

Knovel®

REFINING & PETROCHEMICALS

Case study: Help solving a severe corrosion issue in a refinery boiler

Knovel helps an oil and gas company address corrosion, optimize boiler efficiency, and avoid a \$90,000 retrofitting



Summary

A large oil and gas company encounters a corrosion problem in the boilers at one of its refineries. A company process engineer uses Knovel's interactive graphing tool to discover that increasing the alkalinity of the water solution used in the boilers will inhibit corrosion. By altering the solution, the engineer is able to increase boiler efficiency, avoid condensate return issues, and save \$90,000 in retrofitting expenses.



Steam is a substantial expense in a refinery, rising as high as \$7 million annually in an average-size refinery.

Challenge

One of the largest oil and gas producers in the world owns and manages upstream, midstream and downstream operations, including many refineries. Like other companies in the industry, this producer is always vigilant about corrosion in its facilities. NACE estimates that the annual cost of corrosion in the oil and gas production industry exceeds \$1.3 billion.

At one of the producer's refineries, three boilers were beginning to show signs of corrosion. The discovery created concern because worsening corrosion could increase the risks of health, safety, and/or environmental incidents. Corrosion could also result in reduced boiler efficiency due to poor heat transfer, causing problems in the condensate return system that could lead to extended downtime due to boiler stoppages.

Boilers play a critical role in refineries, providing steam for a wide range of mission-critical processes, including driving process pumps and compression and powering steam turbine generators to produce electricity. Steam is a substantial expense in a refinery, rising as high as \$7 million annually in an average-size refinery, so boiler efficiency is essential to a cost-efficient operation.

A process engineer was tasked with solving the boiler corrosion problem. He needed to identify the root cause of the corrosion and devise a change in the process that would reduce corrosion in the refinery's three boilers—without resorting to an expensive retrofitting of the boilers' piping and instrumentation.



Using the information from Knovel, the engineer learned that an acidic water solution will accelerate corrosion in boilers.



Solution

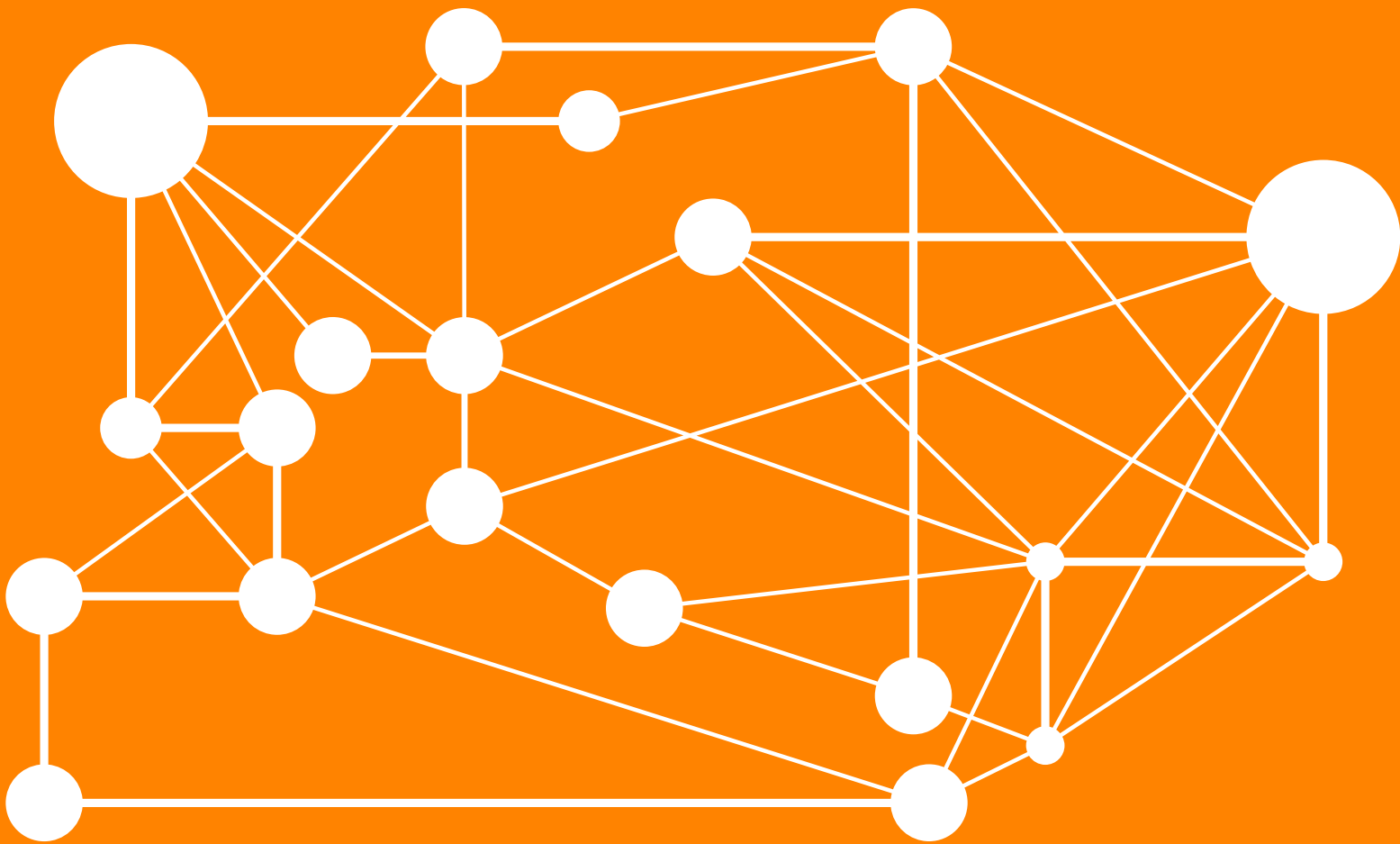
To better understand corrosion in boilers, the process engineer chose Knovel in his discovery process, building foundational knowledge on topics relevant to his corrosion issue and uncovering data-rich answers and insights. He used Knovel's Graph Digitizer, an interactive graphing solution that helped him understand the corrosive properties of metals with respect to pH and water solution speed. He also referred to alkalinity charts to find a stable pH range for the boiler's condensate.

Using the information from Knovel, the engineer learned that an acidic water solution will accelerate corrosion in boilers. He quickly zeroed in on a viable resolution for the refinery's boiler corrosion problem. Operating the water solution used in the boilers at a slightly higher pH (8–9) would create an oxide layer that would serve as protective coating and minimize the formation of eroding particles. The knowledge and insights from Knovel helped the process engineer make his recommendation to increase the alkalinity of the water solution used in the refinery's boilers.

Business Impact

By incorporating the insights he found in Knovel, the process engineer successfully inhibited corrosion in the refinery's boilers. The new water solution optimized boiler performance and significantly reduced the risks of health, safety, and environmental incidents, as well as the risks of condensate return issues and boiler stoppages.

Knovel helped the engineer discover best practices with respect to water solution pH quickly, informing a critical business decision. The company avoided having to implement a retrofitting of the boilers' piping and instrumentation, which would have cost up to \$30K per boiler and \$90K in total for the refinery. The information and data in Knovel also enabled the engineer to optimize the boilers' uptime, which is critical to the multimillion dollar operation for each of the company's refineries.



Knovel

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

Learn More

To request information or a product demonstration, please contact us at elsevier.com/knovel/contact-sales.

Visit elsevier.com/rd-solutions
or contact your nearest Elsevier office.

ASIA AND AUSTRALIA

Tel: + 65 6349 0222

JAPAN

Tel: + 81 3 5561 5034

KOREA AND TAIWAN

Tel: +82 2 6714 3000

EUROPE, MIDDLE EAST AND AFRICA

Tel: +31 20 485 3767

NORTH AMERICA, CENTRAL AMERICA AND CANADA

Tel: +1 888 615 4500

SOUTH AMERICA

Tel: +55 21 3970 9300