



Compabloc recovers energy at UNIPAR

Integrated reboiler solution

Case story



Compabloc reboiler – the integrated solution for energy recovery.

When UNIPAR was looking for an integrated reboiler for use in cumene production, the company contacted Alfa Laval.

After extensive evaluation, UNIPAR decided to install a Compabloc fully welded compact heat exchanger from Alfa Laval, mounted on the benzene distillation column as an integrated reboiler, to ensure maximum heat recovery.

This resulted in substantial savings because the reboiler no longer required a supply of steam. Instead, the heating medium is a cumene vapour from another distillation column further downstream.

In addition to ensuring an efficient process solution, the Compabloc heat exchanger provided UNIPAR with significant savings in operating costs by reducing overall steam consumption.

Background

Cumene is the raw material for phenol production, an important petrochemical intermediary in chemical and pharmaceutical industries. Phenol is mainly used in phenolic resins and as an intermediate for bisphenol A (BPA) and caprolactam production. The UNIPAR plant was originally built under license from UOP.

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As part of a subsequent major increase in plant capacity, UNIPAR decided to look into different ways of integrating the heating process more effectively, in order to both save energy and reduce operating costs.

UNIPAR evaluated two options – a very large shell-and-tube unit and a Compabloc heat exchanger with AISI 316L plates, which was a more compact solution.

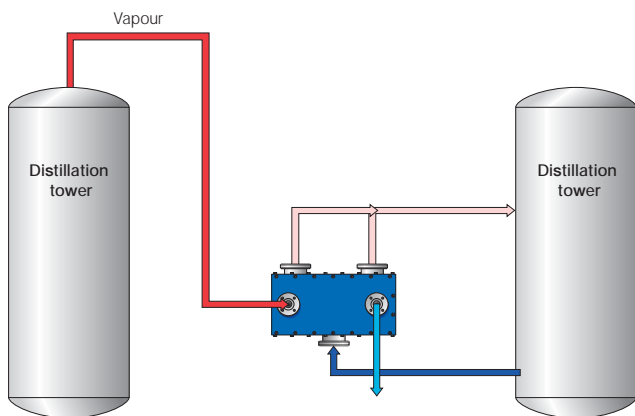
Less space – lower cost

The low temperature approach required for such an integrated reboiler solution would require an extremely large shell-and-tube heat exchanger. The UNIPAR engineers could see that the sheer size and weight of such an installation would necessitate expensive foundations and structural work, and decided that in practice this would make it uneconomical.

The Compabloc design provided a significant contrast, with a much more compact solution that imposed no restrictions regarding installation and placing.

Maximum heat recovery and benefits

The Compabloc fully welded compact heat exchanger provided UNIPAR with the perfect combination of benefits.



Savings in steam consumption amounted to approximately 4.7 MW (1.6 exp7 BTU/hr), corresponding to a payback time of less than one year. In addition, the cumene condenser requires no cooling water, which reduces operating costs and payback time still further.

The compactness and low capital cost of the Compabloc solution from Alfa Laval, along with effective energy recovery and low operating costs that it provided, enabled UNIPAR to install a high-efficiency customized thermosiphon reboiler right on the distillation column.

“In addition to benefiting from the compactness of the Compabloc technology, UNIPAR achieved maximum heat recovery from one small unit, with very close temperature approach and low static head,” says Fadlo Haddad, technology manager at UNIPAR.

The hot medium (cumene) enters at 211°C and is condensed to 197°C, while the cold medium is heated from 171.3°C to 182°C.

This Compabloc reboiler was designed with two outlet connections on the vaporizing side to enable perfect fluid distribution.

Hovanês Emin, senior process engineer at UNIPAR, says, “The Compabloc has provided excellent operating conditions as a thermosiphon reboiler. It achieves around 25% vaporization in the alkylbenzene mixture, and only requires a small area for installation – there simply isn’t enough space for large shell-and-tube units.”

The Compabloc unit has been in continuous operation since April 2004, with no maintenance required.

Key facts about Compabloc

The Compabloc is a high-efficiency, all-welded compact heat exchanger designed for aggressive or hazardous process services. It is available in six sizes, with heat transfer areas in the range 0.7–320 m² (7–3450 sq ft). The heat transfer area is made up of a pack of corrugated plates welded alternately to form the media channels. The plate pack is supported by an upper and lower head and four side panels, which accommodate the connections. The fully welded plate pack extends design limits and provides improved reliability. Because there are no inter-plate gaskets, compatibility concerns are eliminated, and maintenance and operating costs are reduced. Access for inspection and cleaning is fast and easy.

Plate materials

- 316L, 304L, 317L, 904L, 254 SMO and AL6XN stainless steels
- Titanium, Pd-stabilized titanium
- C-2000, C-276, C-22 and B3 alloy.

Specifications

Design pressure:	min. vacuum/max. 35 barg (500 psig)
Design temperature:	min. –30°C/max. 350°C (-20/660°F)
Connections:	PED and ASME (with or without U-stamp)

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