Subject ; Planning and Operating Experience of High-Efficiency Coal-Fired Thermal Power Plant

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The 700MW coal-fired thermal power plant unit No.4 at the Tomatouatsuma Thermal Power Station of Hokkaido Electric Power Company went into commercial operation in June 2002.

This paper presents the features, operation and test results of the Unit No.4. The Unit No.4 uses supercritical steam condition namely, main steam pressure of 25.0MPa, main steam / hot reheat steam temperature of 600°C / 600°C.

In view of the above extreme steam conditions, materials and structure of the steam turbine and steam pipes were selected suitable for high temperature and high pressure. For improvement of thermal efficiency some new technology was also introduced. This unit is tandem compound (50Hz), and a high efficiency 43 inch long final-stage blade optimal for 700MW machine was applied. Supercritical sliding pressure operation coal fired once-through boiler was selected. A forced air turbine cooling system was applied to reduce turbine cooling time for quick inspection and regular maintenance. With this system, time of turbine cooling can be reduced about 50% compared with natural cooling. Simplification of the system structure was also carried out. For example, the steam pipe from main steam line to BFP-Turbine has been omitted, and motor drive feed water pump was applied exclusively for start-up and shutdown.

To ensure stable and reliable operation various tests including start-up / shutdown tests, maximum and minimum load confirmation tests, boiler feed water pump trip load run-back tests etc. were carried out. During minimum load continuous operation test, the unit operated stably at 105MW(15%) which is notably low load for a coal-fired thermal power plant. In boiler feed water pump trip load run-back test, load run-back was conducted with 1BFP turbine emergency stop operation, and the load was lowered stably to target load without plant trip.

With the use of the supercritical steam condition combined with the high efficiency of the turbine, boiler and other major equipments, gross plant efficiency of 44.94% and turbine plant efficiency of 50.04% were achieved in the trial operation, which are currently the highest level in Japan.

This paper will focus on some of the most advanced and interesting features of this plant and its operating experience.

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