Knovel®

CHEMICAL MANUFACTURING

Case Study: Preventing Corrosion in a Pressure Vessel Exposed to Acetic Acid

Knovel helps a manufacturing engineer solve a serious corrosion problem in a product vessel, improving the safety of the operation and making it easier to maintain product quality.

Summary

An R&D executive at a chemical manufacturing company explains how Knovel helped provide a solution that enabled his engineering team to pinpoint the root cause of a corrosion problem in their product vessels and implement a process change in time to avoid substantial contamination costs.

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—Process Engineer

Challenge

A leading global manufacturer and supplier of oxidizing chemicals and environmental remediation products faced a significant corrosion problem in some of its metal tanks. The tanks contained the final product of a peracetic acid production line: an equilibrium solution that included fractions of acetic acid, hydrogen peroxide, a stabilizer, a catalyst (mineral acid) and peracetic acid.

"Just a few months after the tanks were installed, a standard safety check revealed that they were undergoing corrosion at an unexpectedly fast rate," recalls the executive, Byron Byun.* Internal pitting and flow-induced corrosion, along with external oxidation under deposition, were creating stress corrosion cracking and embrittlement in areas where the tank was exposed to vapor. No corrosion was evident where the tank was in contact with liquid.

If this corroded metal continued to mix with the product, the resulting peracetic acid would become impure and unsellable. In addition to these quality control issues, failure to address the corrosion would create significant safety hazards in the manufacturing facility. A cracked tank could result in a dangerous spill of caustic materials and release hazardous vapor into the environment. "My team and I knew we had to come up with a fix for this corrosion issue, and we had to do it quickly," Byun says.

Solution

To find out exactly how the vessel needed to be modified, Byun's engineering team leveraged the vast repository of chemical data on Knovel.

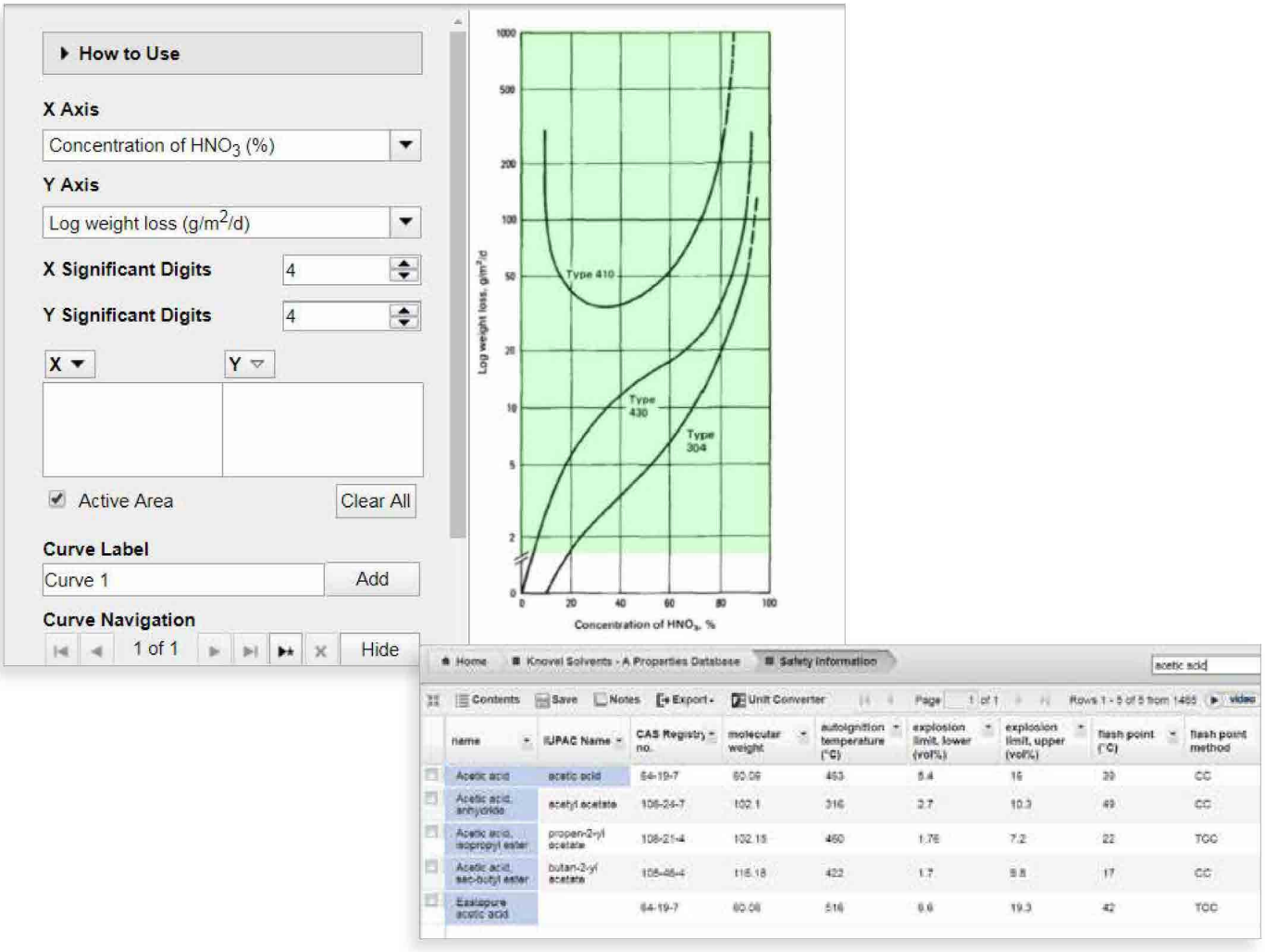
Clear, on-target search results

The engineering team began by running highly targeted searches on Knovel to access results vetted by experts and tailored for engineers. So when a process engineer performed such highly technical queries as "What's the vapor pressure of acetic acid?" and "How does stainless steel 304 behave with other acids with regard to temperature?" she knew she would get quick, accurate results.

Extensive, easy-to-search tables

"I used to look up tables and graphs in my library of reference books," the engineer remembers. "But Knovel makes it a lot easier to find a specific property in a very extensive table—or from data in a graph. That saves me a lot of time, and time was of the essence in this case."

*For confidentiality purposes, names have been changed.



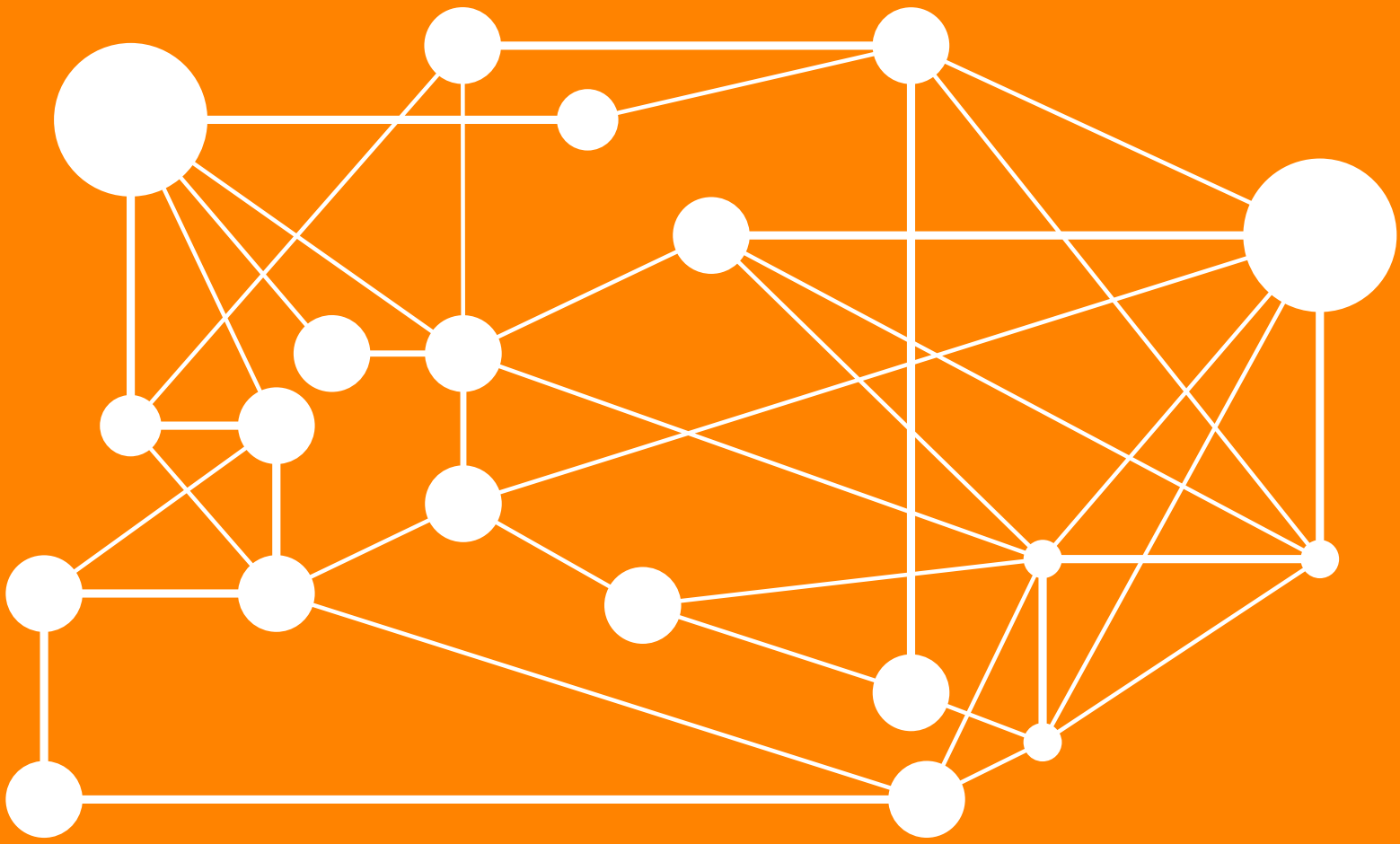
Once the process engineer had found the relevant tables of acetic acid safety data, vapor pressure, vapor corrosion and compatibility with stainless steel, Knovel helped her quickly zero in on the right entries. "Knovel makes it really easy to find the chemical properties I'm looking for, even if they're buried in a dense table or a large graph. It saves me so much time," she adds. "Knovel indexes all the search results I could possibly need— even the ones behind pay walls."

Taking action to address the problem

With the help of the data she found in Knovel, the engineer was able to understand the unusual interaction of the equilibrium solution with the tank and pinpoint the root cause of the corrosion: An unexpectedly high temperature was raising the pressure in the tanks, which resulted in the formation of acetic acid vapors that accelerated corrosion of the steel under those operating conditions. To address the acidic vapor issue, the engineering team made a change to the storage process, moving the tanks out of the sun to avoid higher temperature conditions.

Business Impact

Resolving the corrosion issue not only improved the safety of the company's operation but also made it easy to maintain the quality of the final product—and preserve the company's reputation. The product costs up to $1.25 per liter to manufacture, so with three tanks containing more than $50,000 of product apiece, each batch costs more than $150,000 to produce. The innovation executive and his engineering team avoided the high costs if contamination made a batch unsellable. "The data our engineers found on Knovel led us straight to the root cause of the problem, which we'd been struggling to pin down," Byun says.



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