline Simulation

SwRI pipeline simulation services have been utilized for:

- Design and optimization of new installations
- Modifications of existing facilities
- Hydraulic operation issues
- Transient analyses for liquid and gas systems
- Centrifugal compressor dynamic analyses
- Liquid drop-outs in gas pipelines
- Multiphase flow modeling and flow assurance studies
- Development of pipeline simulator for training operators

Natural Gas Pipeline System - Temperature, Pressure and Elevation Profiles - Steady State Conditions

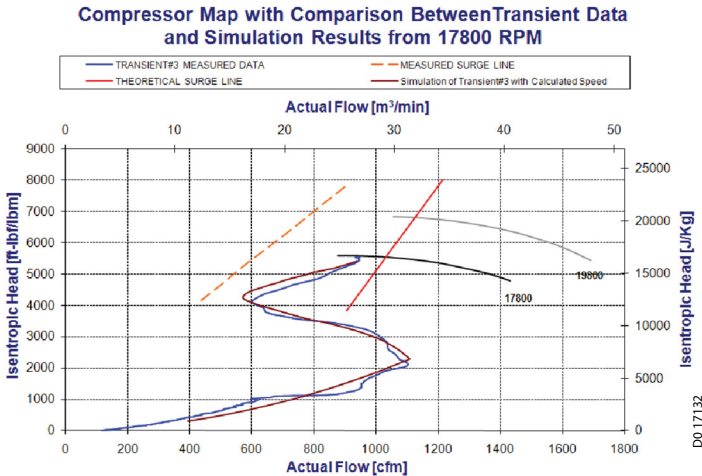


Flow and power usage maximization analysis of a natural gas looped pipeline system

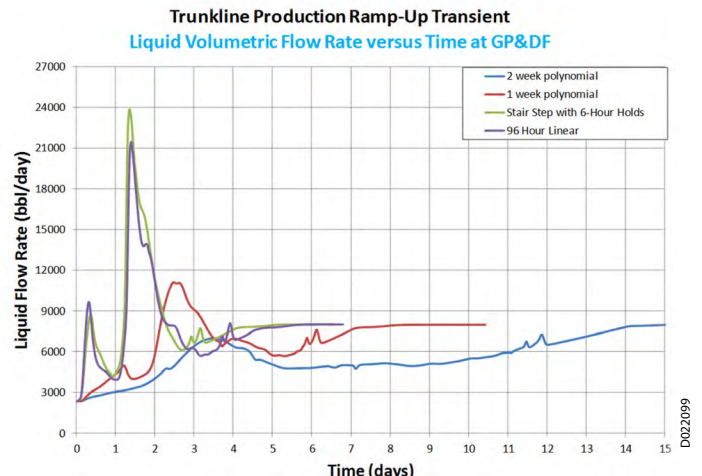
# Transient Surge Simulation

SwRI dynamic modeling can be a valuable tool in the design of an anti-surge control system. Results from the transient analysis are used for:

- Evaluation of the system piping design response time and operating performance
- Placement of the downstream check valve and anti-surge valve
- Valve/actuation system selection
- Surge control system safety confirmation



Validation of centrifugal compressor surge simulations using experimental transient surge data taken at SwRI Metering Research Facility



Trunkline production ramp-up transient

We welcome your inquiries.

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