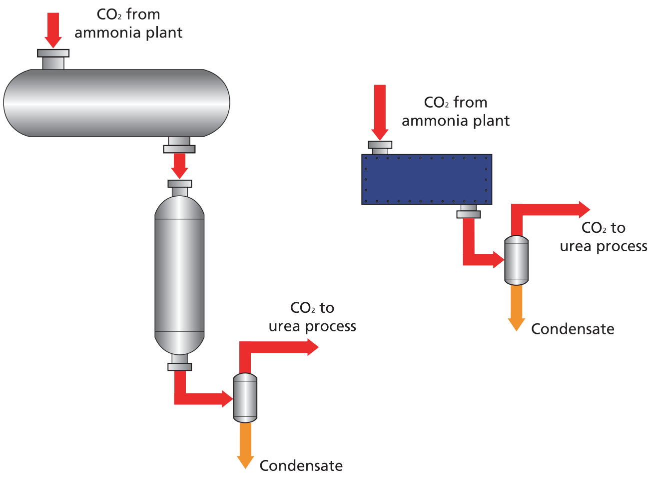
Increased plant capacity and reduced maintenance at fertilizer plant

One Compabloc replaced 2 shell-and-tubes

Case story

In order to increase production capacity, DneproAZOT – a Ukrainian fertilizer manufacturer – replaced its old shell-and-tube technology with a fully welded Alfa Laval Compabloc heat exchanger.

Production of ammonia first started when the plant was brand new, right back in 1934. Set in the Ukrainian city of Dneprodzerzhinsk, DneproAZOT manufactures urea at its ammonia plant and two separate urea plants. The ammonia plant uses the "Kellogg" process with an annual capacity of approximately 450,000 tonnes, and the two urea plants have a combined annual capacity of 660,000 tonnes. In addition to producing ammonia and urea, DneproAZOT produces caustic soda and nitric acid.



Old System vs. new system

At DneproAZOT, the ammonia plant feeds ammonia and carbon dioxide to the urea manufacturing facility. Production of urea, a highly efficient fertilizer, is based on the well-established "Stamicarbon" process. Carbon dioxide from the ammonia plant must be cooled before it is conveyed to the urea plant. This reduces the moisture content in the gas in order to optimize capacity in the urea production process.

Once it has reached the urea plant, the carbon dioxide (CO_2) enters a compressor in order to build up pressure. This compressor requires inter-stage cooling of the CO_2 gas.

CO_2 cooling

Originally, the carbon dioxide from the ammonia plant was cooled in two steps by means of shell-and-tube heat exchangers. In 1999, DneproAZOT turned to Alfa Laval for assistance in replacing the old shell-and-tube system. Alfa Laval suggested installation of a single Compabloc welded compact plate heat exchanger to replace the two shell-and-tube heat exchangers.

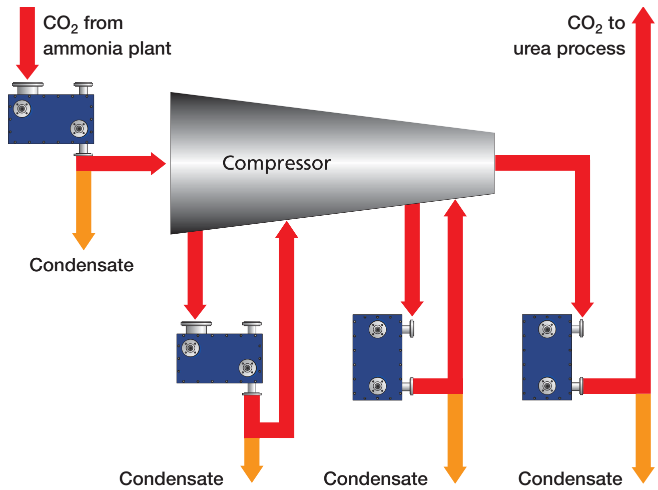
Vladislav Levchenko, production manager at the DneproAZOT ammonia department, says "We decided to try Compabloc for gas cooling applications and I must say that we are very pleased with the result. With the old shell-and-tube system, it was only possible to cool the gas down to 65°C during the summer. With Compabloc, we can now reach temperatures as low as 35°C using the same cooling water, which is taken from the Dnieper river. This means that more water can be removed from the gas, resulting in increased urea production. Compabloc not only solved our cooling requirements, but also helped us to increase profit."

The Alfa Laval Compabloc heat exchanger has operated perfectly since it was installed in 2000. Regular inspections are carried out once a year, compared with frequent opening and cleaning of the old shell-and-tube system, which led to severe production losses.

Another advantage in replacing the two bulky shell-and-tube heat exchangers with Compabloc is its compactness. The Compabloc heat exchanger need only one third of the space required by the old installation.

Inter-stage cooling of CO_2 gas

After successfully installing the CO_2 cooler in the ammonia plant, DneproAZOT also investigated opportunities for increasing efficiency in other parts of the process, such as interstage cooling in the compressor stage of the urea process. This led to replacing the shell-and-tube heat exchangers, with their carbon steel shell and stainless steel tubes, with stainless steel Compabloc heat exchangers in three steps of inter-stage cooling. The old shell-and-tube heat exchangers were three times the size of the new Compabloc replacement, and they required massive foundations, stretching over two floors of the plant. Alexander Sudak, production manager at one of the DneproAZOT urea plants, says “The old shell-and-tube units were very difficult to clean, often suffered from interleakage, and had a very low heat transfer rate.

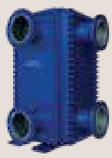


Efficient, reliable compressor cooling

Today, we are satisfied with the temperature programme, the compressor is stable in operation, we have decreased the amount of cooling water needed and we have increased urea production capacity to 1300 tonnes per day!”

The three Compabloc heat exchangers have been in operation for more than a year, without any problems whatsoever. The compactness of the Compabloc units also means extremely short response times following adjustments to the process.

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 m^2 (8,985 ft^2)
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**

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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.