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**“The Alfa Laval rotary jet mixer Iso-mix has set new standards on how beer is going to be made.”**

*Thomas Paludan-Müller, technical operations manager at the Carlsberg Northampton brewery*

**REFINERY MAKEOVER**  
Italian refinery enjoys dual benefits after Compabloc retrofit

**CLEAN COAL PROGRESS**  
New Alfa Laval technology helps tackle cost-efficiency issues

**Great strides towards**  
**CLEANER SHIPPING**

Legislation and technology are effective ways to help the shipping industry reduce its impact on the environment.



# REFINERY REVOLUTION

One bold decision made all the difference to the Falconara refinery in Italy. By replacing an air cooler with two Alfa Laval Compabloc heat exchangers, the refinery not only cut its yearly costs by as much as 3 million euros but it also reduced its environmental footprint.

TEXT: **ERIC J. LYMAN** PHOTO: **MAURIZIO CAMAGNA**

**PERCHED FOUR STOREYS** up the side of the topping facility at the Falconara Maritime refinery in Ancona, Italy, are two nondescript pale-blue boxes, roughly the size and shape of old-fashioned phone booths. These have helped transform the 60-year-old refinery into one of the most technologically advanced refineries in Italy.

The Falconara refinery, owned and operated by Rome-based petroleum giant Gruppo API, covers 70 hectares near the Port of Ancona and processes an average of some 85,000 barrels of mostly Middle Eastern crude oil a day. The refinery opened for business in 1950, and about ten years ago it began its journey towards becoming at vanguard of Italian petroleum processing plants.

Step by step the different parts of the refinery have been examined and improved. A major breakthrough came in 2009 when

The two blue Alfa Laval Compabloc heat exchangers have helped to turn the Falconara refinery into one of the most advanced refineries in Italy.



Falconara's maintenance of the second-stage overhead air coolers in the crude distillation units showed that by making changes to the system the plant could optimize the heat it produced more efficiently. Officials had the option of either replacing the damaged air coolers with the same technology or installing new but unfamiliar Alfa Laval Compabloc welded plate heat exchangers designed to recover heat otherwise wasted in that part of the refining process.

**IT WAS NOT A DECISION** the refinery took lightly. Most refineries that choose cutting-edge heat exchangers as part of the distillation process do so when the refinery is being built. But at Falconara, the installation would require the complex and costly retrofitting of an existing facility.

Before deciding, the company sent a team to Collombey, Switzerland, to study the

#### FALCONARA REFINERY IN SHORT

- API's Falconara refinery covers more than 70 hectares, with a total processing capacity of around 4 million tonnes per year and a storage capacity of 1.5 million cubic metres. Most of the refinery's crude oil comes from the Middle East.
- The refinery also produces around 300 MW of power via an integrated gasification combined cycle plant at the facility.
- Falconara is one of the oldest refineries in Italy, with roots dating back to 1939. The current facility opened for business in 1950.
- The refinery employs around 400 people. More than half are production workers, and turnover has historically been low.
- Thanks in part to the installation of the Alfa Laval Compabloc heat exchangers and other technical improvements, the refinery is now one of the most advanced in Italy and has been certified ISO 14001 for environmental standards, OHSAS 18001 for safety and ISO 9002 for quality. The refinery has also earned a European Union white certificate for environmental efficiency.
- In terms of methane, the refinery's marginal fuel, total savings are at least 7,200 tonnes per year, which translates to a monetary value of about EUR 3 million.
- The refinery is the only plant of its type in Italy to be using Alfa Laval Compabloc heat exchangers.



Reusing heat has not only saved the Falconara refinery a lot of money, but also contributes to improving its environmental footprint.



### COST-SAVING INSTALLATION

**Alfa Laval's Compabloc** is a high-efficiency laser-welded compact heat exchanger made up of a pack of corrugated plates placed in such a way as to form media channels. The plates are supported by four side panels, all of which facilitate connections, plus an upper and lower head. With no inter-plate gaskets, operating costs and maintenance needs are reduced and compatibility issues are eliminated. The end result is a substantial cost savings, in addition to providing other advantages including environmental benefits such as cleaner air and lower greenhouse gas emissions.

At the API Falconara refinery officials estimate the costs savings will total around EUR 3 million per year over the 25-year lifespan of the two units operating there.

"Heating costs can be the largest expenditure at a refinery like Falconara," explains Alfa Laval's Alberto Mazzeo. "So it's a priority to keep those costs under control as much as possible."

Falconara technology manager Alfredo Punzo agrees. "The more wasted heat there is, the more money is wasted," he says. "These Compabloc heat exchangers do a great job at capturing a lot of that heat so we can reuse it."

In the first year of operation, the savings from the crude distillation unit at Falconara are estimated to total 85,000 Gcal/year. Converted to tonnes of methane, the marginal fuel at Falconara, the savings come to around 7,200 tonnes of methane per year. The refinery's original projections were that the installation of the Compabloc heat exchangers would provide total economic savings of EUR 2.5 million per year, but Punzo says that actual savings have been even greater thanks to the reduced need for maintenance.

► Tamoil refinery there. The Collombey refinery had made a similar switch to the same Alfa Laval Compabloc heat exchangers some 12 years earlier. The Falconara officials liked what they saw and heard and decided to make the change.

"We studied the problem very carefully," says engineer Alfredo Punzo, technology manager at the Falconara refinery and one of the API officials who made the exploratory trip to Switzerland. "Part of the evaluation was to speak to the engineer in charge at Collombey. He said that they had had no problem with the heat exchangers and that they would do it again. We learned the value of using the heat exchangers as well as the best way to design and lay the system out."

Once the decision was made, things moved quickly. The official proposal to install the Alfa Laval Compabloc heat exchangers was made in September 2009, with the feasibility study completed the following month and the process study finished a month after that, including modifications to other parts of the refinery to allow the new units to operate at maximum efficiency.

**THE DETAILED PROJECT** plan, including the strategy for shifting operations from the outdated air-cooling shell-and-tube unit that had been operating there to the new plate heat exchangers was finalized in February 2010. The training of workers got under way, and the start-up was carried out on schedule on 7 April 2010 - less than nine months after

the initial decision was made.

From the outside, the Alfa Laval heat exchangers look like a simple metal box. But the simple exterior belies the complex work being done inside the two units, which direct heat from the top fraction, known as the virgin naphtha, so it can be used to preheat the crude oil feed to the furnaces and generate hot water for the refinery.

Previously this heat was released into the atmosphere, a common solution in the processing industries where, according to the International Energy Agency, some 50 percent more energy is used than necessary. At the Falconara plant the switch from the outdated air coolers to Alfa Laval

Alfredo Punzo is more than pleased with the performance of the Alfa Laval Compabloc heat exchangers and estimates the economic savings at more than 2.5 million euros per year.



**“It might be difficult to quantify the exact cost benefits from using these heat exchange units because many of the benefits are intangible or indirect. But so far we are very happy we made this decision, and we would definitely do it again.”**

ALFREDO PUNZO, FALCONARA REFINERY

Compabloc heat exchangers has meant significant cost savings.

“The idea is to burn the least amount possible,” says Marco Silva, energy manager at Alfa Laval in Italy. “The Compabloc heat exchangers are designed to capture the heat so the refinery can reuse it.”

**PUNZO ESTIMATES** that the Compabloc units paid for themselves within a year through the savings generated. The units have an estimated lifespan of around 25 years. With

such a short payback period, savings start accumulating in the second year – an important benefit in a time of escalating energy prices.

There are other benefits as well. The technology helps the refinery to burn less fuel, meaning that it releases less carbon dioxide and other greenhouse gases into the atmosphere, making Falconara one of the few Italian refineries to earn an environmental white certificate from the European Union.

The reduction of heat released into the

atmosphere also improved working conditions for those operating near that part of the plant.

And the heat exchangers require minimal maintenance. Punzo says that so far the refinery has not had to contact Alfa Laval for any kind of cleaning or maintenance. “Based on their performance so far, I predict that the units may never need care,” he says.

All in all there are many advantages. “It might be difficult to quantify the exact cost benefits from using these heat exchange units because many of the benefits are intangible or indirect,” Punzo says. “But so far we are very happy we made this decision, and we would definitely do it again.”

Falconara officials believe that more Italian refineries will eventually choose to retrofit the technology into their plants and that as new refineries are built they will incorporate new heat exchangers into their designs. ■