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Supercritical boiler technology pdf

Proportion of >200MW of commissioned coal (yellow is subcritical, supercritical red). China embraces the ultra-supercritical technology of the large unit. World coal-fired capacity by region 2002-2025. New additions of coal-fired capacity by 2025 (Siemens). Of the 1,000 units working in China, ten 600MW class are supercritical. The Huaneng Yuanan power plant located on the coast of Zhejiang Province in East China has the first ultra-supercritical pressure boilers of 1,000 MW in China. The 9.6 billion euro (900m€) Huaneng Yuanan plant is equipped with four ultra-critical coal-fired power generation units with a capacity of 1,000 MW each. Units 1 and 2 went online in 2006 and Units 3 and 4 in 2007. Operated by China Huaneng Group, the power plant generates 22 billion kWh of electricity per year. The power generated by the plant is sold to the state-owned Zhejiang Electric Power Company. The ultra-supercritical pressure boilers used at the Huaneng Yuhuan power plant The supercritical operation of large charging thermal power plants in the 1980s used steam temperatures usually of 550oC, leading to a thermal efficiency of about 40%. Ultra-supercritical steam conditions now use supercritical pressures of up to 300 bar with 600°C steam and reheated steam temperatures. This provides a net efficiency of 46%. The Huaneng Yuhuan power plant is equipped with four ultra-supercritical coal-fired power generation units with a capacity of 1,000 MW each. Siemens reported that only a 1% increase in efficiency for a typical 700 MW installation reduces 30-year lifetime emissions by 2,000 t NOx, 2,000t SO2, 500t particles and 2.5 million tons of CO2. New units also include the removal and desulphurisation of high-efficiency dust. MHI boilers have a main steam pressure of 27.5 MPa, the main steam temperature of 605°C and a reheating steam temperature of 603°C. The boilers were made and put into operation in collaboration by MHI in Japan, which supplied the key models and products, and Harbin Boiler (HBC) in China. Unit 4 was built by MHI and HBC. Siemens supplied four ultra-supercritical 1,000 MW steam turbines for the Huaneng Yuhuan power plant. They use a tandem compound, four-cylinder arrangement. Steam enters the high-pressure turbine through two main steam valves with reheated exhaust steam and powered to a double-flow intermediate pressure turbine. From there, it leads to two low pressure turbines. The Ovation Control System was implemented at Units 1 and 2 in February 2007. Emerson won the \$7m contract to automate the factory in April 2005. The Ovation system monitors and controls the modulating the sequence control system, the sequence control system, the furnace protection surveillance system and the electrical control system for all major components of the installation. This includes the boiler, turbine, generator and balance of plant processes. Ovation provides users with high levels of plant availability, reliability and environmental compliance. The system provides a with the most adopted bus standards, allowing smart device technologies to be incorporated into processes. The coal supply for the Huaneng Yuanan power plant The coal needed for the Huaneng Yuan power plant comes mainly from the autonomous region of Shanxi Province and Inner Mongolia. The plant site owns 500,000t of coal on site. Contractors involved As general contractor of the EPC desulphurisation system contract, Tongfang Environment was responsible for the design, supply, installation and troubleshooting of the desulphurisation system. The steam turbines at the Yuhuan power plant were designed and jointly manufactured by Shanghai Electric Group and Siemens Power Generation Group. China builds the ultra-supercritical industry Most of China's total energy consumption comes from coal, and the country still has huge reserves. Its burning, however, has severely affected the environment and affected the health of people in China and the surrounding countries. In northern China, cities like Beijing and Shenyang have some of the highest readings for total particulate matter and the world's coal-burning SSo2 being a major source of this. In southern China, large areas have growing problems with acid rain. China has extensive untapped reserves of natural gas. Gas plants are more efficient and cleaner than coal-fired power plants, but some industry observers say that the use of gas for energy production is wasting an inherently clean form of energy. Thanks to its reserves, China continues to rely on coal and uses advanced technologies to reduce pollutants. Technological advances tend to create a need for more advanced materials. And this is certainly the case where the development of Advanced Ultra Supercritical (AUSC) boilers is concerned. Global demand for electricity is growing rapidly, while coal-fired power plants are also needed to reduce emissions and operate more efficiently. Advanced Ultra Supercritical Boilers have been designed and developed to operate at very high pressures and temperatures to meet both environmental and energy efficiency challenges. The efficiency of the steam cycle has been improved, which means that for a certain electrical production there will be a lower fuel consumption (coal) and a lower release of carbon dioxide. Emissions will be reduced More electricity will be produced Costs will be reduced While boiler materials must withstand very high temperatures, power will be required for the high pressures involved, while resistance to corrosion of coal ash will be another essential component. Sanicro® 25 has been developed by us specifically to meet all these challenges for AUSC boilers. Sanicro High 25 for AUSC Sanicro boilers® 25 DA datasheet. From the smallest and most compact USC technologies to the most advanced ultra-super-critical (Usc) technologies available, GE has efficient solutions for the steam power plant, all of which are supported with the latest digital capabilities to provide better greater efficiency and improved reliability, all at a lower cost. When it comes to the efficiency of a coal-fired power plant, it all comes down to the pressure and temperature of the steam entering the turbine: The higher the pressure and temperature, the lower the efficiency and CO2 emissions. At GE Steam Power, we have continued to push the boundaries of our steam technologies to make them even more efficient. The world's most efficient USC technology can help factories deliver net efficiency rates of up to 47.5% – significantly higher than the global average of 34%. Each efficiency improvement in each percentage point significantly reduces CO2 emissions from coal-fired power plants by more than 2 percentage points, resulting in 26 % less CO2 per MW than the coal-fired power plant average. Combined with advanced emission control equipment that can eliminate local pollutants, such as NOx, SO2, and particulate matter, the GE USC coal-fired power plant can provide more power with less environmental impact. Over the past 100 years, GE has been a leader in cleaner coal technology, leading the industry from supercritical technologies to ultra-supercritical technologies. GE's Steam Power has installed 30% of the world's steam turbine capacity, 30% of the world's coal and oil boilers. As a leader in USC coal-fired factories, GE continues to push the boundaries of the best steam technology in the class. For countries that need a reliable and stable base load on a smaller scale, small USCs are a more efficient option than undercritical technology. GE offers smaller USC units – from 150 MW to 400 MW – that offer greater efficiency benefits of larger units but with a more compact footprint. Our small USCs are more flexible, faster to build, closer to the required power source and less expensive to finance. On average, GE's smaller USC units are 2% more efficient than previous generations. GE is the first on the market with ultra-supercritical advanced technology (Usc) and we call it SteamH. Ge SteamH combines the world's highest steam factory technology operating in ultra-supercritical conditions with the digital software of the Predix-powered power plant. Result? Our customers get the highest possible efficiency, lowest emissions and the highest value over the lifetime of their steam plant. Steamh's supply scope covers a wide range of capacity and configurations to meet customer needs, from individual components to full turnkey installations, between 600-1100MW in size. This advanced steam technology is based on GE's ultra-supercritical design with upgraded key components. SteamH's portfolio also includes full offers of air quality control systems. With the power SteamH, GE can provide more than 15 percentage points of additional efficiency beyond the global installed customer average with 50% efficiency. SteamH pushes the physical limits of GE's advanced USC technology with higher steam parameters (touching (touching oC), higher efficiency rates and the best materials that have been proven by more than 30,000 hours of testing in operational ultra-supercritical power plants When steam plants operate in network demand mode, they are needed to intensify faster and more often than they were originally designed to make real-time monitoring particularly important. We've combined our cutting-edge USC and AUSC steam technology with Predix-powered GE's digital capabilities to deliver better performance, higher efficiency and improved reliability, all at a lower cost. By monitoring and analyzing data from more than 10,000 sensor inputs across the installation, the ge digital power plant for steam helps installation operators make smarter decisions about how to run their installations. When our digital steam plant solutions are added, the numbers only become more impressive. You can increase operational efficiency by up to 1.5% over the life of the installation, reduce CO2 emissions by 3%, and allow 5% less unplanned downtime... adding up to \$50M in the net present value over the life of the plant. Our product and service portfolio will provide the highest efficiency and lower emissions for your coal-fired power plant. From boilers, steam turbines and air quality control systems to complete spare parts and retrofit, we are a reliable life cycle partner to ensure optimal installation performance. Discover now our complete suite of technologies and solutions. Solutions.