Alfa Laval Packinox supplied the first Standard Combined Feed/Effluent Heat Exchanger to a Catalytic Reforming Unit in 1982. Over a decade later, a report from the client congratulated Alfa Laval Packinox on the heat exchanger’s constant good performance and minimum maintenance requirements.

In one piece of equipment, Alfa Laval Packinox large welded plate heat exchangers offer the superior efficiency of plate exchangers together with the resistance to high temperatures and pressures generally associated with Shell & Tubes. Moreover, the compact design of a single Alfa Laval Packinox can replace several tubulars, thus enhancing the impact on capex and opex by cutting installation costs and pressure drop consumption.

Alfa Laval Packinox heat exchangers improve the overall economics of greenfield units, and also serve as a low cost retro-fitting basis for debottlenecking existing units as Alfa Laval Packinox allows higher duty with lower pressure drop. No other change to the unit’s existing equipment (compressors, heaters, etc.) is needed to obtain higher throughput and/or higher H₂ production.

As a result of general satisfaction with the performance of Alfa Laval Packinox Standard Combined Feed/Effluent Heat Exchangers in catalytic reforming, Alfa Laval Packinox is now considered the industry standard for CRUs and is specified by the main process licensors for both semi-regenerative and CCR units.

### Typical process conditions:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>5,000 to 70,000 bpd (with one exchanger)</td>
</tr>
<tr>
<td>Temperatures</td>
<td>from 80°C (cold end) to 530°C (hot end)</td>
</tr>
<tr>
<td>Hot approach</td>
<td>as low as 30°C or less</td>
</tr>
<tr>
<td>Operating pressure</td>
<td>7 to 45 bars depending on process</td>
</tr>
<tr>
<td>ΔP in exchanger</td>
<td>2 to 0.7 bar</td>
</tr>
</tbody>
</table>

![Diagram of Alfa Laval Packinox Standard Combined Feed/Effluent Heat Exchanger](image-url)
New unit case study
50 000 bpsd Continuous Catalytic Reforming Process Unit

ALFA LAVAL PACKINOX
HEA = 28°C

S&T
HEA = 44°C

<table>
<thead>
<tr>
<th>Hot End Approach</th>
<th>ALFA LAVAL PACKINOX</th>
<th>S&amp;T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of shells</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Duty</td>
<td>MW</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>MM Btu/h</td>
<td>443.6</td>
</tr>
<tr>
<td>Heat recovery</td>
<td>MW</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>MM Btu/h</td>
<td>23.9</td>
</tr>
<tr>
<td>Estimated dry weight</td>
<td>kg</td>
<td>150,000.00</td>
</tr>
</tbody>
</table>

CAPEX

Estimated equipment cost: $US 3,300,000
Estimated installation cost: $US 1,320,000
Estimated installed cost: $US 4,620,000
CAPEX Savings on installed heat exchanger: $US 480,000
CAPEX Savings on other installed equipment (Heater, Cooler): $US 500,000
TOTAL CAPEX SAVINGS: $US 980,000

OPEX

ENERGY SAVINGS PER YEAR:

CHARGE HEATER, COMPRESSOR,…: $US 3,150,000
EMISSIONS SAVINGS PER YEAR: Nox, Sox, GHG: $US 560,000

assuming: 10.5 $US/ MM BTU, 1 Euro = 1.2 $US, GHG = 20 $US/Ton, Nox = 0.5 $US/Lb, Sox = 0.5 $US/Lb

Revamp case study from an actual catalytic reforming revamp

Prior to revamp
Packinox solution

Naptha flow rate: 15,000 b/d 20,000 b/d
Arrangement: 12 (2 x 6) horizontal S&Ts
                       1 vertical S&Ts
Total weight: 236 tons 114 tons
Total H.E. duty: 82 MW
Feed outlet temp.: 440 °C 475 °C
Hot approach: 60 °C 25 °C
Total pressure drop: 4 bar 1.3 bar
(no new compressor needed)

In this case as in others, one Alfa Laval Packinox heat exchanger replaced 12 horizontal tubulars with no changes to the unit’s compressor or furnaces (only new connections were required).

Capacity rose by 33% at this unit where a Alfa Laval Packinox exchanger has been in service for over 12 years without major maintenance or repair operations.

A report from the client furthermore says Alfa Laval Packinox improved the unit’s energy efficiency, resulting in a reduction of SO₂ emissions and a significant drop in total fuel consumption.

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

Alfa Laval reserves the right to change specifications without prior notification.