Power from biomass and waste

Case study 1: Zabrze CHP plant, Poland

The Zabrze CHP project (see FPSI, August 2017) illustrated how CFB technology deployed to meet the EU renewable energy mandate (20% by 2020) and the West European Directive (WED), which requires materials with a heating value greater than 6000 kcal/kg to be used as a refuse derived fuel (RDF) and no longer landfill. An existing 60-year-old coal-fired district heating system had reached the end of its useful life. The new Zabrze CHP plant is built around a fuel-flexible Sumitomo SHI FW circulating fluidised bed boiler. When commissioned, by the end of 2018, ZCP will supply electricity and steam heat for about 70,000 households in the municipalities of Zabrze and Bytom. The €420 million CHP plant will produce 160 MW of steam, 70 MW of electricity. The plant is initially configured to burn up to 100% domestic hard coal with 0-40% RDF, which translates into burning about 200,000 tons of RDF each year. There are also provisions in the plant design to add the capability to burn up to 100% locally sourced coal and RDF. By combusting these locally sourced residential and industrial wastes, the facility reduces the region’s CO2 emissions. In addition, the plant’s SOX and NOx emissions will remain well below the statutory requirement of 190 mg/Nm³ when burning design coal and biomass mixes using only furnace limestone injection and SNCR, respectively, while concurrently reducing the amounts of waste products.

Case study 2: Kaukano Voima Oy, Finland

The 125 MW CFB facility at the Kaukano Voima Oy plant in Kaukano, Finland, which started commercial operation in 2010, is one of the world’s largest 100% biomass-fired CFB installations. The plant processes steam and electricity for a pulp and paper mill and district heating for Lappeenranta Energy, a city-owned power company. The plant provides 125 MWe, 110 MW of district heat, and 150 MWh of process steam. It supplies about 85% of the total electricity and heating needs of residents and businesses in the city of Lappeenranta.

The biomass fuel is locally sourced and consists of bark and wood pieces from wood handling at the Kaukano pulp and paper mill and from other forest industry plants in the greater Kaukano area. The wood residues consist of chips, bark, and shavings. In addition, energy crops such as willow (salix) and reed canary grass are extensively used. Recovered waste is also burned, such as quality-controlled scrap papers, wood and plastic that cannot be recycled into other materials. The CFB is also designed to combust up to 70% demineralised wood with 30% biomass. Sumitomo SHI FW signed the supply contract for the CFB island of the co-combustion plant with the municipal utility Söderenergi AB in June 2007. The plant entered commercial service in December 2009.

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Case study 3: Lahti Energia, Finland

In March 2017, Lahti Energia Oy, a municipality-owned energy supplier, awarded a contract to Sumitomo SHI FW for its new 60 MW CFB bio district heating plant, Kyömiäri 1, located in Lahti, Finland. The multi-fuel CFB plant is designed to burn up to 100% biomass, which will consist mainly of woodchips from forest residues and forest industry by-products, as well as peat and coal as alternative fuels. The new plant will replace the aging coal-fired Kyömiäri 1 plant, which will be retired. The plant is now under construction and plant testing is expected to begin in mid-2019.

Case study 4: Jyväskylän Energia, Finland

The Jyväskylän Energia power plant is owned by the City of Jyväskylä, the local electricity, water and district heat provider. The plant produces up to 200 MWe and 240 MWt of district heat for the city of Jyväskylä.

The boiler is designed to burn up to 100% locally sourced wood chips providing up to 70% of heat input. The biomass is sourced mainly from central Finland, bringing regional economic benefits. SHI FW supplied the CFB boiler and auxiliary equipment as well as carrying out the erection and commissioning of the boiler island.

Case study 5: Igelsta CHP plant, Söderenergi AB, Sweden

The Igelsta CHP plant is owned by the municipalities of Söderbärke, Botkyrka and Huddinge. The plant produces 200 MWe of district heating and 65 MWe. The plant is installed to fire a fuel mixture of up to 25% RDF pellets and 75% biomass for foreseeing a future heat demand. The plant burns mainly waste from textile branches and wood chips, bark and shavings. In addition, energy crops such as willow (salix) and reed canary grass are extensively used. Recovered waste and bark are also burned, such as quality-controlled scrap papers, wood and plastic that cannot be recycled into other materials. The CFB is also designed to combust up to 70% demineralised wood with 30% biomass.