APPLICATION

Renewable fuels production

In the quest to minimize the environmental impact of refinery products such as diesel, jet fuel and naphtha, more refineries are transforming their plants to operate with renewable feedstocks. To produce fuels with equivalent or even higher qualities than today, hydrotreated vegetable oil (HVO) processing is quickly becoming the preferreda solution for such production. Whether you are co-processing renewable feedstock in an existing hydrotreater, revamping an existing hydrotreater or adding a new purpose-built process unit in your plant, Alfa Laval has the process knowhow to help you maximize the profitability of your investment.

Alfa Laval in renewable fuels production

Today, Alfa Laval has supplied more than 220 Compabloc heat exchangers to both the reactor and the fractionation section of hydrotreating and isomerization plants. We have also provided more than 700 Alfa Laval Olmi high-pressure shell-and-tube exchangers and air coolers to the reaction section of hydroprocessing units.

On top of this, Alfa Laval can provide you with complete process lines for pre-treating your renewable feedstock. This is a technology we have worked with for many decades, delivering more than 500 complete plants and thousands of process sections for fats & oils processing.

To learn how other refineries use Alfa Laval solutions in the renewable fuels production, visit **alfalaval.com/refinery/experience**.

Feedstock flexibility

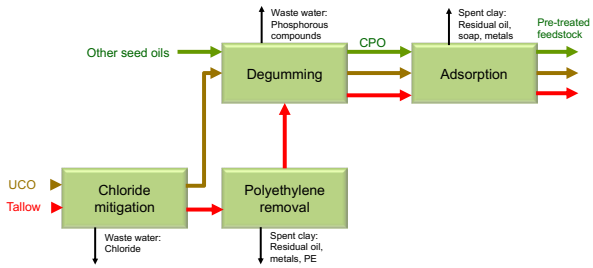
A key parameter for maximum profitability is the ability to obtain a high feedstock flexibility for the plant. Renewable feedstock can contain various impurities such as phospholipids and other phosphorous compounds, chlorides, polyethylene, free fatty acids, solids (such as metals), and moisture. Depending on the type and the concentration of the impurities, there are various pre-treatment methods that must be combined to obtain a feedstock that can be processed in an HVO unit without causing issues such as fouling, corrosion and catalyst activity degradation.

With Alfa Laval solutions, you can add building blocks to your pre-treatment unit to make sure that you meet required quality levels, no matter the feedstock. Because Alfa Laval supports you with both the process knowhow and the critical process equipment, modifications to your pre-treatment units can be done at a later stage if you decide to change your HVO process feedstock.

Product yield improvements

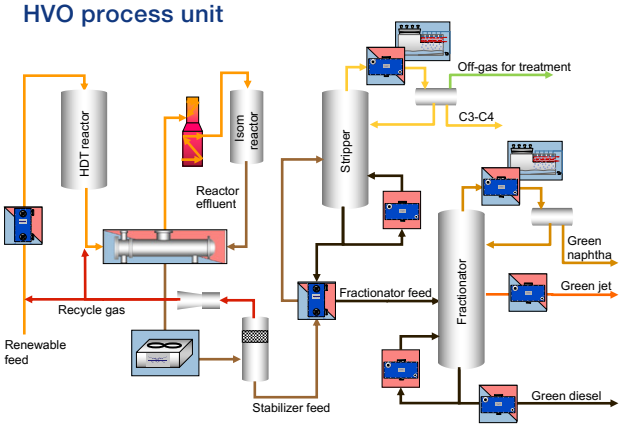
During hot summer months, or in regions with a high ambient temperature, the inability to effectively cool and condense light vapour of the stripper or fractionator can create a yield bottleneck. A closer temperature approach to the cooling media always ensures maximum green naphtha yield from your process unit. With Alfa Laval Compabloc heat exchangers and wet surface air coolers, you can reach a minimal temperature approach to the supply temperature of the cooling media.

Feed pre-treatment



Example of processes giving high feedstock flexibility

HVO process unit



Energy efficiency improvements

Based on the higher oxygen content in renewable feedstock, the hydrotreatment section of the HVO process is more exothermic than normal. This means that there is plenty of energy to recover to use in the process. Even so, there are normally a lot of interesting energy recovery solutions to be found in the stripping and fractionation section of the HVO process.

Designing the process with maximum preheating of the stripper or fractionator feed, by using the column bottom fractions as heating media, minimizes the steam consumption of the column reboilers. Alfa Laval Compabloc heat exchangers can typically increase energy recovery in the feed-bottoms interchanger services by at least 25% in a single heat exchanger. In some cases, they can even eliminate the need for a final product cooler.

Additionally, Alfa Laval Compabloc heat exchangers can recover a lot of low-grade energy from column overhead vapour or rundown fractions. This enables both low-pressure steam generation and hot water loops, making it possible to further increase the sustainable profile of your investment.

Improved sustainability

These energy efficiency solutions, reduce the steam needed in the column reboilers. This can mean lower capacity for the steam boiler, reducing CO_2 emissions from this boiler accordingly. With the steam generated from waste heat recovery, wastewater from the pre-treatment unit and the HVO plant can be evaporated to minimize the amount of waste sent to the water treatment plant. This also generates condensate that can be recycled back to the pre-treatment units, thereby fully eliminating any need for fresh process water.

Process water can also be generated from seawater or other low grade water sources.

Designing the process to maximize the return temperature of the cooling water from the coolers and condensers can reduce cooling water consumption by at least 50%. With Alfa Laval Compabloc heat exchangers, you can do this in a very cost-effective way by using single heat exchangers on minimal plot space.

Improved reliability/availability

While all pre-treatment processes operate at low pressures and temperatures, they may be regarded as less hazardous than the normal refinery processes. However, as renewable feedstock is much more reactive, specific procedures must be taken to minimize the risk of self ignition or other health issues resulting from, for example, handling of animal waste. Based on our expertise in these kind of processes, Alfa Laval can support you with a thorough hazop analysis to make sure the right handling measures are implemented in your plant.

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. Alfa Laval Olmi shell-and-tube exchangers and effluent air coolers are specifically developed to provide the highest reliability in hydrogen processing services.

Minimizing CAPEX

When investing in a new HVO 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.

- Maximum energy recovery in the feed/bottom interchangers can reduce the size of the column reboilers or increase capacity in an existing process unit without an investment in more reboiler capacity.
- Maximizing the energy recovery from hot fractions also means lower cooling capacity needs, thereby reducing the investment in the final run-down coolers. Again, if increasing capacity of an existing process unit, you can possibly avoid investments in more cooling capacity.
- Better cooling/condensing of stripper and fractionator overhead vapour can minimize 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.
- With wastewater evaporation, you can potentially avoid investment in more water treatment capacity. Running this evaporation plant with steam generated from waste heat recovery in the fractionation process means no further investment in steam boiler capacity is required.
- Minimizing cooling water requirements can reduce investment cost in the cooling water system or increase capacity in an existing plant without further 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**

Products and solutions featured

Take a closer look at:

- **Compabloc**
- **Desalination**
- **HVO Feed pre-treatment**
- **Niagara Wet Surface Air Coolers**
- **Olmi air**
- **Olmi shell-and-tube**
- **Spiral heat exchangers**
- **Zero Liquid Discharge**

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