



Lowering refinery emissions to 1/3 of federal requirements with Compabloc

US refinery

Case story



Three Compabloc CPX 120 heat exchangers ensure environmental compliance in a BELCO® flue gas scrubber. PHOTO: Jim Hill.

When a major US refinery set out to modify their plant to achieve higher efficiency, they chose to voluntarily comply with standards that regulate emissions to less than 1/3 of federal requirements. Eight new Alfa Laval Compablocs helped them reach this and other goals.

“We have a close relationship with the company,” says Mr Chris Wajciechowski, market development manager at Alfa Laval. “So we worked with their process development engineers to help them save space and money and cut down on fouling. Also – not least – to significantly improve the performance of their process for cutting particulate and sulfur emissions from fluid catalytic cracking (FCC).”

“The Compabloc offers considerable advantages over shell-and-tube heat exchangers in all of these respects,” continues Mr Wajciechowski. “And because these are big installations, our biggest Compabloc model, the Compabloc CPX 120, was the right choice for the DuPont BELCO® pre-scrubber and the CANSOLV® amine stripper reboiler installations. The remaining three Compablocs were installed in other critical positions on the CANSOLV® unit.”

Close temperature approach essential to meeting emission targets

Compabloc CPX 120 is an all-welded, compact plate heat exchanger with an overall countercurrent flow. It can operate with extremely close temperature approaches, which makes it much better at cooling liquids than shell-and-tube heat exchangers. In the company's Dupont BELCO® pre-scrubber installation, an important requirement for meeting the ambitious emissions targets was to sufficiently cool the hot process water before it comes into contact with the FCC flue gas.

Fast facts:

Company challenge

A major US refinery sought to lower emissions from fluid catalytic cracking (FCC) to less than 1/3 of federal requirements. In addition limited space was available, the risk of fouling was high and cost savings were desired.

The benefits

- Improved cooling helps meet ambitious emissions targets
- Compact design cuts floor space, foundations, piping and installation work
- High alloy means no corrosion
- High turbulence minimizes fouling
- Easy access for easy maintenance
- Costs lower and outcome better



Two compact CPX 120 reboilers efficiently add heat to a CANSOLV® lean amine stripping tower. PHOTO: Jim Hill.

Since March 2011, two Compablocs operating in parallel as pre-scrubber quench subcoolers have consistently performed at about 100 MMBTU/hr at a temperature difference of less than 10 °F (5.5 °C) and met the target temperature for the water.

Space-saving, money-saving Compablocs

“Not only do the two Compabloc CPX 120s cool the process water adequately, they also take up a mere 85 ft² (8 m²) of elevated structure space,” says Mr Wajciechowski. “At least six large shell-and-tube heat exchangers occupying over 800 ft² (74 m²) of floor space would have been required to perform the same duty – and target temperatures would not have been met.”

The Compabloc’s compact design significantly cut down on floor space, foundations, piping and installation work, so the company also saved time and money. In addition, unlike most shell-and-tube heat exchangers, the Compabloc is made of a corrosion-resistant high alloy, made affordable by the relatively small amount of metal needed due to the efficiency of the technology. Corrosion is simply not an issue.

No need for cleaning so far

Cleaning isn’t an issue either although the Compablocs operate in a position where the risk of fouling is high. High turbulence in the Compabloc’s plate channels ensures that fouling seldom occurs. (The same turbulence is responsible for the Compabloc’s high-heat transfer coefficients.) No fouling has been seen since commissioning. But if and when there is a need for maintenance, the units can be fully mechanically cleaned by simply removing their outer panels. And no extra space is required around the installation for tube-bundle access, which means further savings on installed space and costs.

A big job where space is at a premium

“The space requirements for the new CANSOLV® amine stripper reboiler were more than tight. And the duty was a demanding one. That made two of our large Compabloc CPX 120s perfect for the job. Because each one is almost three times bigger, we needed fewer of them than we would have needed of our smaller models. That saved a lot of space around the units. In fact, each of the Compabloc CPX 120 reboilers is performing 95 MMBTU/hr of duty, while taking up less than 60 ft² (5.5 m²) of real estate,” says Mr Wajciechowski.

Of course, even the biggest Compablocs typically occupy only a fraction of the space needed for shell-and-tube heat exchangers. This Compabloc installation is estimated to take 1/5 the installation space and 1/3 the heat transfer area than a comparable installation based on shell-and-tube heat exchangers.

About the solution:

The Compabloc welded plate heat exchanger is suitable for operation in chemically aggressive environments and for handling high-temperature fluids. With no gaskets between the corrugated heat transfer plates, maintenance is straightforward and efficient. Features include:

- High performance - up to five times higher thermal efficiency than shell-and-tube heat exchangers
- Compact size and low installation costs
- Maximum reliability thanks to robust, all-welded design
- Corrugated plate pattern ensuring highly turbulent flow
- Minimal fouling
- Easy cleaning
- Available in many corrosion-resistant materials
- ASME and PED-coded design for up to 42 barg (600 psig)/ 750 °F (400 °C)

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.