

Catalytic hydrotreatment

Hydroprocessing is becoming increasingly important for maximizing refinery profitability – either as a means of removing impurities before further downstream processing, or for securing a supply of products that meet stricter environmental regulations. Whether you are revamping an existing hydrotreater or adding a new process unit in your plant, Alfa Laval has the process knowhow to help you get the most out of your investment.



Alfa Laval in catalytic hydrotreatment

Today, Alfa Laval has supplied more than 150 Compabloc heat exchangers to hydrotreating plants, both in the reactor and the and the stripper and fractionation sections. There are also more than 700 Alfa Laval Olmi high-pressure shell-and-tube exchangers and air coolers installed in the reactor section of hydroprocessing units.

To learn how other refineries use Alfa Laval solutions in hydroprocessing units, visit www.alfalaval.com/refinery/experience.

Capacity improvement

Capacity in existing process units is often limited by either reactor heater or recycle compressor capacity. Designing the process with maximum energy recovery at a lower cycle pressure drop in the combined feed/effluent exchanger offloads the heater and the compressor, and the unit capacity can be increased. With Alfa Laval Compabloc heat exchangers in your naphtha or kerosene combined feed/effluent exchanger services, you can do just that without having to invest more in the capacity of your fired heater or compressor.

Product yield improvements

During hot summer months, or in regions with a high ambient temperature, the inability to effectively cool and condense light vapour of the stripper or fractionator can

create a yield bottleneck. A closer temperature approach to the cooling media always ensures maximum gasoline production from your process unit. With Alfa Laval Compabloc heat exchangers or wet surface air coolers, you can reach minimal temperature approach to the supply temperature of the cooling media.

Energy efficiency improvements

To maximize the energy efficiency of your process units, you can design the combined feed/effluent exchanger with an internal pinch of around 10°C (18°F). This reduces the reactor heater duty by at least 15%. Plus, it offloads your effluent air cooler with the same amount of duty, thereby reducing its power consumption.

With Alfa Laval Compabloc heat exchangers in your naphtha or kerosene hydrotreatment plants, you can see less than 12 months' pay-back time for such an investment. Similarly, designing the process with maximal stripper feed preheating, using the stripper bottom fraction as heating media, reduces the steam consumption of the column reboiler.

Alfa Laval Compabloc heat exchangers can typically increase energy recovery in the stripper feed-bottoms interchanger service by at least 25% in a single heat exchanger. In some cases, they can even eliminate the need for a final product cooler.



Improved sustainability

These energy efficiency solutions minimize fuel use in the reactor heater. This, in turn, can reduce CO₂ emissions from this furnace by at least 15%. If the lower steam consumption in the reboiler also reduces the capacity of the steam boiler, there will be a similar reduction in CO₂ emissions from this boiler as well.

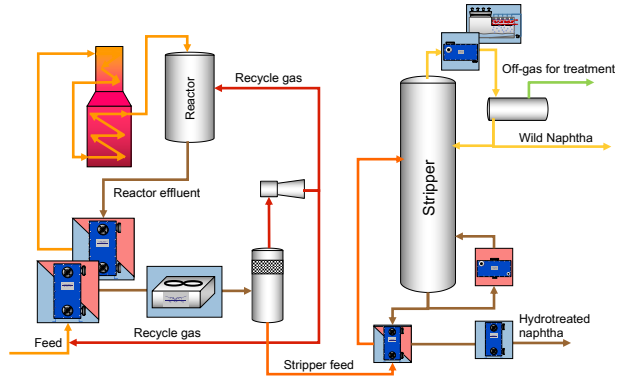
Additionally, cooling water consumption can be reduced by at least 50% if you design the process to maximize the return temperature of the cooling water from the coolers and condensers. Alfa Laval Compabloc heat exchanger enable you to do this in a very cost-effective way, with a single heat exchanger on minimal plot space.

Improved reliability/availability

Processes involving high partial pressure of hydrogen at high temperatures are, by their nature, very critical. The most reliable solutions are therefore needed to minimize hydrogen emissions into the atmosphere. Using an Alfa Laval Compabloc+ heat exchanger gives you a welded plate heat exchanger that can withstand up to 60 barg, even in such critical services. This is thanks to the unique +Seal design feature.

For design pressures above this limit, Alfa Laval Olmi shell-and-tube exchangers and effluent air coolers are specifically developed to provide the highest reliability in hydrogen processing services.

Naphtha hydrotreating



Fouling in the combined feed/effluent exchanger sometimes limits the throughput of the plant. It can even shorten the cycle-length, as heat exchangers need to be taken out for cleaning. Based on our experience in this service, Alfa Laval can recommend how to best operate and install heat exchangers that will maximize the uptime of your process – whether fouling is seen on feed side or on effluent side.



Minimizing CAPEX

When investing in a new catalytic hydrotreatment unit, using cost-efficient heat exchangers installed on minimal plot space is just the start of how you can minimize project CAPEX. By optimizing the process design, you can also achieve the lowest overall process cost.

- An overall lower pressure drop in the combined feed/effluent exchanger reduces the size of the recycle compressor or the feed pump. Alternatively, it can increase capacity in an existing process unit without requiring investment for additional compressor or pump capacity.
- Maximum energy recovery in the combined feed/effluent exchanger reduces the size of the reactor heater or increases capacity in an existing process unit without investment in additional furnace capacity.
- Maximizing the energy recovery from hot fractions also reduces the need for cooling capacity, thereby also shrinking the investment for the reactor effluent cooler or the final run-down coolers. Again, if there is need to increase capacity of an existing process unit, you can do this without investment in additional cooling capacity.
- Better cooling/condensing of stripper and fractionator overhead vapour minimizes the cost of downstream compressor or gas treatment systems. Alternatively, you can increase capacity in an existing plant without investing more in these gas handling systems.

- Minimizing cooling water requirements reduces investment cost in the cooling water system or increases capacity in an existing plant without needing additional investment in this system.

These savings will be much higher than the savings in heat exchangers and their installation cost, but it requires optimizing the process around the efficiency of Alfa Laval Compabloc heat exchangers. This is why you need to involve Alfa Laval early in the project, before the process design is fixed. We will help you optimize the mass and heat balance of your process to make sure you will get the most efficient design – both for OPEX and CAPEX savings!

For a revamp of your existing process unit, payback can be less than a year with a maximum period of around two years, depending on the complexity of the project and how many of above savings we can implement. For a grassroots unit, you can realize millions of Euros in savings by optimizing the process design based on Alfa Laval solutions.



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

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

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