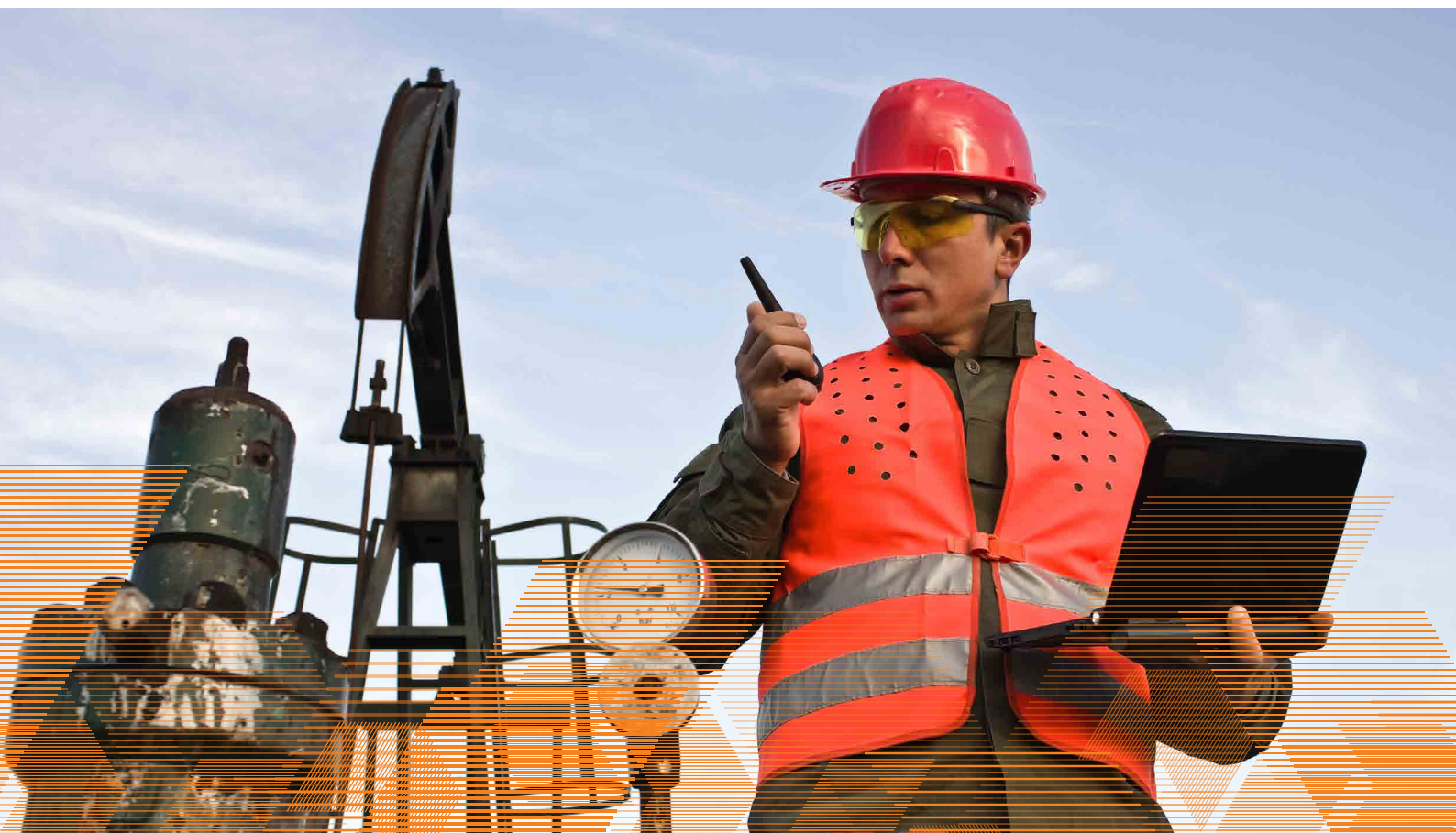


Knovel®

REFINING & PETROCHEMICALS

Case study: Achieving fume mitigation goals at reduced costs

Knovel helps to identify an improved adsorption process to comply with new emissions regulations while avoiding plant refitting, downtime and \$400,000 in capital expenditures



Summary

A large oil and gas company uses a glycol adsorption agent to mitigate its refineries' benzene emissions. New regional environmental laws require an even greater reduction. A company engineer uses answers and insights from Knovel to find a different compound that better adsorbs benzene, saving the company time and money.



Knovel's reliable data, combined with its problem-solving tools, empowered the engineer to validate a vital hypothesis for the project.



Challenge

Regulatory compliance requires refining and petrochemical companies to remain vigilant and diligent. Having to make production changes to satisfy new regulations often generates engineering problems that must be resolved to ensure compliance, thereby avoiding fines, injunctions and other consequences.

A large North American integrated oil and gas company—with a significant presence in heavy oil production and downstream operations, including refineries and pipelines—faced a dilemma in some of its refinery operations. A regional government enacted new regulations that lowered the amount of chemicals a refinery could release in the atmosphere, depending on its size and its proximity to populated areas.

In this region, 10 of the company's processing plants, with a total of more than 160 dehydration units, emitted levels of benzene that would exceed the new regulations. The company used triethylene glycol in these refineries to remove benzene by adsorption, a mechanism in which the molecules adhere to the surface of a solid.

The company asked one of its operations engineers to find a new, cost-effective method to comply with the new emissions regulations. Time was of the essence because the new regulations would go into effect soon.

Engineer Andrei Jarecki* knew that there were two ways to reduce benzene levels sufficiently:

1. Add a gas flare that would burn the benzene, transforming it into CO₂ and H₂O as it was released into the atmosphere.
2. Use a different chemical compound that would adsorb a greater amount of benzene than triethylene glycol.

Integrating gas flares into its production process would require the company to make a significant capital expenditure, about \$40,000 per plant for the equipment alone. It would also incur the costs of modifying the plants' piping to incorporate the flares. If the company could find a more effective adsorption agent than it was currently using to reduce benzene emissions, it would save a lot of time and money.

*For confidentiality purposes, names have been changed.

Solution

To research his project, Jarecki used Knovel to find relevant information about gas processing, cleaning and sweetening, as well as data about different chemicals that could replace triethylene glycol in the adsorption process.

By using Knovel's search and other features, Jarecki quickly found data on the adsorption of triethylene glycol and the adsorption of benzene in triethylene glycol, as well as information on gas dehydration units. Knovel's equation solver and equation plotter tools, which provide interactive solvable worksheets, enabled him to calculate the impact of such variables as pressure

and temperature on adsorption. Using Knovel's tools, he was quickly able to model the adsorption of benzene and calculate the benzene adsorption rates of various compounds.

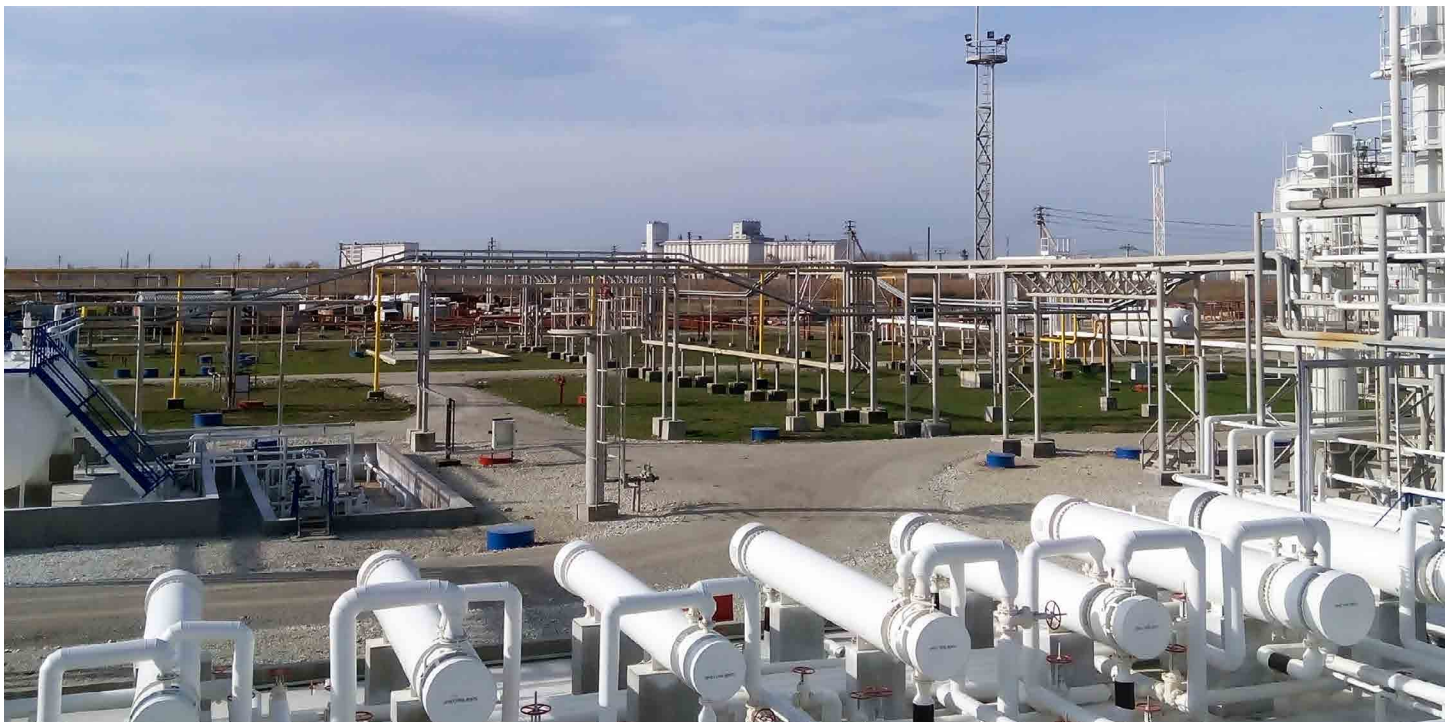
Jarecki quickly zeroed in on diethylene glycol as an ideal replacement for triethylene glycol. It has a higher capacity for adsorbing benzene than triethylene glycol under the same pressure and temperature conditions. Even better, using diethylene glycol as the adsorption agent would enable the company to comply with the new emission regulations while avoiding the expenses of making modifications to its existing plant infrastructure.

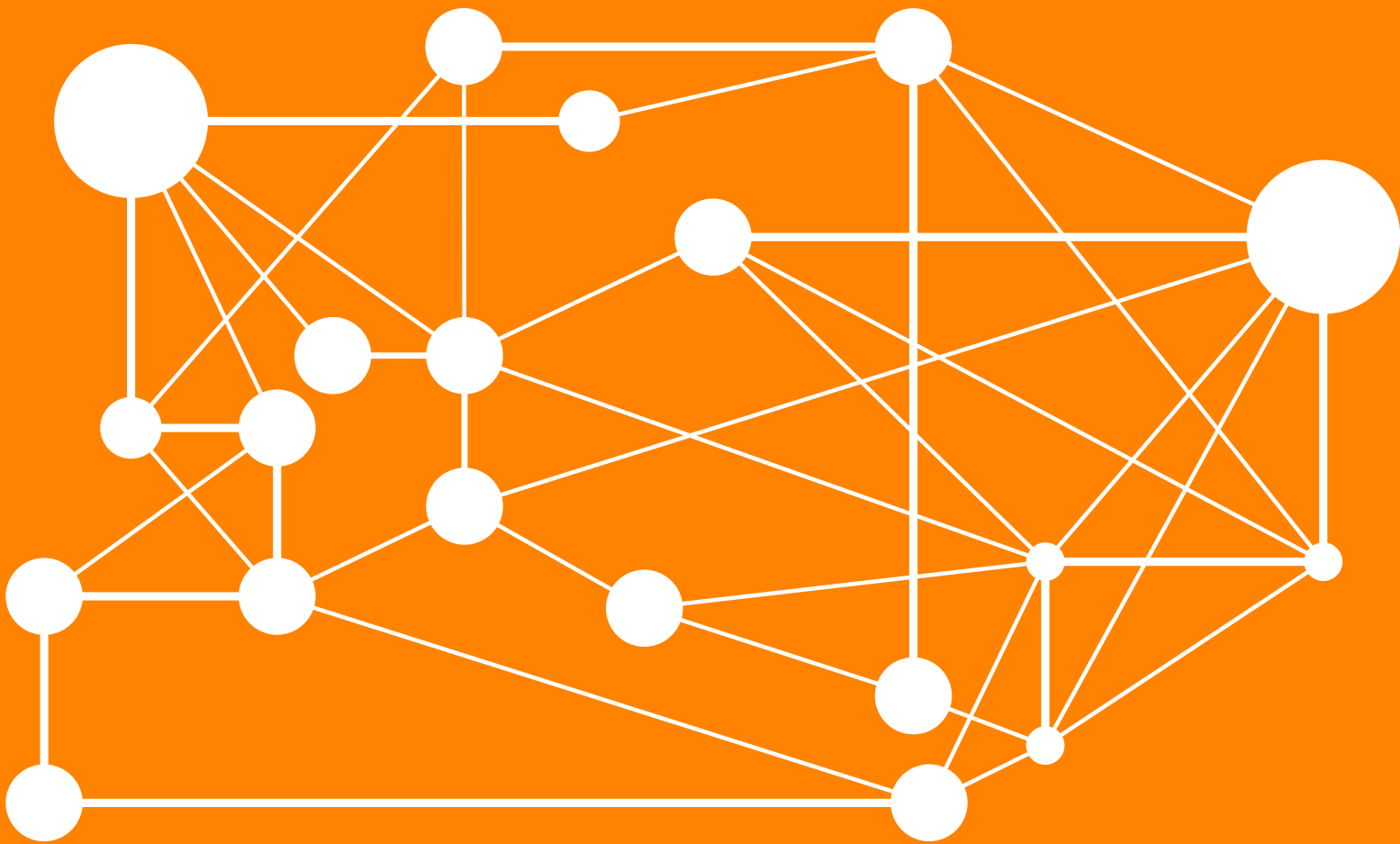
Business Impact

Relying on the answers and insights available in Knovel, Jarecki successfully identified a glycol that would adsorb enough benzene to comply with the new emission regulations—without requiring any change in plant machinery. Knovel's reliable data, combined with its problem-solving tools, empowered the engineer to validate a vital hypothesis for his project.

Using Knovel, Jarecki was able to save his company \$40,000 in capital expenditures for gas flares at each plant—a total savings of \$400,000. By finding the right glycol, he also allowed his company to avoid the substantial expense of making significant changes to the plants' piping systems and the costs of suspending production to install the flares.

Knovel's combination of the right data and indispensable equation tools helped this engineer solve his company's compliance issue. The energy company's processing facilities now emit lower levels of benzene, which is good for the company, the environment and the communities where its plants are located.





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.

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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