



A new design of all turbine casings elevated arrangement for high efficiency double reheat units

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Despite the expected high unit efficiency, the expensive nickel-based high temperature piping is a long-standing problem of the 700°C plan. It's estimated that the cost of a 700°C ultra-supercritical unit will double that of a 600°C one. If combined with double reheat, the piping problem will become more serious due to the large size of the second reheat piping. Pingshan phase two project, building a 1350MW double reheat USC unit with 600°C level steam temperatures, has eliminated more than 80% of the main steam and reheat steam pipings except the hot second reheat piping to minimum by elevating the first two of the seven turbine casings to the platform that close to the boiler headers while the rest five casings remain conventional arrangement. In this way, only the hot second reheat piping remains conventional length. This design reduces most of the pressure and heat loss of the piping system and thus promote the advantages of double reheat cycle. Combined with other energy-saving technologies, the unit net efficiency can achieve a historical level of 49.6% under rated condition. An updated design based on Pingshan phase two is proposed and introduced in this paper. For a 600MW class double reheat USC unit, the number of turbine casings is five thus all turbine casings can be elevated to the platform that close to the boiler headers. In this way the second reheat pipes are also greatly reduced, saving remarkable pressure and heat loss as well as cost. Meanwhile the condenser remains conventional height and two huge and long exhaust steam duct will connect the low pressure casings and the condenser. Calculation shows that the pressure drop of these large duct is little thus the back pressure of the turbine is barely affected. Study shows that combined with other energy-saving technologies that is being conducted in Pingshan Phase two, this updated design can achieve a close efficiency with Pingshan Phase two. The biggest advantage of this design is that it makes the future 700°C unit economically feasible and attractive. Now this new design is applied in Fuyang Phase two project, building two 660MW double reheat USC units with 600°C level steam temperatures. This project will demonstrate the most high-efficiency and economically attractive solution for the future 700°C units.

