

# Alkylation

Alkylate blending is essential to ensuring gasoline with exceptional anti-knock properties and minimal soot formation. Whether your refinery is adding a new alkylation unit or revamping an existing one, you need an optimal process design to minimize project cost and maximize the efficiency of your processes.



### Alfa Laval in alkylation

Today, Alfa Laval has delivered more than 70 Alfa Laval Compabloc heat exchangers for alkylation units all over the world. These Compabloc installations enable customers to maximize the capacity, yield, energy efficiency and uptime of their plants. For these reasons, many licensors are now standardizing this solution for new process units.

To learn how other refineries use Alfa Laval solutions in their alkylation processes, visit [www.alfalaval.com/refinery/experience](http://www.alfalaval.com/refinery/experience).

### Capacity improvements

In an existing alkylation unit, the refrigerant compressor can sometimes create a bottleneck that prevents further increase in capacity. Designing the process to condense the refrigerant at a lower pressure, however, off-loads the existing compressor, enabling a capacity increase.

With Alfa Laval solutions you can do just that. As Compabloc heat exchangers can condense the refrigerant at a temperature just above the supply temperature of the cooling water, you can achieve minimal pressure in the refrigerant loop, and the compressor can handle a higher load.

### Product yield improvements

Operating the sulphuric acid alkylation reactor at lowest possible temperature has a very positive effect on the alkylate yield. However, it can also put very high demands on the refrigerant plant.

Designing the process to cool the reactor feed as much as possible, using the cold reactor effluent, will therefore increase the alkylate yield. This can be done with Alfa Laval Compabloc heat exchangers.

Another possibility to increase the product yield is to improve the efficiency of the downstream fractionators. Operating those columns with lower flash-zone pressure improves the split between close-range boiling point fractions. Lower column pressure would require cooling and condensing overhead vapour at a lower saturation pressure and with a minimized pressure drop.

Alfa Laval Compabloc heat exchangers and wet surface air coolers are optimal solutions for cooling and condensing overhead vapour at the lowest pressure and with minimal pressure drop. With a minimal temperature approach to the cooling media, these technologies help maximize the efficiency of your fractionation columns and thereby also your product yield.

### Energy efficiency improvements

An alkylation unit includes several fractionation columns where various light hydrocarbon fractions are separated from the alkylation mix. Recovering and transferring the energy between these columns is critical to the overall energy efficiency of the process.

As an example, you can design the process to maximize the feed preheat to the de-isobutanizer (DIB) column. This is done by recovering energy from the DIB column bottom fraction, the alkylate. It not only reduces the energy consumption of the DIB column reboiler, but also minimizes the alkylate cooling needs.

With Alfa Laval Compabloc heat exchangers, it is possible to get a minimum temperature approach between the two fluids, meaning that you can increase the DIB feed preheating by at least 25% in a single heat exchanger. Similar solutions can, of course, be implemented for all fractionation columns in the alkylation process.



### Sustainability improvements

The more energy that you recover and integrate in the process, the less external energy sources you need. By designing the process to maximize all column feed preheating, you can minimize steam consumption in the reboilers. This makes it possible to reduce the load on the steam boilers, meaning a reduction in CO<sub>2</sub> emissions.

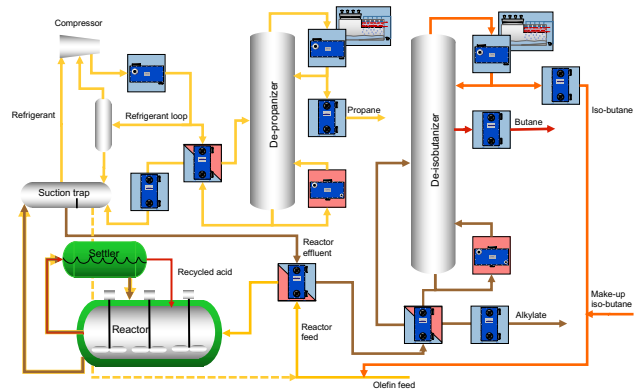
With Alfa Laval Compabloc heat exchangers, you can increase column feed preheating by at least 25%, with an equivalent reduction in the CO<sub>2</sub> emissions from the boiler. On top of emission reductions, you can reduce cooling water consumption by at least 50% if the process coolers and condensers are designed to maximize the return temperature of the cooling water. With Alfa Laval Compabloc heat exchangers, you can do this cost effectively in a single heat exchanger, occupying a minimal plot space.

### Improved reliability/availability

Alkylation processes normally involve highly corrosive fluids such as sulphuric acid. To maximize process reliability, high-grade materials are therefore sometimes needed in the process equipment.

Alfa Laval Compabloc heat exchangers are available in a wide range of corrosion resistant materials such as various grades of Hastelloys. And with a much smaller required heat transfer area, it does not cost a fortune to improve the reliability of your plant!

### Alkylation - sulfuric acid process



### CAPEX savings for new investments

On top of reducing the investment cost of new heat exchangers in high-grade material, you can also achieve substantial savings on other high-cost equipment, such as the refrigerant compressor, by properly optimizing the process design.

With a process design that minimizes the pressure in the refrigerant loop, you can reduce the compressor cost by 15-20%. Alfa Laval Compabloc condensers can condense the refrigerant at a much lower temperature, with only 3°C (5,4°F) approach to the cooling media supply temperature, minimizing the pressure in the refrigerant loop, which lowers the investment cost of the refrigerant compressor. In fact, the combination of higher performance, smaller footprint, and the reduced number of heat exchangers results in impressive total-installed-cost (TIC) savings.



Rethink  
your  
refinery

With Alfa Laval as your partner, you get access to world-leading expertise in process optimization. Together with your process engineers, we create highly efficient and reliable solutions that will take your plant to the next level.

Learn more and see all the facts from real-life customer cases at [www.alfalaval.com/refinery](http://www.alfalaval.com/refinery)

### Our service offerings

Every Alfa Laval solution is backed by the market's only supplier with deep process knowledge and a global network of experienced experts.

Get to know more about our maintenance solutions at [www.alfalaval.com/refinery/service](http://www.alfalaval.com/refinery/service)

### Products and solutions featured

Take a closer look at:

- **Compabloc**
- **Niagara Wet Surface Air Coolers**