Compablocs improve performance and eliminate corrosion at Brazilian oil refinery

Petrobras' Replan Refinery, Paulinia, São Paulo, Brazil **Case Story**

Starting in 2002, Petrobras' Replan oil refinery began replacing some of its shell-and-tube condensers and reboilers with Compabloc compact heat exchangers from Alfa Laval. Today Replan has eight Compablocs in operation. The switch to compact heat exchangers was prompted by corrosion problems in the shell-and-tube units in the sour water stripping unit and the need to improve the thermal performance of the condensers in the fluid catalytic cracking unit, FCC.

"We needed a cost-effective heat exchanger solution where titanium and alloys could be used to avoid corrosion problems," explains Osmar Vallim Pedroso, Senior Engineer at Replan. "Also, a solution that would allow space for revamps at various process stages. Alfa Laval proposed Compabloc compact heat exchangers."

Technical aspects analyzed

As the refinery had no previous experience of compact heat exchangers, at first there was some concern about implementing this technology conversion. Accordingly, all technical aspects of Compabloc compared to shell-and-tube solutions were analyzed before going ahead with the purchase.

Osmar Vallim Pedroso: "We chose compact heat exchangers due to their high efficiency. Also because it's possible to install a Compabloc in a reduced footprint area for revamping projects. To get the same heat transfer capacity using shell-and-tube units requires more space, and material and installation costs are much higher."

Petrobras' Replan Refinery in São Paulo has installed Alfa Laval Compabloc compact heat exchangers in the sour water stripping unit and the FCC unit.

Excellent thermal performance

"Alfa Laval gave us good support in finding the best solution. The Compablocs give excellent thermal performance and maintenance costs are lower than for shell-and-tube units. The Compablocs have required very little maintenance, some units have required no main–tenance at all."

The first of Replan's eight Compablocs, installed in 2002, operates as a condenser in the sour water stripping column.

Fast Facts:

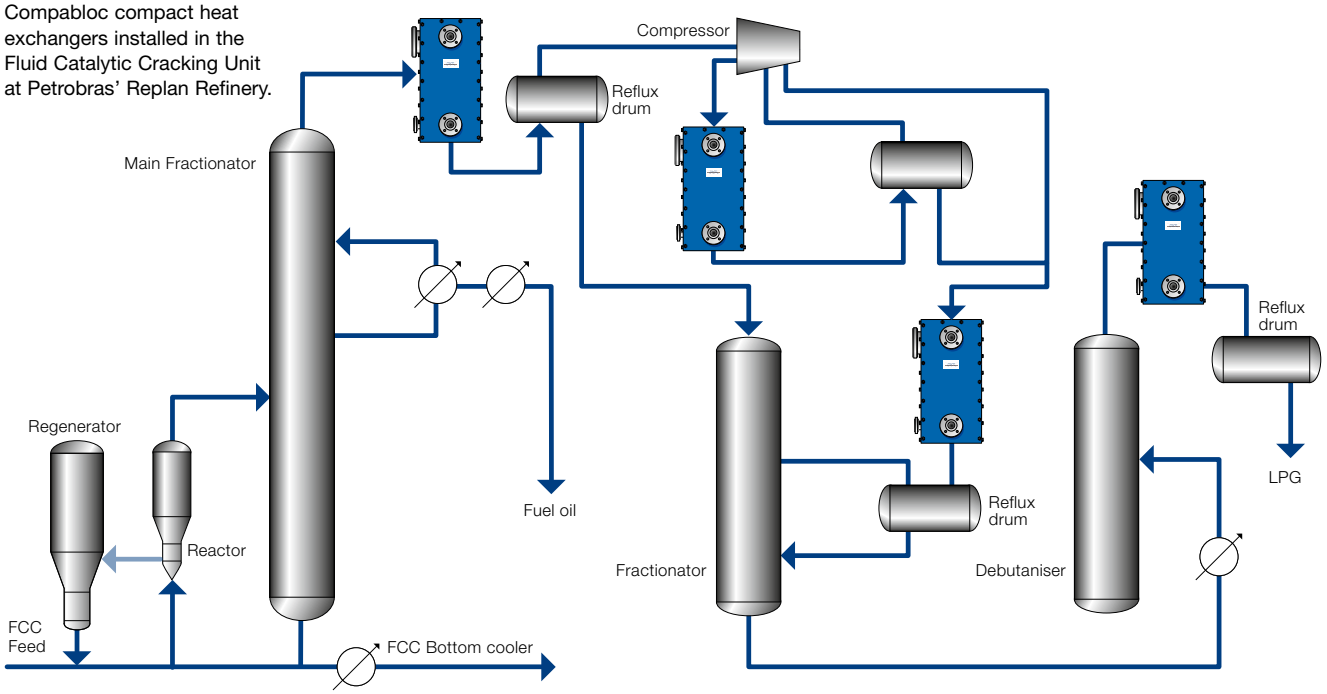
Petrobras, Brazil

Founded in 1953, Petrobras is a Brazilian multinational energy company. In terms of market capitalization and revenue, Petrobras is the largest company in Latin America and was rated the world's seventh biggest oil company in 2007.

Replan Refinery

Out of 15 refineries (11 in Brazilian territory) Replan Refinery in São Paulo is the largest, processing 360,000 barrels a day which represents 20% of refining capacity in Brazil.

Compabloc compact heat exchangers installed in the Fluid Catalytic Cracking Unit at Petrobras' Replan Refinery.



Equipped with titanium plates, the unit replaced an existing shell-and-tube unit with a tube bundle in AISI 304 which was facing serious corrosion problems. These were primarily due to high contents of chlorides and hydrogen sulphide in the vapour stream. No corrosion problems have been experienced since the unit was installed.

Compact design, low static head

Replan later added another Compabloc with titanium plates as a reboiler at the bottom of the sour water stripping column. The compact design and low static head necessary for this installation were key factors in choosing Compabloc for this application.

Today, in addition to the Compablocs in the sour water stripping column, the refinery has four Compablocs in the FCC unit, and two in the naphtha fractionation unit, as described below.

In 2005, Replan replaced two shell-and-tube units with one Compabloc vertical condenser at the vapour compression stage, providing 20% additional heat transfer capacity in a smaller space. Two more Compablocs, with plates in 254 SMO, were installed in the naphtha fractionation unit as top condensers in 2007.

With its compact design, compared to a shell-and-tube heat exchanger, Compabloc can be installed where floor space is limited.

Hydrocarbon load on compressors reduced

When Replan revamped the FCC unit in 2009, they added three more Compablocs, each operating in parallel with existing shell-and-tube units. "The high efficiency of the Compabloc condensers made it possible to reduce the hydrocarbon load on the compressors," says Bruno de Luca, Process Engineer at Replan refinery.

Altogether, Petrobras has more than 60 Alfa Laval Compabloc compact heat exchangers installed in its refineries in Brazil.

Compabloc compact heat exchangers

The all-welded, gasket-free Compabloc compact heat exchanger is designed to operate with a wide range of aggressive media and at high temperatures and pressures.

Corrugated plate patterns generate high turbulence that results in overall heat transfer coefficients three to five times greater than a shell-and-tube heat exchanger. In addition to minimizing fouling, this makes it financially viable to use corrosion-resistant exotic metals.

With its compact design, Compabloc can be installed virtually anywhere – as a condenser or reboiler for distillation and stripping columns, as a condenser on top of reactors and in a wide range of other heat exchanger applications.

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.