

Crude distillation

Crude distillation is the heart of the refinery, and optimal performance of this process is key to profitability. Whether it is your atmospheric or your vacuum distillation unit that needs optimization, Alfa Laval has the experience and the solutions that will take your refinery to the next level.



Alfa Laval in crude distillation

Today there are more than 1000 Compabloc heat exchangers installed in atmospheric and vacuum distillation processes all around the world. There are also more than 25 preheat trains in which every single heat exchanger is a Compabloc, and close to 200 Compablocs are installed as overhead vapour condensers.

To learn how other refineries use Alfa Laval heat exchangers in the crude distillation processes, visit www.alfalaval.com/refinery/experience.

Capacity improvements

In many existing distillation units, the throughput is limited for reasons such as feed pump or furnace capacity limits.

Often, such limitations can be overcome by replacing several high-fouling shell-and-tube heat exchangers in series with a single Compabloc heat exchanger. This provides both lower overall pressure-drop and increased energy recovery. It means both the feed pump and the furnace will be off-loaded and capacity could creep up. And with low-fouling heat exchangers, the end-of-run capacity will be close to the start-of-run performance.

Crude flexibility

Refinery profitability is often related to the crude feed-stock flexibility.

With Compabloc heat exchangers, it is possible to redesign your crude preheat train for the crude slates operated today, and to build in flexibility for future variations in crude slates. Thanks to being cost-efficient in high corrosion resistant materials, the heat exchangers will not prevent you from also processing high-TAN crudes in your plant.

Product yield/optimization

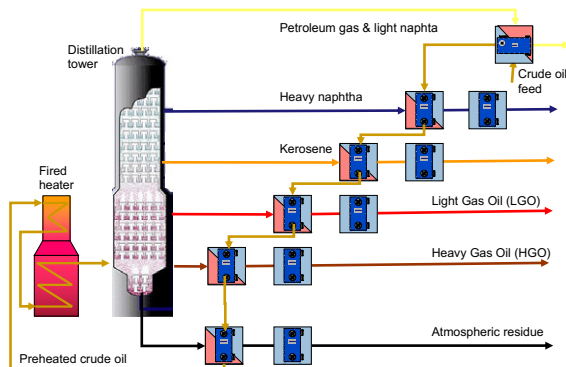
In uncertain market conditions, one key to refinery profitability is improved flexibility in the production of high-value products.

With Compabloc heat exchangers, it is possible to condense overhead vapours at a lower saturation pressure and with minimal pressure drop. This means it is also possible to lower the pressure in the flash zone of the column and thereby also increase the separation efficiency of close boiling range fractions. On top of this, it is possible to cool the vapour to lower temperatures, which is something that will increase the naphtha yield even further.

And with the right decisions in heat exchanger sizing and design, high variations in product flows can still be handled with maximal efficiency and minimal fouling tendency.



Atmospheric distillation



Energy efficiency

Energy consumption in atmospheric and vacuum distillation processes can account for more than 30% of the total energy consumption of a refinery. Minimizing this energy consumption therefore has a direct impact on the profitability of the plant.

With Compabloc heat exchangers, energy consumption in the fired heater can be reduced in two ways. The first is by maximizing heat recovery from the hot fractions leaving the distillation column. The second is by reducing the pressure drop in the overhead vapour system, thereby reducing the operating pressure in the flash zone of the column.

This means energy consumption in the fired heater can be reduced by at least 25%. With low-fouling heat exchangers, the end-of-run energy efficiency of the plant will not be far from the start-of-run efficiency.

Another opportunity to improve the energy efficiency of the distillation processes is to recover more waste heat. Using Compabloc heat exchangers for run-down cooling or vapour condensing enables maximum recovery of low-grade energy for generation of superheated steam or for boiler feed water preheating or district heating.

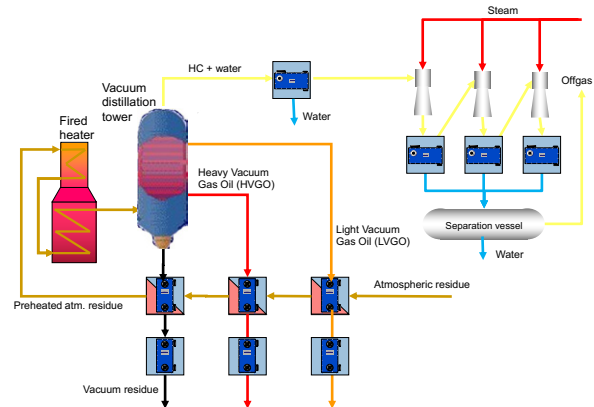
Improved sustainability

With less fuel burnt in the fired heater, Compabloc heat exchangers can help a refinery to cut CO₂ emissions from their distillation processes by at least 25%.

On top of emission reductions, Compabloc heat exchangers can also minimize cooling water consumption in rundown coolers and condensers by up to 50%. And with the steam generated from waste heat recovery, process water can be evaporated to minimize waste and to generate condensate that can be recycled back to the process.

Alternatively, process water could be generated from seawater or other low grade water sources.

Vacuum distillation



Fouling mitigation

Shell-and-tube heat exchangers installed in atmospheric and vacuum distillation processes normally suffer from serious fouling. This can have a big impact on refinery profitability, as it can lead to both throughput limitations and increased energy consumption.

When using Alfa Laval's experience to design Compabloc heat exchangers for these high-fouling services, it is possible to minimize the chemical deposition of fouling in the hot end of the preheat trains. This helps prevent bottlenecks and extend operating intervals in between cleanings. With fewer heat exchangers to clean, and easier access to the heat transfer channels for cleaning, it is also possible to minimize downtime for maintenance.

Reliability/availability

If distillation processes go down, a refinery will quickly lose a lot of money. Maximizing the performance and the reliability of the process equipment is therefore key to achieving the highest plant availability.

Using Compabloc heat exchangers in the distillation processes increases reliability in many ways. Less fouling extends heat exchanger run-length, and in many cases, prevents the need for cleaning between scheduled turn-arounds. If Compabloc heat exchangers have been added to the process as part of a revamp, it is often possible to keep the existing shell-and-tube heat exchangers on stand-by, providing a back-up solution if, for any reason, the Compabloc is taken out of service.

Compabloc heat exchangers are also a cost-efficient solution in high-grade materials, as much less heat transfer surface is needed. This means that it is an affordable way to upgrade to more corrosion resistant materials in the most aggressive services in a plant.

CAPEX savings for new investments

Using Compabloc heat exchangers in atmospheric and vacuum distillation processes, instead of traditional shell-and-tube heat exchangers, can reduce overall project CAPEX in many ways.

Firstly, fewer heat exchangers are required, as a single Compabloc can replace up to eight shell-and-tubes in a series. This reduces heat exchanger cost. If high-alloy materials are also required to minimize corrosion, using a Compabloc means the heat exchanger savings are even higher.

Secondly, fewer heat exchangers occupying a minimal plot space and having a much lower flooded weight reduces costs substantially. This is particularly the case if the heat exchangers are installed on structure. If the new investment is planned as a modular design, utilizing smaller and less heavy process equipment has a major impact on the project cost.

However, beyond total installed cost savings for the heat exchangers, optimizing processes according to the advantages of Compabloc heat exchangers can cut much more of the total project CAPEX. This includes:

- Lower overall pressure drop in the preheat train can reduce the size of the feed pump or eliminate the need to add a booster pump to an existing train. This also minimizes the pressure rating of downstream equipment.
- Maximal crude preheating can reduce the size of the furnace or, alternatively, make it possible to increase the capacity of an existing unit without adding furnace capacity.

- Maximizing energy recovery from hot fractions also reduces the need for cooling capacity of these, thereby reducing investment in final rundown coolers.
- More cooling/condensing of overhead vapour reduces the amount of off-gas and minimizes cost of the downstream compressor or vacuum systems. Alternatively, it can increase capacity in an existing plant without requiring investment in more capacity for these systems.
- Minimized cooling water requirements can also minimize investment costs for the cooling water system, or increase capacity in an existing plant without investment in this system.

These savings will be much higher than the savings in installed heat exchanger cost, but only if the process is optimized around the efficiency of 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 based on our solutions to make sure you will get the most efficient design – both for OPEX and CAPEX savings!

For a revamp of your existing process unit, the payback period can be less than a year, and around two years maximum, depending on the complexity of the project and how many of above savings we can implement.

For a grassroots atmospheric distillation unit, you can realize savings of up to 30 MEUR, just taking into account the installed cost of the preheat train heat exchangers. When factoring in cost reduction for other equipment as listed above, savings are even higher.



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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