How to not let fouling bog you down

Compabloc improves performance in an ammonia plant

Case story

An Asian ammonia producer had severe problems eliminating fouling in the lean/rich interchanger in its acid gas removal process. As a result, performance and production output were down. Fortunately the problems disappeared when the existing coil-wound heat exchanger was replaced by four Alfa Laval Compablocs. With the new heat exchangers, fouling builds up much more slowly and can be completely eliminated with cleaning. So they deliver stable performance while requiring minimal maintenance.

A Compabloc operates with a crossing temperature program and a temperature approach as low as 3°C (5.4°F). So significantly more energy is recovered than with shell-and-tube heat exchangers.

Uptime and performance are crucial in all processing industries. And with great demand for ammonia, production capacity becomes particularly critical for producers.

Problems with an existing heat exchanger

One of the major ammonia producers in Asia used a coil-wound heat exchanger as a lean/rich interchanger in its acid gas removal system.

This heat exchanger was cleaned using cleaning in place (CIP) every 1-2 years. But after a while, cleaning with CIP wasn't bringing the heat exchanger back to full capacity. An investigation revealed fouling in the heat exchanger that could not be removed using CIP. Since a coil-wound heat exchanger cannot be cleaned mechanically, the company had no choice but to replace the unit.

Alfa Laval proposes a solution

The company's engineers searched for a solution where fouling could be completely eliminated during cleaning, and efficiency maintained over time.

They tried using a traditional shell-and-tube heat exchanger. But the performance of the new heat exchanger wasn't good enough, and there was no room to install a second unit.

Alfa Laval proposed complementing the shell-and-tube heat exchanger with four Compablocs to boost capacity. Because Compablocs provide high thermal efficiency, they're much smaller than comparable shell-and-tube heat exchangers and can usually be installed in the available space. The company installed two pairs of Compablocs in series with the existing shell-and-tube. The four Compablocs recover 14 MW.

Minimum fouling and easy cleaning

Compablocs are also less susceptible to fouling than shell-and-tube heat exchangers thanks to their highly turbulent flow. They're easy to clean and performance can be returned to 100%. Service personnel can then use CIP – which is normally sufficient. Or they can clean the heat exchanger surfaces with a high-pressure water jet. All surfaces are fully accessible for mechanical cleaning. Since no tube bundle needs to be extracted, the required service space is minimal.

This makes Compablocs suitable for heat recovery positions, for example as lean/rich interchangers. A Compabloc operates with a crossing temperature program and a temperature approach as low as 3°C (5.4°F). So significantly more energy is recovered than with shell-and-tube heat exchangers.

Maintained performance and uptime
The Compablocs have performed according to specification, and after three years of continuous operation there was still no need for cleaning. Pressure drops were the same as when the heat exchangers were installed and thermal performance has decreased only marginally.

The plant's service engineers anticipate the Compablocs will need their first CIP cleaning after four years. The shell-and-tube is cleaned every 1-2 years using a high-pressure jet.

Replacing their existing coil-wound heat exchanger with four Alfa Laval Compablocs eliminated the performance problems caused by severe fouling – and incomplete cleaning – that the plant struggled with before.

Fast facts

Customer
A leading Asian ammonia producer.

Problem
- Severe fouling problems in the lean/rich interchanger in its acid gas removal process.
- Previous coil-wound heat exchanger could not be properly cleaned.
- Performance and production output were down.
- Replacement shell-and-tube heat exchanger delivered insufficient capacity.

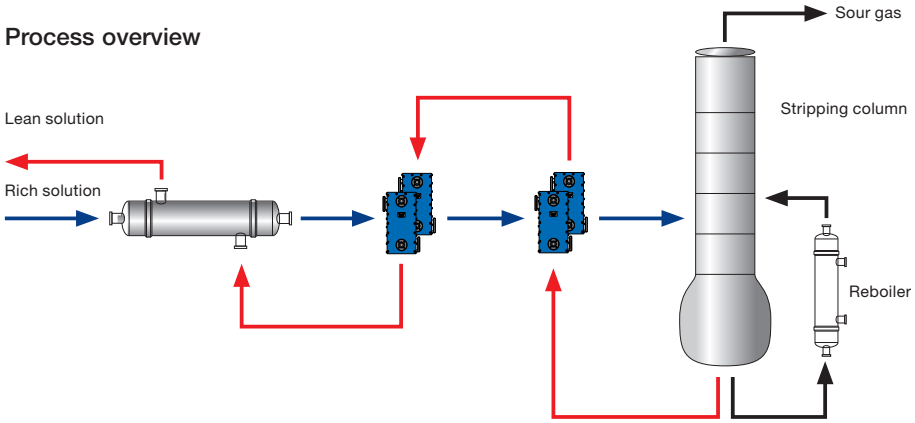
Challenge
- Double the capacity of the lean/rich interchanger in half the floor space.
- Eliminate performance problems caused by fouling.

Solution
- Two pairs of Compabloc heat exchangers, in series with existing shell-and-tube.

Result
- Fouling problem eliminated.
- No CIP cleaning required in three years of operation.
- Stable high performance and production output.

Replacing their existing coil-wound heat exchanger with four Alfa Laval Compablocs eliminated the severe fouling problems the plant struggled with before.

Process overview



The lean/rich interchanger in the acid gas removal system recovers heat from the stripping column and uses it to preheat the feed. Replacing the existing coil-wound heat exchangers with four Compablocs has meant that fouling builds up more slowly and that it can be eliminated completely during cleaning maintenance.

About the solution

The Compabloc
The Compabloc fully welded plate heat exchanger is suitable for operation in chemically aggressive environments and for handling high-temperature fluids. It is fully accessible. And with no gaskets between the corrugated heat transfer plates, maintenance is straightforward and efficient.

Compabloc heat exchangers
Compabloc heat exchangers provide efficient heat transfer in compact equipment with a small footprint. The units have a flexible design and are easy to service and maintain.

How to contact Alfa Laval
Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com.