Knovel®

OIL AND GAS

Solution Story: Reducing downtime risk in oil and gas pipelines

Knovel delivers consolidated data and methodologies suitable to estimate component and equipment lifetimes and to assess the feasibility of redundancy systems for pipelines

Summary

Centrifugal pump failure can bring oil and gas pipelines to a halt, costing companies millions of dollars. To protect business continuity, one hydraulic engineer at a major transporter for oil and gas was tasked with estimating the feasibility of having backup pumps in a redundant pump system. The engineer turned to Knovel to discover which pumps had the appropriate lifespans and thus the longest mean time between failures.

Confident that the sources in Knovel are reliable, the hydraulic engineer was able to produce a credible recommendation that saved his company millions of dollars.

Challenge

Oil and gas production companies push their product through pipelines using large centrifugal pumps. If the pump fails, the downtime can stretch to two weeks and in extreme cases, can cost up to $100K per hour—and that is just due to stopping of the facility. Other costs include loss of business and the need to find alternative means of shipping the product.

The output of a centrifugal pump is determined by the physics of the system: the pressure or head and the flow of the fluid. Pumps have an optimal pressure and flow at which they can function with maximum efficiency (Figure 1). Outside of that range, the efficiency and the lifespan of the pump decrease. In addition, high pressures and flows can decrease the important parameter mean time between failures (MTBF) of the pump or its component parts. A short MTBF exposes the company to very high costs due to the repeated downtime.

In this case, the client company owns and operates a pipeline system, providing transport for oil, refined petroleum products and natural gas liquids. Downtime due to pump failure was a major concern. As part of a business continuity improvement project, they tasked a hydraulic engineer with evaluating the feasibility of a redundant pump system where a second pump could take over whenever the main pump failed.

Solution

The engineer chose Knovel, a recognized and reliable source of consolidated engineering information, to perform the in-depth research into the feasibility of running a redundant pump system.

Specific information that the engineer researched and found included:

- Crude properties
- Pressure and flow relationship charts for different fluids
- Methods for evaluating the reliability of pumps under different conditions
- Statistical methods for estimating the MTBF for pumps and their components
- Average MTBFs and lifespans for different pumps

Figure 2 illustrates the kind of information that can be obtained using Knovel in a case like this. Knovel provided all the data in an easy-to-find, uniform and actionable resource set. Otherwise, multiple databases would have been needed, adding considerable time to the project.

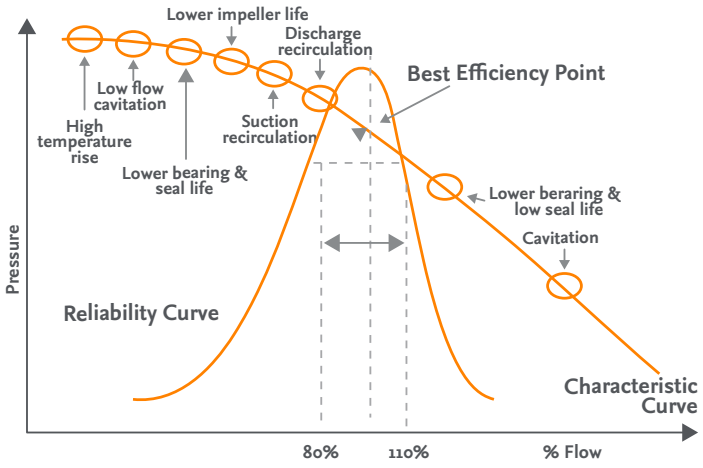


Figure 1. The intersection of the characteristic curve relating pressure to flow and the reliability curve for a centrifugal pump under those conditions can be used to determine the best efficiency point for the pump.

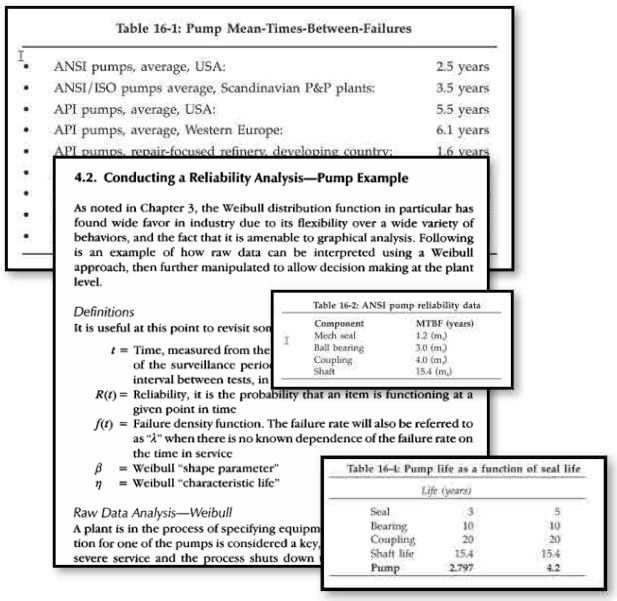


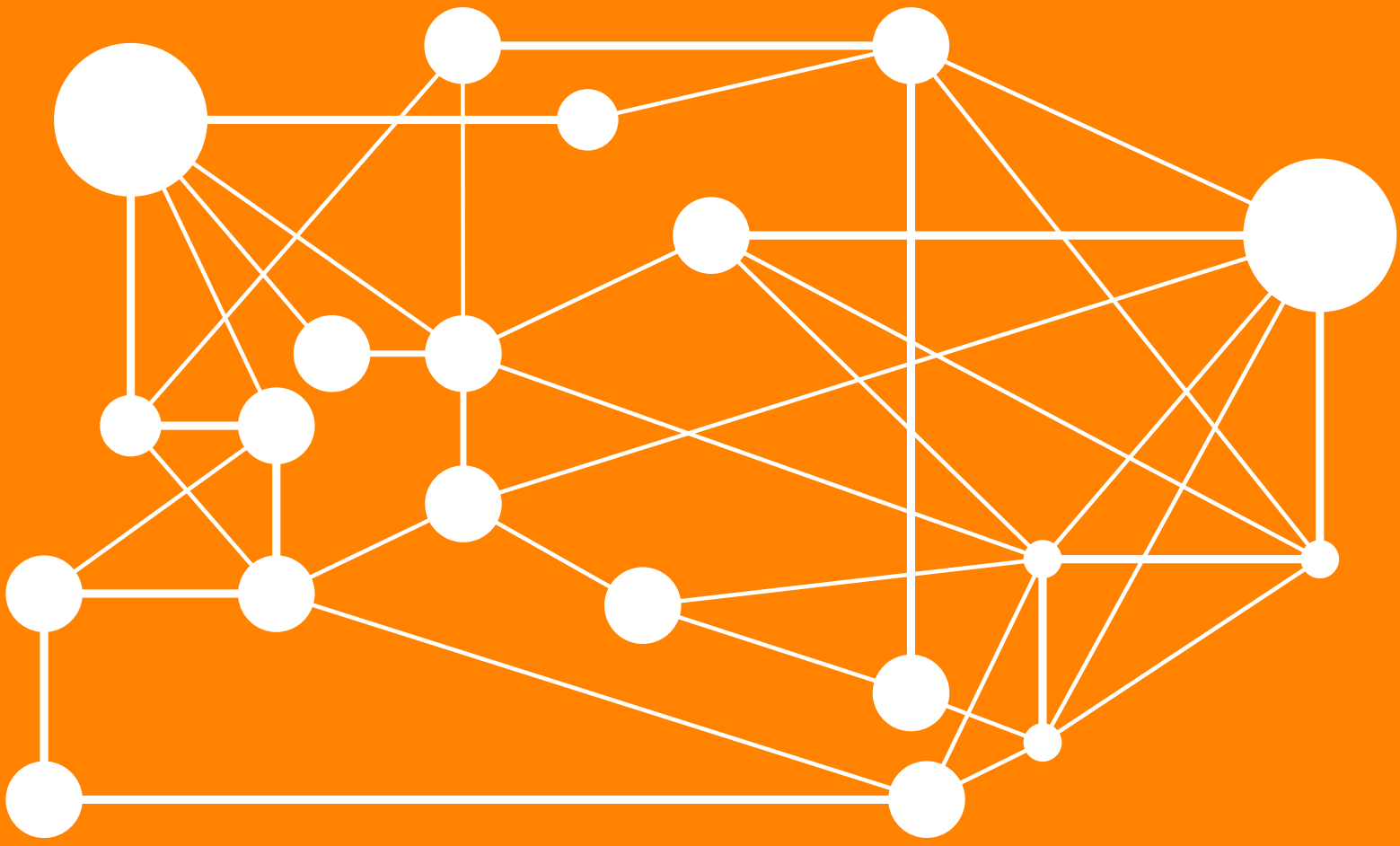
Figure 2. Knovel retrieves a whole range of precise methods and information.

Business Impact

Equipped with information about the MTBFs for pumps working under different conditions, the engineer could now qualify a given pump's lifespan as long or short. This provided better insight into the existing pumps and their potential problems, and helped to inform decisions on which types of equipment might be worth investing in.

Confident of Knovel's reliably curated and vetted sources, the engineer was able to produce a credible recommendation about the systems where purchasing redundancy pumps would benefit the company most. The cost of the recommended redundancy purchases was $2M—far less than the millions of dollars that downtime would have cost.

Knovel helped the engineer build a clear business case, featuring data and references from trusted sources. By providing all the necessary information through a single interface, Knovel saves research time, even for complicated and computationally intensive projects such as this one. Ultimately, this means engineers can more quickly make informed decisions about risks that can cost millions of dollars, implementing risk mitigation strategies before problems arise.



Knovel®

Knovel helps oil and gas companies minimize risk while maximizing output and efficiency by providing engineers access to technical reference materials and interactive tools for developing and managing projects.

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July 2017