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Fully Automated Power Plant Supplies Steady Flow of Electricity to National Grid

Location: Rayong, Thailand
Order Date: 1999
Completion: October 2000
Industry: Power

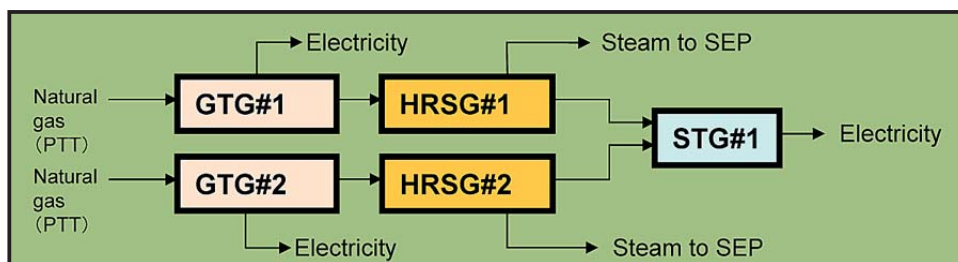


Executive Summary

In 2000, Thai National Power Co., Ltd.(TNP) a wholly owned subsidiary of International Power GDF Suez, completed construction of a 110 MW power station in the Siam Eastern Industrial Park (SEP), in Thailand's Rayong province. This is a combined cycle power plant with very high energy conversion efficiency that is comprised of two gas turbines, two heat recovery steam generators, and one steam turbine. It relies on a Yokogawa CENTUM CS 3000 control system that was installed by Yokogawa Thailand and has performed reliably with no major malfunctions. The power station uses as its main fuel source clean burning natural gas that is supplied from the Gulf of Thailand by the Petroleum Authority of Thailand (PTT), and is part of the Thai government's Small Power Producer program (SPP), which was established to encourage efficient energy usage throughout the country.

Upon commissioning, the power station began providing 90 MW each day to the national power grid, which is operated by the Electricity Authority of Thailand (EGAT), with the remainder of its output going to industrial customers at SEP. A subsequent upgrade increased the power plant's capacity by 10 MW. In 2002, a fogging system was installed. In 2005, equipment was installed that boosted the plant capacity 8 MW by increasing the firing temperature. Also in 2005, absorption chillers were installed that used steam from this plant to provide cooling to industrial customers. In 2006, reciprocating gas engines were installed that increased plant capacity by 23 MW.

In the unlikely event of a plant failure, power can be imported directly to industrial customers from the national power grid. The plant can also operate in "island mode," which enables it to continue supplying customers at the SEP if any failure occurs in the power grid. Thanks to the reliability of this plant's design and to such failsafe features, customers at the SEP have been assured a reliable and consistent supply of power since this plant was commissioned in 2000.



Main process flow

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The Challenges and the Solutions

The overall energy conversion efficiency of gas to electricity of a combined cycle power plant like TNP's is about 47%. It is possible, however, to increase the overall energy conversion efficiency by extracting steam from the power plant and using it for process heating. In this way some of the latent heat can be usefully employed. It is thus possible to increase the overall efficiency of the combined cycle to more than 70% in this way. This process is called co-generation. In a co-generation plant the power plant is integrated with a customer factory and the steam is supplied by pipe to a factory process and replaces steam produced by boilers.

Yokogawa's reliable CENTUM CS 3000 is fully integrated with other vendors' systems, allowing operators at its human interface stations (HIS) to control and monitor every operation throughout this co-generation plant. The benefits of the CENTUM CS 3000 solution are as follows.

1. Highly reliable system components ensure stable operation of the co-generation plant
2. Integrated Modbus communications with gas/steam turbine control systems enable monitoring of operations throughout the plant
3. Preconfigured HIS control sequences achieve safe plant startups and shutdowns under all circumstances
4. Allows clear and flawless monitoring of all control loops
5. Reduces the plant's environmental footprint by controlling water supply and combustion processes

This TNP co-generation plant provides customers a reliable and cost effective supply of both electricity and steam. To ensure the stability of power generation and steam supply, TNP performs a thorough check of all plant facilities and equipment, including control systems and field devices, every three years. In addition, the plant is shut down for 22 days every six years for an even more comprehensive maintenance check. Under the terms of an annual maintenance contract, TNP relies on Yokogawa Thailand to keep these systems and equipment in top working order.



Central control room

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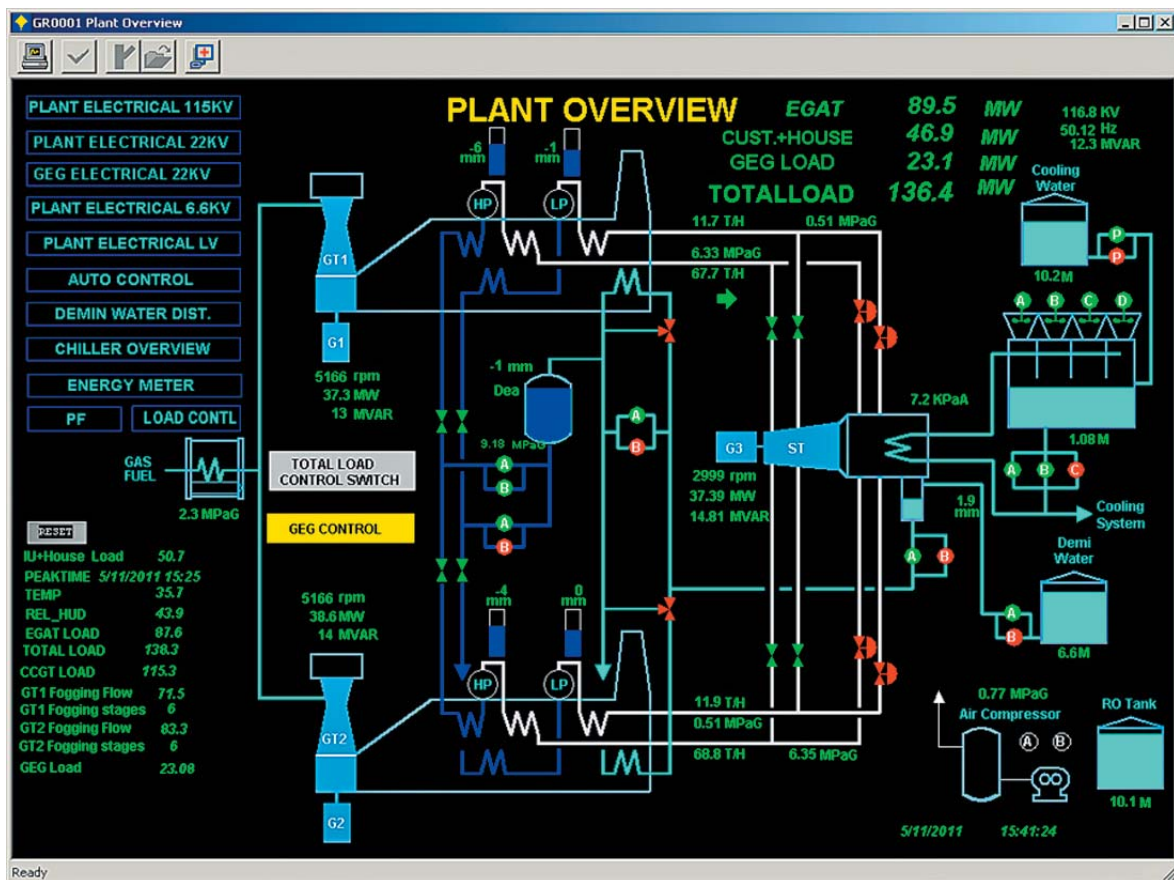
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Customer Satisfaction

James Lee, CEO of TNP, said, "Our goal is to supply stable power to the national grid and customers in SEP. And we also supply steam to each customer's cooling system. Yokogawa's CENTUM CS 3000 is a very reliable system and we are very happy that it has been running without any major failures since 2000. The system is the heart of this co-generation plant. We are looking to make our operations even more efficient, so now we are considering use of the Exaquantum plant information management system."



Plant overview graphic display

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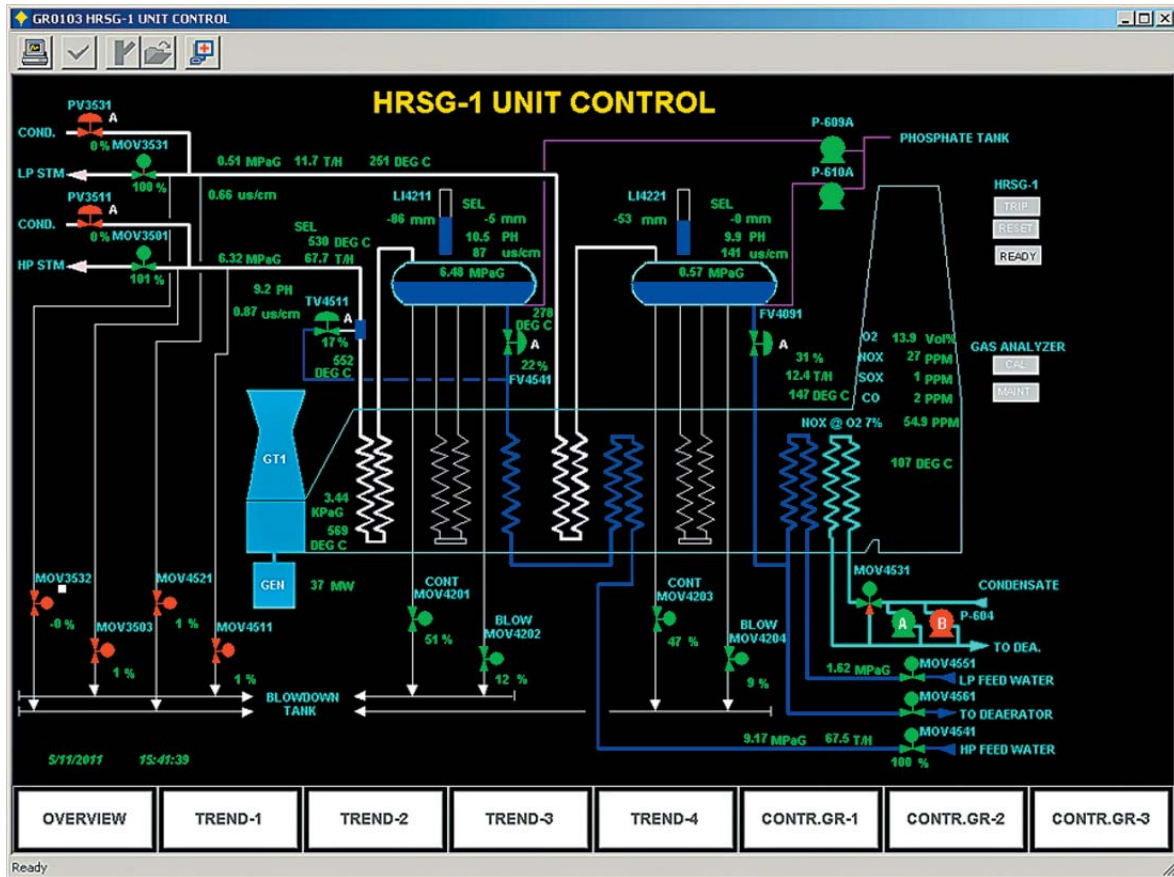
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Heat recovery steam generator graphic display

Plant details

- Gas turbine: GE (40 MW x 2 units)
- Heat recovery steam generator: KHI (2 units), 65 t/hr each
- Steam turbine: KHI (40 MW)
- Steam temperature: 530 deg C
- Steam pressure: 63 bar

Systems delivered

- Distributed control system: CENTUM CS 3000
- Total I/O: 1,500