NOTICE CONCERNING COPYRIGHT RESTRICTIONS

Innovation and Efficiency

Darajat 2 Acclaimed as World's Most Efficient Geothermal Power Plant

On June 28, the Institution of Professional Engineers New Zealand (IPENZ) recognized Indonesia's Darajat 2 project as the world's most energy efficient commercial geothermal power plant, with the world's lowest per unit capital costs. The 81-megawatt (MW) project is one of two in the $300 million (U.S.) Darajat steam field development, located on the flanks of Mt Kendang, a "young" volcano in central Java.

IPENZ recognized the engineering excellence of the project with its Merit Award for Innovation. "Darajat 2's energy efficiencies have been achieved as a result of innovative commercial and technical strategies jointly developed by energy company Amoseas Indonesia Inc. and leading consulting firm, Sinclair Knight Merz (Auckland, NZ)," said IPENZ in a press release about their award.

Amoseas operates the Darajat steam field, which supplies steam to the 55-MW Darajat 1 geothermal power plant, and owns and operates the Darajat 2 facility. Amoseas commissioned Sinclair Knight Merz in 1988 to carry out a feasibility study for development of the Darajat geothermal resource.

The association between the two companies continues to the present day with Amoseas' appointment of Sinclair Knight Merz in 1992 to assist with the design and procurement of the Darajat steam field collection system and the development of Darajat 1. Four years later, Amoseas again commissioned Sinclair Knight Merz to provide engineering services for the development of Darajat 2, and later to further develop the steam field's capacity.

Sinclair Knight Merz Project Manager Paul Quinlivan said the Darajat geothermal resource has unusual characteristics in that it produces dry steam with large production capacities at high wellhead pressures. "Our 1988 feasibility study proposed to take maximum advantage of the field's unusual characteristics in order to reduce turbine steam consumption and provide significant savings in steam field development costs," says Quinlivan.

Key features of the Darajat 2 design developed by the joint owner/consultant team include the use of large diameter pipe to minimize the number of pipelines and reduce capital costs. The team also eliminated the traditional steam vent station used to control interface pressure.

Instead, the steam system is separated into a low-pressure system that supplies the Darajat 2 geothermal power plant interface at constant pressure, and a variable high-pressure system that incorporates a control valve station installed between the high- and low-pressure systems of each steam field sector. A control system provides interface pressure control by modulating the pressure control valve station, eliminating the need to vent excess steam.

"This was the first time this system had been used on any geothermal power development and it has proven highly successful in minimizing steam waste," explains Quinlivan. Other innovative design features included the use of steam cleaning within pipelines, eliminating the need for a steam scrubbing vessel, and a fully automated supervisory control system with comprehensive remote monitoring and control functions.

Sinclair Knight Merz

"The project as a whole, including the steam field and power plant, has proven to be very reliable and capable of achieving power plant availability factors of more than 95 percent," Quinlivan continues. "This is well in excess of the 80 percent assumed in the Darajat project financial model and is equal to the best in the world."

Darajat 1 commenced commercial operation in 1994, but Darajat 2—effectively completed in 1999—was not put into service until 2000 due to the aftereffects of the Asian economic crisis and Indonesia's civil unrest that led to the demise of the country's former leader, President Suharto. Since taken out of mothballs and recommissioned in early 2000, the Darajat 2 geothermal power plant has operated continuously at loads of greater than 90 MW, with high plant availability.

"Any power generated in excess of the nominal capacity of 81 MW substantially improves the Project's economics," asserts Quinlivan. Sinclair Knight Merz is currently involved in the construction and commissioning of more than 2,500 MW of new power generation projects around the globe. Major roles being filled by Sinclair Knight Merz include project manager, owner's engineer and independent engineering adviser, and include more than 10 projects in Russia, Africa, and the Asia-Pacific and Australasia regions. The projects cover a wide range of renewable and conventional technologies, including geothermal power, and confirm the group's growing role in the global power sector.

For more information about the Darajat 2 project and Sinclair Knight Merz, contact: Paul Quinlivan, Project Manager, at Sinclair Knight Merz. Phone: +64 9 913 8900. E-mail: pquinlivan@skm.co.nz.

(Sinclair Knight Merz) ■