A crude oil transfer pump on an offshore platform in Malaysia needed to be rerated to meet changed working conditions. Sulzer found a retrofit solution that complied with the challenging space and time constraints.

“The retrofit helped us to save space, time, and money.”

Mohd Hazran Mat Rahim, Talisman Malaysia Ltd
Low oil prices put more pressure on oil producers around the world to extend the life of mature oil fields and to debottleneck existing platforms. This has led to a rise in the global demand for individual and tailored retrofit solutions while—as far as possible—making use of existing pumps as assets. Shell Malaysia operated the Kinabalu platform for approximately 25 years. When that contract expired, the platform was handed over to Petronas, who, as the asset owner, subsequently appointed Talisman Malaysia Limited as the operator. Situated at East Malaysia Sabah, Kinabalu produced an average of 7 mboe/d in 2014. Talisman wanted to continue production, further develop the platform, and improve the recovery of crude oil from the Kinabalu oil fields. The company decided to make a significant investment in upgrading and expanding the existing facilities. The major challenge was to adapt the equipment quickly to the new duties despite limited space on the existing platform while simultaneously avoiding additional shutdowns.

New duties for the pump
Because of reduced output from the wells and changes in the processes, the crude oil transfer pump on the platform needed to deliver much lower flow rates. Furthermore, the pump flow was also expected to vary over the next five years. To avoid bottlenecks, this operation-critical pump—a Sulzer CD pump (BB2 type)—would have to operate at three different duty points going forward. The existing duty, at a flow of 406.8 m³/h and a related head of 336.7 m, had to be rerated. The new flow was set at 200 m³/h with an allowable minimum flow of 80 m³/h at lower required heads. The following duty points were required:
- 112 m³/h flow rate, 157 m head
- 152 m³/h flow rate, 148 m head
- 200 m³/h flow rate, 147 m head

One possible solution to achieve the different operating points would have been to install a variable-frequency drive (VFD). A VFD adjusts the speed of the pump motor and provides an energy-efficient method of reducing the flow rate. However, because of space and weight limitations on the oil platform, such a speed control could not be considered.

Talisman contracted Sulzer to find a suitable retrofit solution that would fit into the fixed-speed drive. Further challenges were:
- Sand carry-over was high.
- The pump mean time between repairs (MTBR) was only 6–8 months.
- The rotor had to be replaced and installed on site during a limited time window of a 30-day platform shutdown.
- A performance test was required to confirm the duty change.

Quick local turnaround
Sulzer provided state-of-the-art hydraulic expertise to offer the customer the best solution with a hydraulic rerate as the centerpiece. Sulzer supplied a new low-flow, low-head hydraulics to meet the various duty points.
conditions. The major difficulty in meeting three different duty points was resolved by throttling the flow and reducing the pressure using a discharge valve. This made the pump run closest to the best efficiency point (Fig. 1). This method represented the best technical and economic solution under the given space constraints. The losses in energy were minimized. Further, at 148 m head and 112 m³/h at 157 m head can be achieved by throttling the flow and reducing the pressure using a discharge valve. This solution does not require any additional expenditure or the space—that is not available on the platform—for a VFD. Also, a minimum continuous flow is viable at 80 m³/h. The customer installed a liquid control valve (LCV) at the discharge.

Retrofits

Retrofits are available for any industrial pump. Find out more:
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- Watch Sulzer’s retrofit video: www.sulzer.com/what-is-retrofit
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Increased reliability
The original pump characteristic reveals that the pump was operating at 406.8 m³/h at a required head of 336.7 m—already noticeably off the design point. The power rating was at 463 kW. Thanks to the new hydraulic design, the retrofitted pump allows for a flow up to 200 m³/h with a required head of 147 m. The other operating flows of 152 m³/h at 148 m head and 112 m³/h at 157 m head can be achieved by throttling the flow and reducing the pressure using a discharge valve. This solution does not require any additional expenditure or the space—that is not available on the platform—for a VFD. Also, a minimum continuous flow is viable at 80 m³/h. The customer installed a liquid control valve (LCV) at the discharge to reduce the head to 148 m and 157 m at the lower flows of respectively 152 and 112 m³/h. The power consumption was reduced to 140 kW—reducing the energy consumption by 70% to only 30% of the original value while operating at high reliability. This gave the operator the utmost flexibility.

Customer benefit—only changing what’s required
The cost- and time-effective solution included changing the rotor design while making use of the existing pump casing, motor, seal plan, and piping arrangement. No hot work—such as welding, grind cutting, etc.—was required on site. Except for the impeller, which needed to be optimized to the new duty, most of the spares were and still are interchangeable. Therefore, the available inventory stock can be used for future maintenance. The existing general arrangement was maintained.

Contact: Marc Heggemann sulzertechnicalreview@sulzer.com

The retrofitted crude oil transfer pump is a radially split between bearings single-stage pump (API BB2 type).