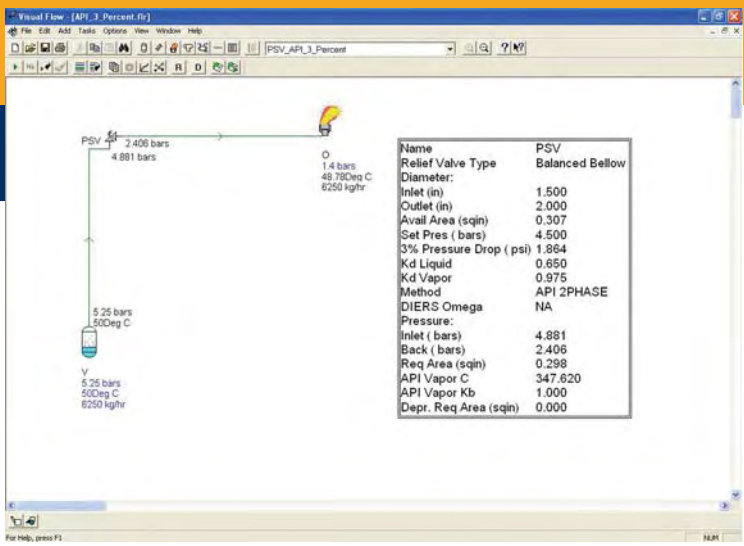
Invensys®
SIMSCI-ESSCOR™
The Power of Simulation℠

Troubleshooting Relief Valve Instability Using Visual Flow®



BENEFITS

- Aids in documentation and compliance of safety regulations and environmental laws.
- Prevents potentially dangerous malfunction of relief valves.
- Detects errors in plant processes by simulating specific operating conditions.
- Reduces capital and operating costs by making the process as efficient and safe as possible.

About VISUAL FLOW

VISUAL FLOW provides engineers with a state-of-the-art tool for designing, documenting, and modeling safety systems, pressure relief networks, and general plant fluid-flow systems. VISUAL FLOW delivers fast, reliable, and accurate answers to the toughest problems, from the rating of complex relief systems to highly looped cooling water systems. Benefits from this easy to use software include safer designs and operation, faster regulatory documentation and compliance, more efficient flare network modeling, and reductions in capital and operating costs.

CUSTOMER CHALLENGE

Operators are being required by regulatory agencies such as OSHA or HSE to assess the safe operation of their plants. A standard requirement of this assessment is often a comprehensive model of flare relief systems of the plant with full documentation of network structure, control systems/strategy, and maximum relief rate capacity. VISUAL FLOW is designed to address this need while improving the productivity of the teams assigned to complete this task either as part of a new design, a plant revamp, or on-going operation. The case management capabilities provides an efficient means to ensure that a full analysis is completed for all scenarios. The program has been successfully used by major oil & gas, refining and petrochemical companies to help meet regulatory compliance requirements and improve the safety of operating plants.

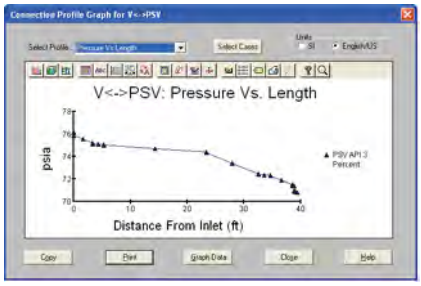
This application summary illustrates a process plant operating a flare system with a problematic relief valve. Instability and chatter in the relief valve have caused concern among engineers in the plant. Since operational changes often increase the potential for pressure relief valve to malfunction, engineers must eliminate the chatter and instability to prevent damage of the valve's seating devices which could potentially lead to more hazardous consequences.

To pinpoint the cause of this problem, API Recommended practice 521 must be reviewed. Per the API, the primary cause of chattering and instability in relief valves is due to improper design of relief valve inlet piping. API recommended practice 520 part II limits the total pressure drop due to nonrecoverable losses to 3 percent of the set pressure. VISUAL FLOW follows the above API recommended design consideration and identifies non-conforming valves and inlet piping. Once identified, the inlet piping to the valves that fail the 3 percent rule can be redesigned or replaced to ensure regulatory compliance. The identification of these valves is not only a key first step to regulatory compliance, but also the first step in ensuring the safe operation of the plant.

"Visual Network was used to simulate the (new cooling water) system which involved 3 large refinery units and a large cooling tower. The problem was identified and the solution was agreed upon to everyone's satisfaction. When the new piping was installed, the system performed as expected." - **Denny Robertson, Process Engineering Manager at ENGlobal Engineering**

INVENSYS SIMSCI-ESSCOR SOLUTION

In order to identify the source of the problem, a comprehensive model of the flare relief systems of the plant is built and run using VISUAL FLOW. The balanced bellow relief valve (PSV) produces a warning message in the solution status window during the simulation run. The warning message states that "The constraints specified for this network caused the following RVs inlet piping to fail the 3 PERCENT RULE." The 3% rule is crucial when considering the design of any relief valve and if ignored during the design stage, it may lead to chatter and instability of a relief valve in an actual plant. In this particular example, the PSV is violating the API 3% rule. To abide by the API 3% rule, the inlet pipe size to the problematic relief valve (PSV) should be increased. Once the correct inlet pipe size is utilized, the VISUAL FLOW model runs and does not find the PSV to be in violation of the 3% rule. This simple example shows how VISUAL FLOW can be used to identify problematic valve configurations early in the design phase, preventing costly mistakes before they become safety hazards in the plant.



VISUAL FLOW's ability to perform a comprehensive evaluation of a plant's flare relief system provides the most valuable benefit of all -- confidence that the plant's flare relief system is adequate to safely operate the plant.

ABOUT SIMSCI-ESSCOR

Design-Operate-Optimize a safe and profitable plant.

For 40 years, SimSci-Esscor's advanced applications have improved asset performance and utilization with integrated simulation, optimization, training, and process control software and services. Spanning the entire lifecycle of modern processing facilities, customers range from the novice user to executive expert within a variety of industries, including oil & gas exploration and production, petroleum refining, petrochemical and specialty chemical manufacturing, power generation, EPC, and more. Benefit from software products, solutions, and services that minimize capital demands, optimize facility performance, and maximize investment returns.

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