



## Compabloc - a refiner's formula for energy efficiency

Petronas Kerteh refinery, Malaysia

Case story

**In its efforts to continually implement sustainable practices in its operations, Petronas has invested in cutting-edge energy efficient technology.**

Spirits are high at Petronas' Kerteh refinery on the east coast of Malaysia. The refinery celebrates its 30th anniversary this year. At the same time it is shifting to an all-year-round operation and implementing efforts to improve its energy efficiency.

### **Reduced energy consumption by almost 10 percent**

The first of two such projects was completed in November 2010 and will reduce the energy consumption in the Petronas Crude Distillation Unit (CDU) by almost 10 percent while reducing CO<sub>2</sub> emissions by 8,000 tonnes per year. This is very good news for the national oil and gas company, an industry where margins are critically important for business sustainability.

The second project is scheduled to turn the refinery into a 24/7 operation and is due to be completed by February 2013. When completed, this is expected to increase capacity by as much as 600,000 barrels of crude oil a year from 17.65 million to 18.25 million, while improving energy efficiency and reducing the CO<sub>2</sub> emissions of the CDU even further.

### **Compabloc - small size, low maintenance and better energy efficiency**

Both projects involve the use of Alfa Laval's compact welded plate heat exchangers, known as Compablocs. This equipment is designed to recover the maximum amount of heat produced in the refinery processes. The advantages of Alfa Laval Compablocs are their small size, lower maintenance and better energy efficiency compared with traditional shell-and-tube (S&T) heat exchangers.

Project One, which involved the installation of a Compabloc in the CDU via a design configuration, allowed the refinery to keep the original S&T on stand-by and achieved a payback period of less than a year. Alfa Laval Compabloc heat exchanger technology was not the typical technology to use in such a critical refinery process, but based on the proven results of greater energy efficiency and technological reliability, the company decided to implement it at the refinery.



Petronas' Kerteh refinery in Malaysia has enhanced its energy efficiency by using Compabloc technology.

### **Reduced the CO<sub>2</sub> emissions**

The Compabloc was delivered in August 2010 and commissioned in November the same year. The company has since recorded encouraging results. The energy costs of heating the crude oil in the CDU were 0.0576 gigajoules per barrel (GJ/bbl) before the Compabloc was installed, based on existing start-of-run figures. After the Compabloc was installed, this was brought down to 0.0525 GJ/ bbl. This represents a 9.2 percent savings in total energy consumption per year. This translates into less fuel gas needed in the fired heater, something that will also reduce the CO<sub>2</sub> emissions by 8,000 tonnes per year.

Cost savings are crucial at the Kerteh refinery, given that it is designed to refine the local Tapis oil, which is very expensive compared with other types of crude. Any cost savings will have a big impact on the bottom line.

### **Reducing the environmental footprint**

While the cost savings is important, the Compabloc also contributed to the refinery's energy efficiency rating. This is measured according to the Solomon Energy Intensity Index (EII), an industry standard. The lower the score, the more energy-efficient you are.

The Kerteh facility, which was already in the top quarter of the world's most energy-efficient refineries, cut its score by three points with the Compabloc technology. Eva Andersson, Alfa Laval's regional manager for Southeast Asia, says: "Reducing the environmental footprint is on most refineries' agenda today, and the refineries in Southeast Asia are of course no exception."



Encik Khairul Emran Aziz Badli, the refinery's Head of Technical Services, says: "The energy savings are good and the commissioning was achieved within the targeted timelines."

### Another six Compablocs in the second project

Due to the success of Project One, Petronas decided to install another six Compablocs along the pre-heat train, which warms the oil before it reaches the crude distillation tower. As part of its decision-making process, Petronas sent a team to a refinery in France that had commissioned two Compablocs in 2010.

The project engineering, procurement and construction phase began in January this year and is due to be completed in February 2013. While this will further improve energy efficiency and reduce CO<sub>2</sub> emissions, the main objective was to

allow the refinery to become a 365-day-a-year operation facility, thus avoiding plant shutdowns that would affect its efficiency. This is expected to boost production by 600,000 barrels a year.

### No disruption in output

One of the key advantages of Compabloc is that with its small space requirements, it can be installed alongside an existing the S&T system, which is bigger and bulkier. This means both systems can exist in a parallel configuration, keeping the old S&T in stand-by. When a Compabloc needs to be cleaned, which is typically much less frequent than S&T, the refinery can switch to the old system to ensure that output is not disrupted.

Today, the Kerteh refinery is normally closed 10 to 12 days a year for S&T maintenance. When the continuous operation goes live next year it will mark a major achievement for the CEO of Petronas' Kerteh refinery, En Ahmad Hamizan Hasan. He says: "When I joined in 2009, there were a few improvements I wanted to make. One of them was to make the plant run 365 days a year. With energy prices rising all the time, margins are constantly being squeezed."

### 365-day-a-year operation

A 365-day, 24/7 operation does not just equate to cost savings. It also reduces the risk of accidents happening, as these are more likely to occur during shutdowns. During maintenance periods, contract



Due to their minimal space requirements, Compabloc heat exchangers can be added to the pre-heat train while still keeping existing S&Ts in stand-by.

workers unfamiliar with the refinery are often brought in to help with cleaning tasks while permanent staff complete their duties in an environment different than normal conditions. Accidents can be catastrophic, costing innocent lives and billions of dollars.

Working with an energy consultant, Petronas' Kerteh refinery conducted pinch analysis along the pre-heat train, looking at new configurations for its layout that could lead to even greater energy savings. Technologist Puan Raudhah Damanhuri, who helped oversee Project One, says: "The advent of new technologies in the past five years allowed us to compete and be at par with world-class refineries."

Petronas has three refineries in Malaysia (two in Malacca along with Kerteh). Says Ahmad Hamizan: "The Compabloc technology has contributed to our efforts to be as energy-efficient as possible."

#### Key Facts:



**Design temperature**  
400°C (752°F), down to -100 °C (-148°F)

**Design pressure**  
From full vacuum to 42 barg (600 psig)

**Maximum heat transfer area**  
840 m<sup>2</sup> (8,985 ft<sup>2</sup>)

**Material of construction**  
316L, SMO254, 904L (UB6), Titanium, C-276/C-22/C-2000

**Duties**  
Heat recovery, cooling, heating, condensation, partial condensation, reboiling, evaporation and gas cooling.

Learn more at [www.alfalaval.com/compabloc](http://www.alfalaval.com/compabloc)

#### Unique features

Compabloc is the champion of heat exchange thanks to unique Alfa Laval innovations that enable reliable, efficient performance, letting you save energy and improve sustainability.



**SmartClean**  
Fast and efficient flushing of fouling material



**C-Weld**  
Superior cleaning and extended performance



**XCore**  
Advanced design for higher pressures



**ALOnsite**  
Qualified support at your facility

#### Fast facts:

##### The customer's challenge

Shift to an all-year-round operation and implement efforts to improve the energy efficiency.

##### The benefits from the Compablocs

- Reduced the energy consumption in the Petronas' Crude Distillation Unit (CDU) by almost 10 percent while reducing CO<sub>2</sub> emissions by 8,000 tonnes per year.
- Increased capacity by 600,000 barrels of crude oil a year from 17.65 million to 18.25 million.
- Payback period of less than a year.
- 9.2 percent savings in total energy consumption per year.
- 365-day-a-year operation facility.
- Output was not disrupted due to the Compabloc's minimal space requirements, which meant they could keep the old S&T system in stand-by.
- Cost savings, with big impact on the bottom line.

#### 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](http://www.alfalaval.com).