Sumitomo breaks ground in circulating fluidized bed market with launch of Sumitomo SHI FW

Sumitomo's SHI buys Amec Foster Wheeler's CFB technology to create a new force in fuel flexible CFB technology.

The Samcheok Green Power Plant in South Korea features 2,200MWe of our advanced ultra supercritical CFB technology.

When coal mines began to mature and power plant owners started to move to lower quality coal seams, Sumitomo Heavy Industries (SHI) saw a huge opportunity to hasten the growth of the low quality solid fuel market. SHI leveraged on the increasing value of fuel flexibility to innovate the use of circulating fluidized bed (CFB) plants and provide plant designs catering to all kinds of generation needs. To further boost their power in the CFB market, SHI acquired Amec Foster Wheeler's (AFW) fluidized bed technology to form Sumitomo SHI FW (SFW) a new global leader in providing reliable and sustainable energy solutions.

Tomas Harju-Jeanty, chief executive officer of SFW, said that the world's boiler market remains dominated by conventional pulverized coal (PC) technology, especially for large coal utility projects. With the growth of large utility coal CFBs in the past ten years, utilities, IPPs, and developers are turning to CFB boiler technology to make their new power plants more reliable, cost competitive and sustainable. In fact, SFW was the first company providing large super critical CFBs from 460 to 550 MW of generation capacity.

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SHI's acquisition of Amec Foster Wheeler's fluidized bed business, is a strategic move for growing CFB technology in the large utility power sector. Eiji Kojima, chairman of SFW said that while their business has boomed in Japan, the acquisition allowed them to tap into the wider global market where there are more opportunities that need their unparalleled experience.

Harju-Jeanty said that the new team is a wider and stronger organisation with a higher ability to come up with new technologies, new designs, and new power solutions to meet the needs of their growing client base. Harju-Jeanty added that with the combined expertise of the two companies, what they have now is the world's leading and most experienced CFB organisation with the most up-to-date and innovative technology possible.

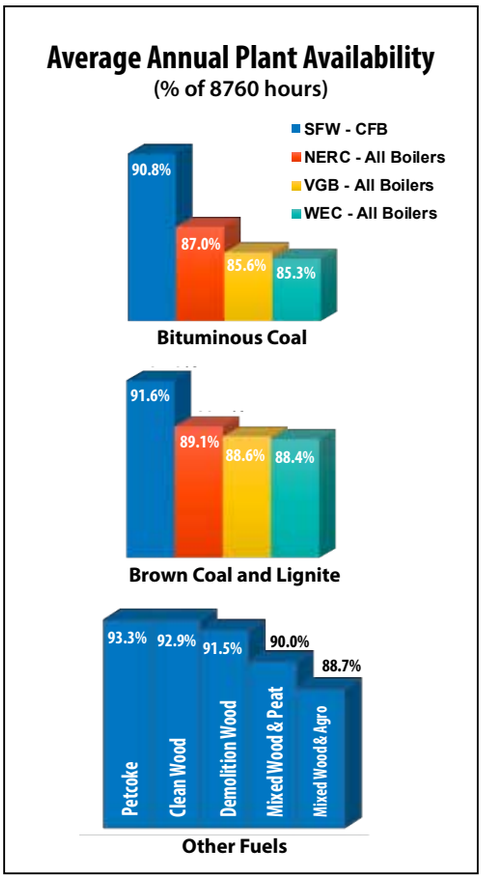
The benefits of CFB

Robert Giglio, senior vice-president at SFW, said that fuel flexibility, where buyers and sellers are willing to trade quality for price, enabled more large-scale CFB plants to go online for the past ten years. CFB plants, unlike PC plant designs, allow plant owners to explore the growing fuels market and take advantage of price discounts for lower rank coals, even for ultra-supercritical plant designs. At present, there is a growing supply of discounted coals, domestic lignites, and waste coals, providing an economic advantage for fuel-flexible plants capable of burning lower rank, less expensive fuels.

"The cost of fuel is the largest operating cost line item on the balance sheet for any power plant so the economic advantage often goes to the plant that can operate reliably with lower rank, and therefore lower cost, fuels. The magnitude of the fuel cost savings for a 600 MWe coal plant can be demonstrated by using $70/tonne (5,500 kcal/kg) coal as a base. Reducing the cost of fuel by $10/tonne will add $7 million to the plant's bottom lineevery year, which is worth $102 million in today's money over the life of the plant." Giglio added.

The global coal market is currently dominated by Indonesian coal, with about 50% of its exports being high-moisture, sub-bituminous coals with gross-as-received higher heating value (HHV) ranging between 3,900-4,200 kcal/kg. This is in contrast to the traditional 6,000 kcal/kg which has been the norm for the past 50 years.

In fact, Giglio added that the best quality Indonesian coal reserves are expected to produce coals with average HHVs not greater than 5,200 kcal/kg (with economical washing levels) in the future.



"PC boilers have trouble burning low quality fuels due to their narrow fuel specification that typically demands 5,500 kcal/kg (23 MJ/kg) HHV or higher energy content, fuel moisture below 30%-35%, and volatility above 20%. However, this is not the case for CFB technology.

Modern CFBs can reliably burn both low rank coals and petroleum cokes with heating values ranging from 1,000 to 8,500 kcal/kg (4 to 35 MJ/kg), fuel ash and moisture levels as high as 60%, and volatiles down to 5%," Giglio added.

What makes CFB technology so special?

According to Giglio, plants can fully rely on CFB to burn low rank coals because of its unique flameless, low-temperature combustion process. PC boilers rely on an open flame, but the CFB's circulating solids can achieve high combustion and heat transfer efficiency, in turn allowing fuel to circulate until completely burned. "The ash in the fuel does not melt or soften at low bed temperatures which allows the CFB to avoid the fouling and corrosion problems encountered in conventional boilers," Giglio said.

Moreover, the CFB's key design criteria is that the combustion temperature is well below the fuel ash's melting temperature. Giglio added that since the ash doesn't melt, fouling and corrosion is minimised throughout the entire boiler, thus allowing the CFB to be reliable on levels that the PC boilers cannot. Lower combustion temperatures also also minimise NOx, thus avoiding the expense of selective catalytic reduction (SCR). Limestone can also be added right into the furnace to capture SO2, SO3, HCl, and HF, thus preventing corrosion and fouling. According to Giglio, most projects, adding limestone to the CFB can achieve the required SO2 stack emission without the need for a downstream FGD. "Finally, unlike PC boilers, the fuel doesn't have to be finely ground, dried or dispersed into the furnace by burners avoiding the cost and maintenance of fuel dryers, mills, coal pipes and burners. For the CFB, the fuel is coarsely ground and dropped into fuel chutes using gravity to get the fuel into the boiler," Giglio said.

At the same time, CFB technology addresses the issue of steam generator outages and their effect on bottom line economics and consequently, on the operating life of a plant. CFB technology demonstrates superior life-cycle economics, with up to an average 5.5 percentage point superiority in plant availability.

Specifically, for bituminous coal and brown coal and lignite, CFB plants have higher long-term plant availability against all boilers of competing companies across the globe.

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More than just various mixes

Despite the rapid increase of solar and wind projects, coal remains an important part of a balanced portfolio strategy. In fact, as fuel flexibility enables increasing CFB plant commissions, fuel agnostic plant owners are provided a market advantage. For instance, CLECO's Brame Energy Center, located in Boyce, Louisiana and in commercial service since 2010, has the ability to burn a wide range of market fuels, including 100% petroleum coke, 100% Illinois No. 6, 100% sub-bituminous Powder River Basin coal, and can co-fire up to 92% lignite or co-fire up to 5% paper sludge or wood waste.

However, Giglio said that fuel flexibility goes beyond just being able to burn various coals or coal and biomass mixes. He said that fuel flexibility also means that plant reliability, maintenance, ease of operation, and stack emissions must be largely unaffected by changing fuel quality and fuel mixes. The longest operating supercritical CFB power plant in the world was supplied by SFW over 8 years ago.

Located in Bedzin, Poland and in operation since 2009, the Lagisza CFB powerplant has a 460 MWe supercritical SFW CFB that has unique and pioneering design features with an impressive net plant efficiency of 43.3% (LHV) on bituminous coal. "Perhaps most importantly, the plant meets its permitted stack emissions without SCR or FGD equipment, thereby saving Tauron over $100 million in its construction cost and millions more each year in avoided O&M costs," said Gigilio.

Door to affordable and secure power

For countries with domestic low rank coals, lignites, waste coals or hard-to-burn fuels, like anthracite and petcoke, the CFB opens the door to affordable and secure power over the long term while lessening the risk of future carbon regulation due to the CFB's ability to utilize biomass and other carbon neutral fuels.

An even more impressive example of the benefits of using CFB is demonstrated by the 2,200 MWe Green Power Plant in Samcheok, South Korea. The Samcheok plant has four larger 550 MWe SFW CFBs utilizing ultra-supercritical steam conditions (257 barg, 603/603°C).

The Samcheok plant began operation in 2016 and meets very low SOx and NOx emissions at 50 ppm without any FGD scrubber, saving Korea's Southern Power Company (KOSPO) over $100m in construction cost. These CFBs are the most advanced units in the world.

The 460 MWe Lagisza Power Plant in Poland utilizes our CFB technology and is the longest running supercritical CFB plant in the world.