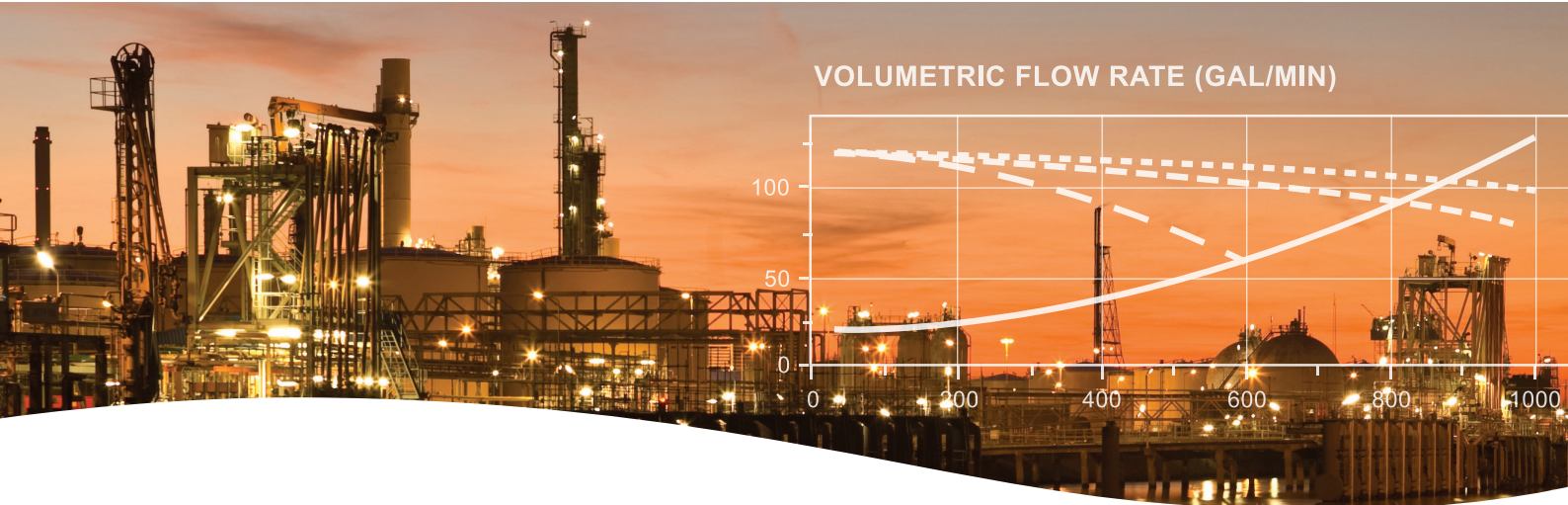




# Hydraulic Modeling System Assessments



## See the problems—and find the solutions.

Hydraulic modeling can answer “why”, “what” and “how” to an endless array of questions about your piping systems:

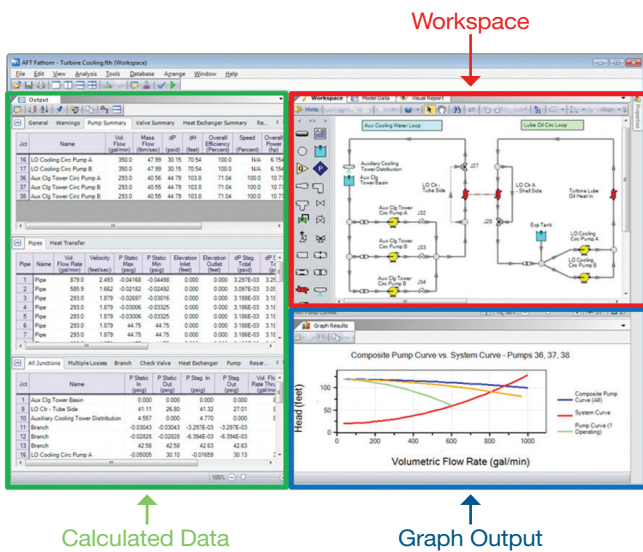
- Why are my flows and pressures so unpredictable?
- What is causing water hammer, vibration or noise?
- What effect is pipe fouling having on pressure and flow in my system?
- Why am I having so many reliability issues?
- How will new pumps or valves affect my system?

With our hydraulic modeling services, Flowserve doesn't just show you these problems; we show you how to fix them.

## A holistic view of your system to measure the potential impact of changes

It's virtually impossible to analyze complex systems by hand. Flowserve modeling provides far more detailed analyses of your system performance and hydraulic issues. We gather test measurements and input the data into software that generates a hydraulic model that simulates the conditions in your piping system, showing the complex interplay of flows, pressures and temperatures. With this holistic view of your system, Flowserve troubleshoots problems and shows you the potential impact and benefits of making changes, such as:

- Adding, removing or upgrading pumps, valves, motors and other components
- Changing the pump speeds or design curve
- Resizing or using different valves
- Addressing system transients, such as variations in pump speed, pump starts and stops, control valve position adjustments, and others
- Correcting problems causing pressure losses, water hammer or acoustic resonance





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### Evaluate and verify solutions before implementation

While other companies can also test your equipment and generate a hydraulic model, none have the combination of product depth, engineering expertise and hydraulic modeling capabilities of Flowserve. As a world-class pump and valve manufacturer, Flowserve has the pump hydraulic design knowledge that is critical for system analysis. We match our data to the Flowserve model to custom engineer pump and valve solutions for your system. The results of the hydraulic model are used to develop pump and system improvement recommendations. To eliminate guesswork, we verify our solution will work before you implement the recommended solution at the plant.

### The complete approach to improving reliability

Resolving reliability and performance issues is all about having enough information to identify the root causes of problems—and the information it takes to engineer solutions that solve them. From testing to hydraulic modeling and analysis to engineering, Flowserve is the industry leader in providing all of these services via a “one-stop shop” for improving reliability.

### Case study: Trinidad plant avoids new capital cost using hydraulic modeling

A chemical plant in Trinidad needed to increase its boiler feed system output. There were two boiler feed pumps, one in operation at a time. The turbine-driven pump was operated at maximum speed and could not make sufficient flow; the motor-driven pump couldn't make sufficient head or flow and was rarely used. The plant asked Flowserve to create a hydraulic model of the system to help size new pumps. Through hydraulic modeling, Flowserve discovered that a downstream control valve was not opening fully, introducing a large pressure drop into the system. Further investigation showed there was an error in the valve's control logic. After correcting the error, the turbine-driven pump could meet the new load demand of the unit, and the purchase of new pumps was deemed unnecessary. With hydraulic modeling, Flowserve discovered and resolved a major system problem while saving the customer an unnecessary and large capital expense.

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