



Alcohol refining

– With Alfa Laval into the future

Case story

Alcohol production in the grand style has a long tradition on the east side of Munich. What began as a cognac distillery as long ago as the end of the 19th century was later taken over by the Federal Monopoly Commission for Spirits (BfB), which then used the plant to refine raw alcohol from potato and corn distilleries in the countryside into high purity neutral and absolute alcohol. With the opening of the borders of Europe, the BfB monopoly lost its significance, with the result that the distillery in Munich was subject to increasing cost and quality pressure from private sector competitors.

Modernisation and further development

“We haven’t let the grass grow under our feet”, says Georg Scheuermeyer, technical manager at the plant. “We have been modernising things step by step, and developing the process still further. We are now refining 250,000 to 300,000 hectolitres per year, using only 1.35 kg of steam per litre of alcohol, to create a product which is rated as top quality on the European alcohol market. We have nothing to fear from European competition.”

Conversion in summer 2004

The most recent conversion of the system was carried out in the summer of 2004, with the replacement of a normal-pressure distillation column by a vacuum column. The aim was to introduce a further pressure stage in the energy configuration of the column, so as not only to reduce specific consumption and hence costs but also to enhance product quality still further.

During the conversion the main focus was on two basic considerations:

1. The restricted space available in the existing plant building.
2. Using the existing air cooling system for the vacuum system.

To convey the vapour energy from the upstream normal-pressure column via the vacuum column to the cooling system, the heat exchange at the sump of the vacuum column needed to be as efficient as possible.



The AlfaVap solved a space and a heat recovery problem at the same time.

The solution was two Alfa Laval plate evaporators in a mirror image arrangement, using the purely natural circulation process, at a remarkably low driving temperature gradient of only about 5 °C, to condense the 8 tonnes of ethanol conveyed per hour and evaporate it on the opposite side. The only other way to achieve such a temperature differential would be falling-film evaporators, which for this project would not only have exceeded the space available but would also have gone well beyond the investment and operating cost budget.

Another reason for using Alfa Laval plate evaporators in the vacuum system was the partly welded cassette design, which virtually excludes the possibility of a leak on the vacuum side.

Functional principle of the plate evaporator

A plate evaporator is based on a package of plates clamped between the frame plate and the pressure plate by means of locking screws. The plates are welded together to form cassettes, and the channels between the cassettes are provided with seals.

The plate evaporator operates on the principle of the updraught evaporator, with the inlet for the medium which is to be evaporated being situated at the bottom. The resulting two-phase mixture is led away via the vapour connection at the top. Standard materials are stainless steel plates made of AISI316 and seals made of EPDM or nitrile, but plates made of malleable metals and other elastomers are also available on request.

The various different steam and condensate connections of the plate evaporator were developed to achieve optimum processing of the two-phase flows on both sides of the plate. The special plate embossing arrangement, with a preheating area and an evaporation area, is formed from different structures to achieve uniform distribution. The plate embossing optimises the imparting of turbulence, which increases the transfer of heat and leads to minimisation of dirt contamination.

Alfa Laval – innovative heat exchanger specialists

The plate evaporator is only one of the innovations developed by Alfa Laval in the heat exchanger sector over the 70 or so years the company has been active in this area. Alfa Laval are world leaders in the manufacture of compact plate heat exchanger systems, and the wide range of products includes sealed, soldered and welded plate heat exchangers, plate heat exchangers using fusion technology, helical heat exchangers, plate evaporators, and plate condensers. And the company's worldwide service network provides customers with extra operational reliability and security.



Main features of AlfaVap

AlfaVap is a tailor-made solution for evaporation functions, with an excellent capability for achieving a high degree of temperature approximation between the heat medium and the medium which is to be evaporated. The plate evaporator has two inlet connections for the product and a large outlet for steam and condensate. There is a large inlet connection for the heating steam and two outlets for the condensate. AlfaVap uses the cassette concept whereby the plates are welded in pairs. The heating steam is condensed in the welded channels, while the product which is to be evaporated is led through channels provided with seals.

Specifications

Design pressure: 1 / 8 barg
Design temperature: 180 °C

Plate material:

Alloy 304, Alloy 316, 254 SMO, Alloy 904 L, titanium, Alloy C-276, PD-titanium