Rapid construction is a strength of the GasCube package. Despite difficult conditions it was ready ahead of schedule.

BOXING CLEVER AT BONTANG

TEXT: JUNIOR ISLES

WÄRTSILÄ'S FIRST GASCUBE PLANT has just been commissioned at Bontang, Indonesia. The pre-engineering approach to the installation and the integrated modular design concept of the GasCube brought the customer a pleasant surprise when the project was completed ahead of schedule.

Electricity demand in Indonesia has been growing at an annual rate of around 7% in recent years. To meet this rapidly increasing demand, the government launched its so-called 'Crash Programme' in 2006 with the goal of adding 10,000 MW of generating capacity by 2010. A second programme will see another 10,000 MW of capacity added between 2010 and 2014.

It was against this background that the state utility PT Perusahaan Listrik Negara (PLN) Persero took the decision to build a new power station at the site of an existing power plant in Bontang. The objective was twofold: to increase generating capacity and meet the growing need for energy in a more cost effective manner.

Bontang is a city in the province of East Kalimantan on the eastern coast of the island of Borneo. Commenting on the need for the new plant, **Hareshchandra Thakur**, Head of Asian Project Management Centre said: "The existing plant uses high-speed gensets to supply power to the local community. As these are quite old and operating and maintenance costs are relatively high, PLN was looking for a plant that could offer both higher reliability and higher-quality power."

Ideal for use when space is limited

After discussions with the local utility on possible solutions, Wärtsilä was awarded an EPC contract on 28 December 2007 to erect a 14 MW gas-based power plant within the existing Bontang power plant boundary. The contract with PT PLN Persero, Wilayah Kalimantan Timur covered engineering, delivery, construction and commissioning of the power plant including the gensets, auxiliary equipment and building structures.

The new plant had to be compact as it would be located in limited free space next to the existing power plant building. Construction would also have to be rapid, and power generated by the plant would have to come at an appropriate price. Wärtsilä therefore decided to offer its new GasCube package – a design that is not only quick to construct but can also be installed at sites where space is limited.

"Space was a major constraint," said Thakur. "We had to squeeze the new plant within the boundaries of the existing power plant." Each GasCube building has a footprint of just 113 square metres, smaller than any other conventional power plant with the same power output.

Cubic developments

In developing its PowerCubes (there are two versions, the GasCube and the OilCube), Wärtsilä's aim was to design a power plant optimized for a small number of engines, a plant that can be assembled like a kit on site using fully engineered, pre-fabricated modules.

PowerCube plants typically consist of one to three

A major feature of Wärtsilä PowerCubes is their integrated design.

units. They can all be installed at the same time or the plant can be expanded in a step-by-step process as demand for power grows. The GasCube installation at Bontang consists of two units, each of which has a Wärtsilä 16V34SG engine.

A major feature of Wärtsilä PowerCubes is the way in which the radiator structures are integrated with the building structures of the power plant. Locating radiators on the roof reduces the building footprint and also improves cooling performance. The engine exhaust stack and silencer are also integrated into the PowerCube. As roof-mounted radiators reduce the amount of piping and assembly work needed on site, no separate supports or foundations are required, thereby further reducing the number of interfaces that have to be handled by stakeholders.

GasCubes comprise an enclosure that has the engine and generator located on a common baseframe. The inlet air module, charge air silencers, exhaust gas system and an auxiliary module are all connected to the genset. The auxiliary module includes a gas regulating ramp, the cooling system, an instrument air system, an engine pre-heater and a water pump for use in engine maintenance. The start air bottle and the maintenance water tank are installed next to the auxiliary module. The only major component not located on the auxiliary module is the starting air compressor which is positioned close by. The modular concept used in all auxiliary units not only reduces their size but also makes the tasks of erection and installation easier and quicker.

The use of variable frequency drives for radiator fans and ventilation units reduces auxiliary power consumption, resulting in higher net power output.

First mover

The Bontang project started up on 15 February 2008, just six weeks after the contract was signed. The Bontang Power Plant was the first in the world to install Wärtsilä's GasCubes.

As with any project, this one presented a wide variety of challenges and opportunities. "At times heavy rain made working conditions a little more challenging," says Thakur. "The ground became waterlogged and very slippery, making both the piling and downstream civil works rather more complex."

ASSEMBLED ON SITE FROM PREFABRICATED MODULES.

Even so, the project was completed and the power plant was ready for service ahead of schedule in May 2009. As a gas connection was not available, the performance trials and its operation could not however begin before October 2009.

A pleasant surprise

Once the erection and installation work picked up momentum, the two GasCubes took shape more rapidly than expected. Project shipments: building structures, wall panels, gensets, control panels, auxiliaries, and associated cables, pipes and pipe-fittings, were delivered in three phases. First came the building structures, then the gensets and auxiliaries.

Thakur recalls the customer's pleasure as the new power plant took shape. "Visible advances were made each day with both the structures and the equipment they house. It was great to see things drop into place, just like a jigsaw puzzle. Levels of enthusiasm among members of the project team and the customer's representatives were really boosted by the rapid progress being made."

According to Thakur, the power out from a GasCube power plant can be achieved 4-6 weeks earlier than with a conventional power plant of the same capacity. This means economic benefits for the customer. Thakur explains: "As fewer man-days are spent on the project, we save on both site-management costs and project-management costs. Faster completion also means that the customer can start generating revenue earlier. A typical 14 MW plant can generate 336,000 kWh of electricity each day and earn a significant sum over a 40-day period."