Chapter A2

Other Kalsi Engineering products

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Individual chapters of the Kalsi Seals Handbook are periodically updated. To determine if a newer revision of this chapter exists, please visit www.kalsi.com/seal-handbook.htm.

1. Introduction

In addition to rotary shaft seals, Kalsi Engineering offers a range of state-of-the-art products designed to meet the needs of our oilfield and power generation clients. From user-friendly jarring analysis software to actuator fitness testing, to critical service gate valves in nuclear power plants, Kalsi products extend service life and improve operating efficiency. Our water flow loop is available for testing client products, and our engineers are expert in consulting and design services.

2. Drillstring jarring analysis software

JarPro™ software description

JarPro™ 2D software performs various phases of oilfield drillstring jarring analysis, ranging from jar placement optimization to detailed time histories of jarring impact.

A systematic stress wave tracking approach simulates the transmission of forces and motion in the drillstring during jarring. This approach enables JarPro to solve complex drillstring configurations efficiently, using relatively simple inputs that facilitate its use by drilling engineers, rig personnel, and jarring tool manufacturers. This general purpose program requires only basic jarring parameter selections and drillstring data during input, and a parametric range can be evaluated in a single run. Additionally, the program automatically generates all internal nodes and elements needed for mathematical computation. Data input can be in batch or interactive mode, and the format can be modified to your specifications.

Output consists of jarring parameter selections, the drillstring model, and a summary of analysis results. Analytical results include the characteristics of jarring and, most importantly, the stuck point movements. Detailed time history of force, velocity, and displacement at any section in the drillstring is available for an in-depth jarring analysis. A plotting package is available for displaying the drillstring model, and to facilitate review of parametric studies or time history analyses (Figure 1).

Reducing the cost of a stuck pipe event

The loss of a bottom hole assembly due to a stuck pipe event is extremely costly. The total cost includes the cost of the bottom hole assembly, lost time, and various sidetracking expenses. Users of JarPro software can reduce these costs by improving the selection and placement of jarring tools and accelerators.

Software verification

JarPro has undergone extensive verification through comparisons against closed-form solutions, manual computations, and more than 20 transient dynamic finite element runs.

Furthermore, a matrix of instrumented tests performed by JarPro users and drilling research organizations have confirmed the program's predictions.

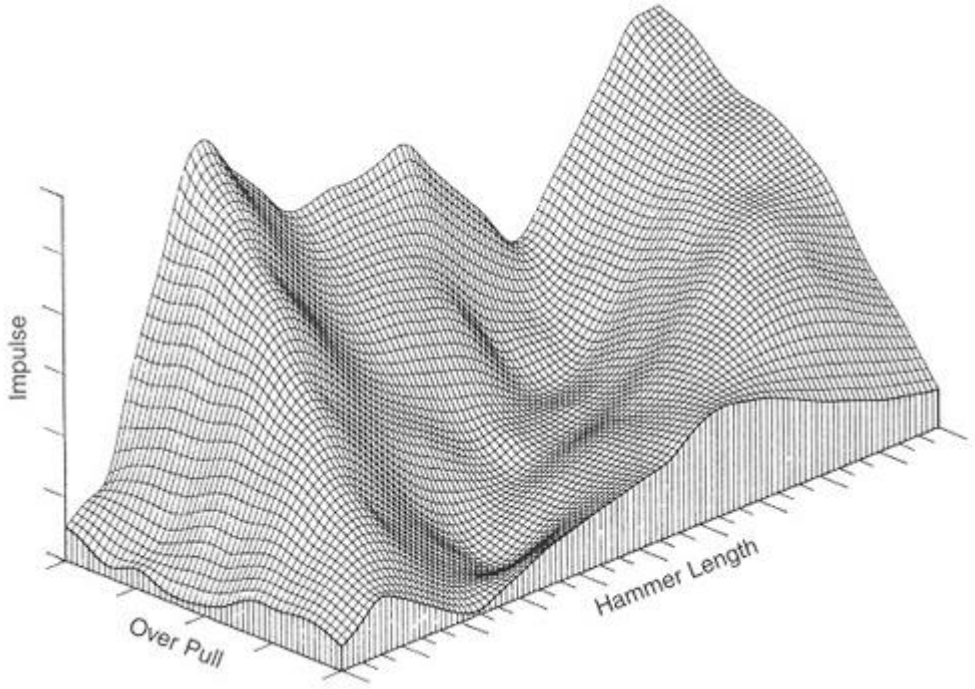

Figure 1
Jarpro impulse prediction

Jarring tool impulse varies significantly as a function of over pull and hammer length. JarPro impulse predictions are used to optimize jar placement in complex bottom hole assemblies.

Summary of Jarpro capabilities

The key capabilities of JarPro are:

- Versatile two-dimensional drillstring modeling and ease of input
- Parametric analysis for jar placement, tripping force, stuck force, and stuck location
- Detailed time history of jarring forces, velocities, and displacements at user-selected locations
- Both jarring-up and jarring-down simulations
- Enhanced jar placement optimization options
- Special sections for accelerators and shock subs with nonlinear springs

- Modeling mud buoyancy, side wall friction, and pump-open at jar
- Material changes in a drillstring
- Single point or differential sticking simulation
- Plotting the analysis results and drillstring model

For more information, visit Kalsi.com or call 281-240-6500.

3. Valve actuator test stands

Kalsi Engineering manufactures several types of actuator test stands that are used to measure the output of motor operated valve (MOV) actuators used in nuclear power plants. The Kalsi Engineering MOV Actuator Test Stand (Figure 2) quantifies actuator fitness for service by detecting degradation or misassembly. This enhances productivity during power plant maintenance outages, and reduces radiation dose by minimizing personnel time at the valve. The test stands also effectively improve actuator margins by accurately quantifying actuator torque output off-line, eliminating uncertainty in torque output. The test stand load range is 0 to 75,000 pounds of thrust and 12.5 to 3,000 ft-lb of torque, bi-directionally. An optional power cabinet provides user-defined discrete motor voltages ranging from 100 to 600 volts (alternating or direct current).

The test stand provides for quantification of the following:

- Torque output with and without stem thrust
- True capability under degraded voltage
- Torque switch setting
- Torque switch repeatability
- Gear efficiency (with optional dynamometer)
- Torque switch balance
- Electric motor power

Figure 2

Kalsi MOV actuator test stand

Kalsi Engineering manufactures several types of actuator test stands used in nuclear power plants around the world to measure the output of valve actuators. The stands eliminate rework at the valve by identifying refurbish problems before actuator installation.

4. Valve and actuator software

KVAP™, CVAP™ and LiFE™ are state-of-the art software applications that evaluate critical valve and actuator issues in nuclear power plants. A user-friendly graphic interface minimizes the potential for user input error (Figure 3). Our latest software, COMMAND™, comprehensively meets the documentation and trending requirements of the ASME OM Code Mandatory Appendix II, Check Valve Condition Monitoring Program.

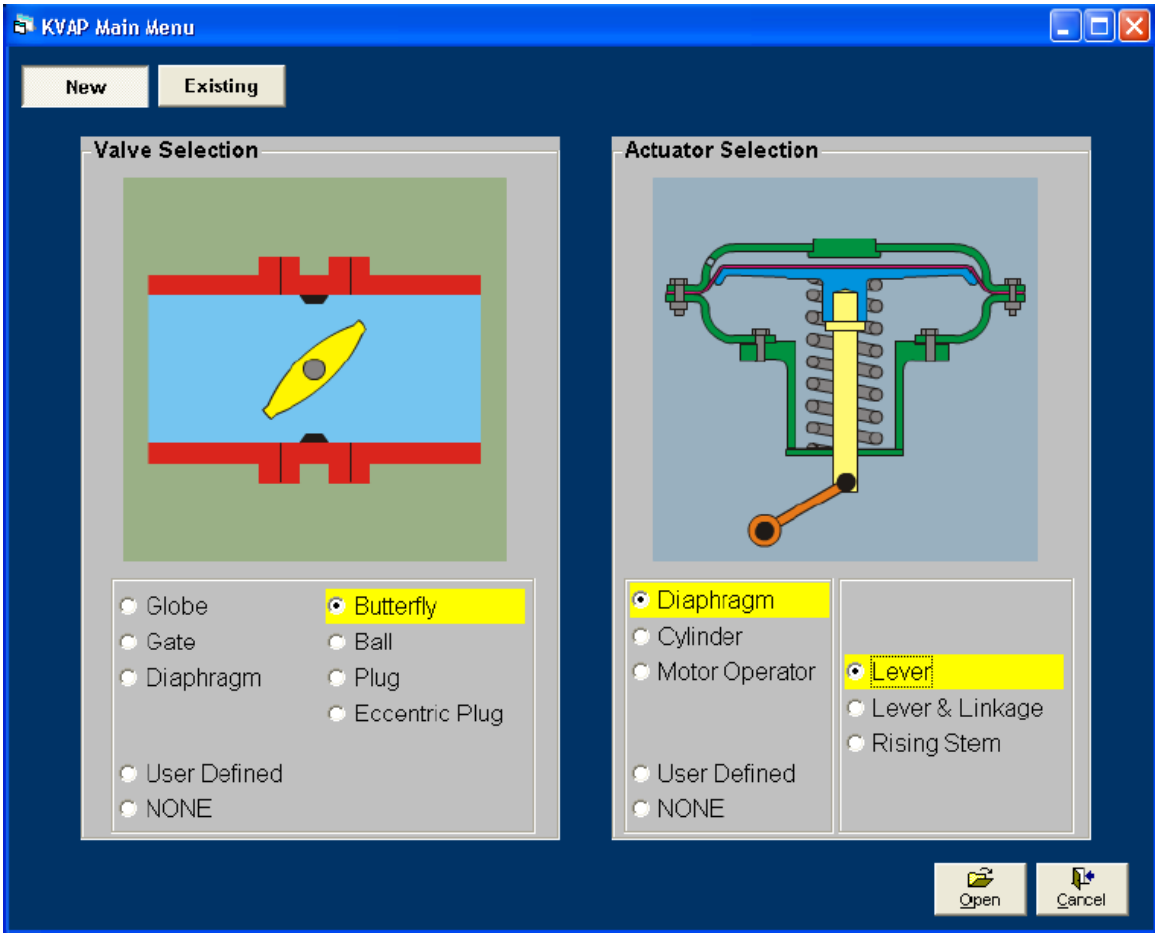

Figure 3

The main menu of the KVAP valve analysis software

The KVAP software input and output screens are heavily supported by graphics that illustrate critical features and dimensions of the valve being analyzed. This user-friendly graphic interface minimizes the potential for user input error.

5. Critical service gate valves

Kalsi Engineering, in cooperation with qualified manufacturers, provides an improved pressure sealed gate valve for critical service in nuclear power plants. The patented gate design (Figure 4) eliminates the severe galling and degradation commonly observed in conventional gate valve designs under high-pressure blowdown conditions, and also mitigates unwedging problems caused by pressure pinching and thermal binding to ensure reliable valve opening. The following features contribute to the superior performance of the Kalsi gate valve:

- A guide design that eliminates gate tipping and guide point contact, minimizes edge loading, and employs a galling resistant hard facing material.
- A flat bottomed, hard faced wedge design that prevents point contact between the gate and the seat.
- Engineered wedge flexibility based on a slotted center section design that limits contact stresses while providing uniform sealing stress around the circumference of the seat.

Figure 4
Critical service gate valve for nuclear power plants

This proven gate design prevents galling during high pressure blowdown conditions to ensure reliable valve closure, and also mitigates unwedging problems caused by pressure pinching and thermal binding to ensure reliable valve opening. The uniform seat stresses enhance long-term leak tightness of the valve.

6. Flow loop testing

Our water flow loop (Figure 5) was especially designed to investigate flow-related characteristics of valves used in typical power and process plant applications. The facility has been used to perform thousands of tests on nuclear and commercial grade check valves, choke valves, butterfly valves, gate valves and plug valves for various clients including power generation utilities and valve manufacturers.

The flow testing facility comprises three major sections: The hydraulics section, the control and instrumentation room, and the adjacent main consulting engineering laboratory. The hydraulics section features rapidly reconfigurable test section piping located in an indoor air-conditioned bay, and also includes a 5,400-gallon reservoir and a 180 HP diesel engine-driven variable speed centrifugal pump that are located outdoors. The flow loop is capable of delivering 2,700 gpm and 150 psig. This flow rate corresponds to a flow velocity of 30 feet per second in a 6-inch pipe.

The test section is of modular construction, allowing rapid piping configuration changes. Grooved couplings eliminate the need for expensive custom pipe welding and time-consuming bolted flanges. The laboratory has a large inventory of pipe spools, fittings, and flow control valves to support testing activities. The flow metering section utilizes orifice plates and high-accuracy differential pressure transducers to provide flow rate data. The meter run is constructed in accordance with the requirements of ANSI/API Standard 2530, providing a flow accuracy of ± 0.5 percent.

Electronic equipment, pump controls, and valve controls are housed in the control and instrumentation room, adjacent to the flow loop hydraulics area. Test instrumentation feeds data directly to a high speed computerized digital data acquisition system that can display and process the data in real time. A variety of pressure, temperature, displacement, load, and other transducers are available.

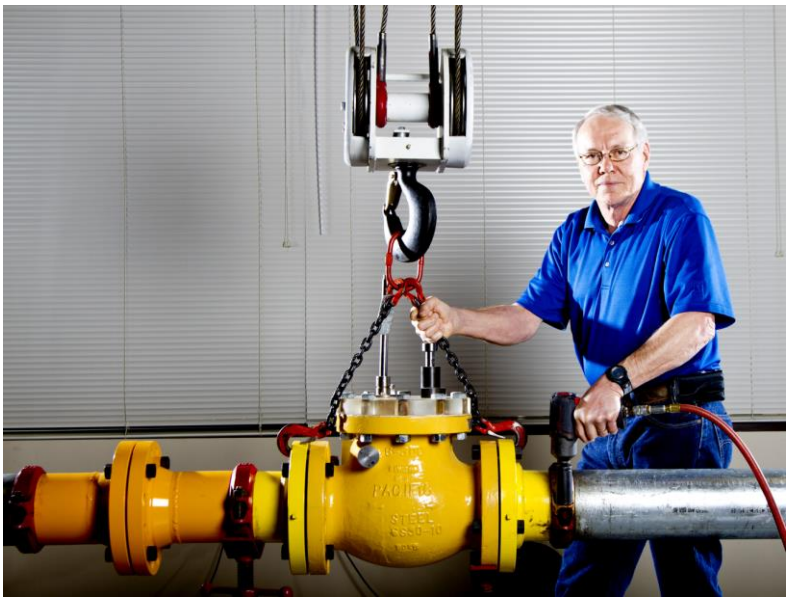

Figure 5

Kalsi Engineering's indoor flow loop facilities

Our water flow loop is available for testing customer products. It is capable of delivering 2,700 gpm and 150 psig, which corresponds to a flow velocity of 30 feet per second in a 6-inch pipe.