



A condenser and reboiler for the space age

Saving space at the Syzran oil refinery

Case story

Alfa Laval Compabloc condensers and reboilers take up very little space, so they were a natural contender when a new stripper tower was required for the gas sweetening process at the Syzran oil refinery

The Syzran oil refinery in Russia, run by the YUKOS Oil Company, has a capacity of 150,000 barrels of crude oil per day. When the plant was extended, Alfa Laval Compabloc reboiler and condenser units were installed instead of traditional shell-and-tube units.

Compabloc thermosiphon reboilers were installed at the base of one of the stripper columns, and a Compabloc reflux condenser was mounted directly on the top of the column. The stripper column is used in the gas sweetening process, in which hydrogen sulphide (H₂S) is absorbed in 15% MEA solution, and then removed at the top of the stripper. The reboilers operate at 125°C and 2.3 bara, and the condenser at 115°C and 2.1 bara. The H₂S is subcooled down to 40°C in a condenser.

The Compabloc condenser and reboiler consist of a welded stack of corrugated plates made of stainless steel. The corrugated pattern in a Compabloc unit creates a high level of turbulence, which results in very efficient heat transfer. The heat transfer coefficient in a Compabloc reboiler is normally 2–4 times higher than that in a shell-and-tube unit, and the required heat transfer area is consequently 2–4 times less. In addition, the Compabloc design is in itself extremely compact. In other words, it is possible to reduce the total space occupied by the reboiler by a factor of five, and sometimes even more.

Inspection and cleaning are seldom required, but these tasks are made easy due to the minimal space requirements. Downtime is thus significantly reduced, compared with shell-and-tube units.

The decision to install the extremely compact Compabloc solution instead of traditional shell-and-tube units enabled YUKOS to save both money and space. The Compabloc reboilers have been in operation since January 2002, and the general consensus of opinion at the Syzran refinery is that the Compabloc units work extremely well.



Stripper tower in gas sweetening process, with reboilers and reflux condenser marked with circles (close-ups on next page)

The reflux condenser installed at the YUKOS plant is a good example of the versatility of a Compabloc solution. The Compabloc reflux condenser is mounted directly on the strip-per column, which saves costs in connection with installing foundations, piping and pumps. The alternative is a shell-and-tube unit mounted at ground level, with piping for the vapour going down, and a pump and piping for the reflux going back up to the top of the column.

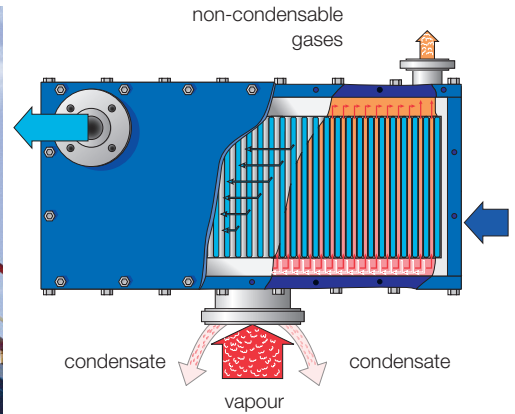
Vapour enters from the bottom and condenses on the cold plates, with non-condensable gases being removed at the top, and the condensate flowing back to the column. The cooling water is forced through several passes in order to maximize turbulence, thus boosting the heat transfer coefficient and minimize fouling.

Compabloc is the most compact reboiler solution available on the market today. The reboilers installed at the YUKOS plant are a good example of the Compabloc thermosiphon concept. While one unit would have been adequate, the customer chose to install two parallel units in order to prevent any unnecessary shutdowns during cleaning procedures. Circulation of the medium is carried out by means of the thermosiphon system.

The process medium enters at the bottom and is distributed through the channels. As the liquid passes through, it is brought to boiling point and a mixture of vapour and liquid exits from a larger connection at the top. The service medium, in this case steam, meets the process medium in a cross-flow arrangement.



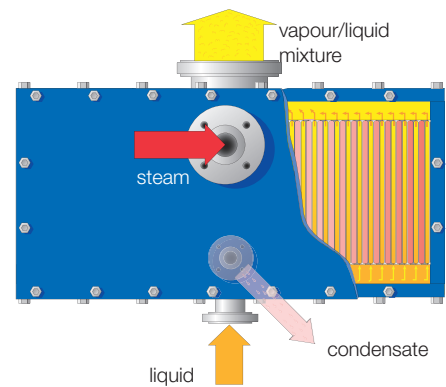
Compabloc reflux condenser mounted directly on the column



Compabloc reflux condenser

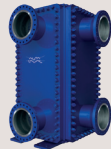


Compabloc reboilers operating with steam as heating medium



Compabloc thermosiphon reboiler

Key Facts:



Design temperature
400°C (752°F), down to -100 °C (-148°F)

Design pressure
From full vacuum to 42 barg (600 psig)

Maximum heat transfer area
840 m² (8,985 ft²)

Material of construction
316L, SMO254, 904L (UB6), Titanium, C-276/C-22/C-2000

Duties
Heat recovery, cooling, heating, condensation, partial condensation, reboiling, evaporation and gas cooling.

Unique features

Compabloc is the champion of heat exchange thanks to unique Alfa Laval innovations that enable reliable, efficient performance, letting you save energy and improve sustainability.



SmartClean

Fast and efficient flushing of fouling material



C-Weld

Superior cleaning and extended performance



XCore

Advanced design for higher pressures



ALOnsite

Qualified support at your facility

Learn more at www.alfalaval.com/compabloc

How to contact Alfa Laval

Contact details for all countries are continually updated on our website. Please visit www.alfalaval.com to access the information direct.