Alfa Laval Packinox for catalytic reforming

Combined feed/effluent heat exchanger

Replacing tubular heat exchangers in a catalytic reforming unit with an Alfa Laval Packinox combined feed/effluent heat exchanger can increase production and cut operating costs substantially. The return on investment is very attractive for medium-sized and large catalytic reforming units. For larger units the payback time is often under a year.

The industry standard for heat recovery in catalytic reforming units

Low investment costs, high capacity, large energy savings and exceptional operational reliability have made Alfa Laval Packinox the industry standard for feed/effluent heat recovery in catalytic reforming units.

We have designed and manufactured Packinox heat exchangers for catalytic reformers – both CCR and Fixed Bed – since the early 1980s. At present there are more than 350 Packinox units in operation in refineries and petrochemical plants around the world, with an excellent track record.

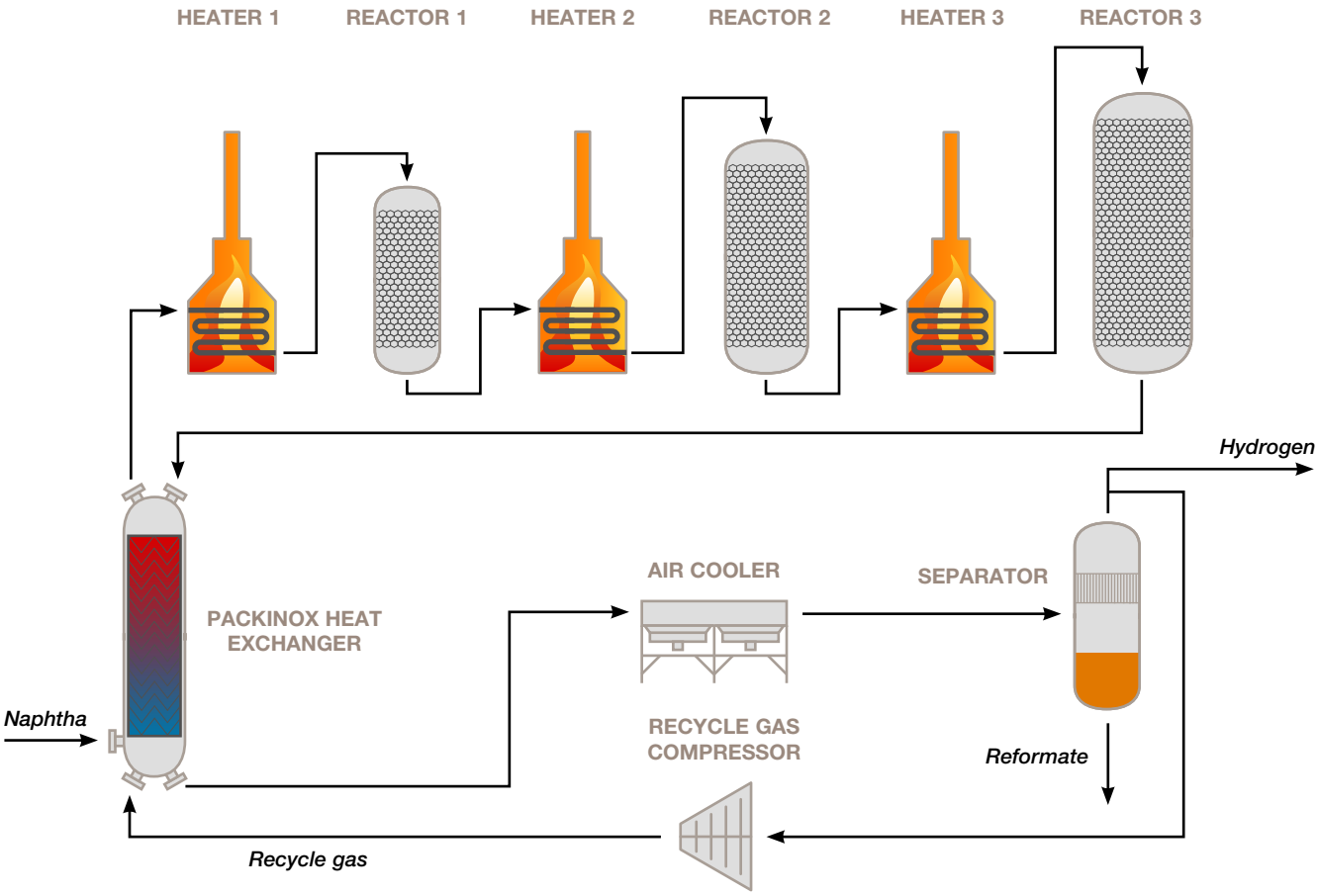
Increase profitability by replacing shell-and-tube heat exchangers with a Packinox

Refinery managers around the world are constantly on the lookout for ways to increase capacity and efficiency in their plants.

An easy and straightforward way to achieve this is to replace existing shell-and-tube feed/effluent heat exchangers in the catalytic reforming unit with an Alfa Laval Packinox. Benefits include:

- Higher yield and production capacity
- Low investment costs and compact size
- Lower energy consumption
- Reliable operation
- Less and easier maintenance
- Higher worker safety
- No changes are necessary to existing equipment (compressor, heaters, air coolers, etc.) to obtain higher throughput and/or higher hydrogen production.

TYPICAL PROCESS LAYOUT



High yield thanks to a low pressure drop ...
Thanks to a very low pressure drop compared to shell-and-tubes, Packinox heat exchangers make it possible to operate catalytic reformer units at a lower pressure and thereby increase the yield. The total, flange-to-flange pressure drop for both sides can be as low as 0.5 bar, compared to 1 bar for vertical and 6 bar for horizontal shell-and-tube heat exchangers.

... and an optimum flow of recycle gas
A second factor that influences the yield is the liquid feed/recycle gas ratio. To maximize the output, this ratio should be as high as possible, but it is critical that the flow of recycle gas is sufficiently high to lift all the droplets through the heat exchanger.

Alfa Laval's unique Lifting Controller software makes it easy to set the optimum flow rate of the recycle gas by continuously analysing operating data and clearly indicating the minimum value required to lift the liquid feed. This makes it easy to optimize operations over time and especially when conditions change, e.g. when switching feed stocks.

The design of a Packinox heat exchanger offers greater operating flexibility than a set of shell-and-tubes, and allows you operate it with a lower gas flow without compromising lifting, resulting in higher yield.

The easy way to increase capacity
If heater capacity is limiting production, the easiest way to resolve this bottleneck is to exchange existing shell-and-tube heat exchangers for a Packinox.

Thanks to its outstanding heat-transfer efficiency, a Packinox heats the liquid feed/recycle gas mixture far more than a shell-and-tube. This reduces the load on the heaters and enables a higher production rate.

In some cases the improved heat recovery also makes it possible to switch the order of the first and second heaters in order to increase capacity even further.

Low investment costs
The high thermal efficiency means that Alfa Laval Packinox heat exchangers are very compact compared to shell-and-tube units. One single Packinox can often replace multiple shell-and-tubes. This means costs for plot space, civil engineering, structures and piping are much lower when building a new plant.

In revamp projects where shell-and-tube heat exchangers are exchanged for a Packinox, there is no need to replace equipment such as compressors, heaters, etc. and existing structures can often be reused with minimal alterations.

Low operating costs
A Packinox heat exchanger is able to recover much more of the energy in the reactor effluent than a shell-and-tube heat exchanger, and consequently the feed is preheated to a higher temperature. The approach temperature can be as low as 20°C (36°F). The means the load on the heaters and the cooling system is much lower with major savings in energy costs as a result.

Maintenance costs are kept low thanks to minimal fouling and cleaning needs, as well as the easy-to-service design of an Alfa Laval Packinox.

Knowhow and experience
All Alfa Laval Packinox heat exchangers are fully customized and optimized for high reliability and performance. We have a close cooperation with some of the world's leading licensors and with more than three decades' experience, we understand the challenges refineries are facing.

For more than 30 years we have been carrying out regular performance analysis on our entire installed base. This has allowed us to perfect the calibration of our design software.

We put all our knowledge and experience into the design of each heat exchanger to make sure our customers get the best possible solution in terms of low total cost of ownership and maximum production capacity.

Alfa Laval Packinox combined feed/effluent heat exchanger installed in a refinery.

Example – Revamp of 30,000 bpd CCR unit

	Shell & tube HEX HAT = 65°C (117°F)	**Packinox HEX HAT = 35°C (63°F)**
Number of shells	2	1
Duty	36.04 Gcal/h (143 MMBTU/h)	39.6 Gcal/h (157 MMBTU/h)
Additional heat recovery	-	3.56 Gcal/h (14 MMBTU/h)
CAPEX		
Equipment cost	-	2,300,000 EUR
Installation cost	-	920,000 EUR
Total installed cost	-	3,220,000 EUR
OPEX		
Fuel savings per year *	-	1,748,900 EUR
Payback time		**22 months**
Total savings after five years' operation		**5,524,500 EUR**

* Assumed fuel cost = US$300/tonne

How to contact Alfa Laval
Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com