Robert Giglio, Sumitomo SHI FW

Q&A

CFB technology in a low carbon world

How does CFB boiler technology sit in an energy landscape that is looking for renewable and low carbon solutions?

Last year Sumitomo Heavy Industries acquired Amec Foster Wheeler's fluidized bed businesses, creating a new company, Sumitomo SHI FW.

We spoke to Robert Giglio, Senior Vice-President of Strategic Business Development for Sumitomo SHI FW, about the acquisition, the market potential for CFB boiler technology, and how it fits into an energy world that is increasingly looking for low carbon solutions.

Q: Why was the acquisition a good fit for both companies?

A: For over 30 years, Sumitomo's SHI Company had been a licensee of Foster Wheeler's CFB boiler technology, supplying 67 CFBs in the small to medium-size range, mostly to their home market in Japan. Whereas, Amec Foster Wheeler's CFB business was truly global, delivering the full range of CFBs from small industrial, CHP and WTE units to very large ultra-supercritical CFBs for utility power plants.

Sumitomo saw the acquisition as an opportunity to go global and greatly expand the size of their CFB boiler market and business. In addition to the CFB boiler technology, the acquisition included AmecFW's BFB boilers, fluid bed gasifiers, CFB scrubbers, fabric filters, specialized metallurgical waste heat boilers and a broad spectrum of aftermarket services. Like the CFB boilers, these additional products and services had unique market positions driven mainly by their fuel, application and operational flexibility.

Q: What is the market potential for SFW's CFB boiler technology?

A: Today, about 80-85 per cent of the global boiler market continues to stay with conventional pulverized coal (PC) technology. PC technology hasn't changed much over the last 50 years and still carries three fundamental disadvantages: very limited fuel flexibility, high air emissions and expensive emission control. Over the last 40 years, SFW's CFB boilers have redefined the meaning of fuel flexibility, reliability and clean combustion without back-end controls. This has been noticed by utilities, IPPs, developers and industrial companies who have been selecting CFB boilers more and more.

So the CFB has lots of room to grow into the global boiler market because of the higher values it offers over PC technology. Even if the boiler market remains flat or even declines, CFB still has an upside growth potential of 80-85 per cent.

Q: Why hasn't CFB technology already taken more of the overall boiler market share?

A: Most of the global boiler market is in the large coal utility sector. Like most other energy markets, this capital-intensive sector is slow to accept change mainly because people tend to stay with what they know and have experience with.

The CFB market is still predominantly in the small to medium size range serving multiple sectors like industrial, WTE, CHP, district heating and cooling. This is where the CFB was born and is the market segment we still serve the most, because our CFBs are best able to reliably fire a diverse and wide range of challenging fuels demanded by these sectors.

But change is happening. Our first large 460 MW supercritical CFB went online at the Lagisza plant in Poland eight years ago. At that time, this was the world's first supercritical and largest CFB unit in the world. Last year, we commissioned 2000 MW of our ultra-supercritical CFBs at the Green Power Plant in Samcheok, South Korea. As of today, we have delivered 38 CFBs, each over 200 MW in capacity, totaling over 11 GW of electric capacity.

Q: What benefits does CFB boiler technology bring to the market?

A: Our CFBs offer value in multiple dimensions. Their fuel flexibility provides power generators and industrial plants with the ability to shop for the lowest cost coals, petcokes and lignites keeping power prices at the lowest levels. They can co-fire carbon neutral fuels up to high levels and employ highly efficient ultra-supercritical steam technology providing a flexible carbon reduction solution without turning to expensive

carbon capture and sequestration (CCS) technology. Our CFB's can convert the environmental liability of industrial byproducts and waste into valuable power, steam and heat.Their clean burning process produces the lowest emission without needing expensive air pollution control equipment saving millions in plant construction and operating cost. And finally, they provide these benefits as a highly reliable and dependable base load capacity option to maintain grid stability.

Q: How do you see the CFB technology fitting into the global trend of carbon reduction?

A: Our CFB's can achieve a closed loop on carbon emissions by fully firing carbon neutral biomasses in both small and large plants. This provides a near net zero carbon solution without going to the expensive and uncertain carbon capture and sequestration (CCS) solution. Further, biomass is a renewable energy source. But unlike wind and solar, biomass plants can provide dependable energy on-demand which is a big advantage for a renewable energy source.

Looking beyond new build thermal plants, our fluid bed gasifiers can be retrofitted to existing PC coal plants to allow them co-fire the highest levels of carbon neutral fuels and waste, significantly reducing their carbon profile. Crossing over to the transportation sector, these gasifiers can also be integrated into biomass-to-liquid solutions to produce renewable biofuels and green chemicals.

But the 100 per cent biomass solutions are not a good fit for all markets since the logistics and cost of sourcing large and continuous supplies of biomasses and wastes can be very challenging.This is where our CFBs provides the flexibility to co-fire carbon neutral fuels with more dependable fuels like coals, lignites and petcokes that have well establish large scale supply chains.

In essence, the CFB allows each project to set the balance point between carbon emissions, fuel security and cost of energy. Since biomass supplies also vary seasonally, the fossil fuels can fill in as needed, providing energy security to consumers and financial security to project investors.

Q: And how do you see the CFB technology fitting into the global trend of renewables?

A: Globally we see nearly all markets strongly embracing solar and wind, which offer a true zero carbon solution, and with dropping prices, renewables are growing faster than ever before. But like biomass, too much wind and solar may not be a good thing.

We are seeing a growing trend of rising energy costs and declining power reliability in markets that have high penetration levels of over 30 per cent of wind and solar energy, like in Spain, Germany, and Australia. Without large scale energy storage, grid operators scramble to meet load when the winds dies down or clouds cover the sky.They are relying more and more on expensive fast-moving peaker-plants fueled by natural gas and oil to manage the growing intermittent capacity. The unwanted result of this is a direct relationship of increasing energy prices with increasing wind and solar capacity.

We at SFW have always believed in keeping all technology and fuel options in the generation mix for a balanced energy portfolio. As with any investment, a balanced portfolio provides the best protection against uncertainty of the future. As we all know too well, the energy sector has significant uncertainty related to changing policy, regulation, fuel availability and technology.

This is another area where the CFB provides value, since the same unit can burn the widest range of fuels, it provides the ability to rebalance the fuel mix without having to build another plant. And, it provides these benefits as a highly reliable and dependable base load capacity option to maintain grid stability.

Q: Where do you see the CFB option providing the most value in today's markets?

A: CFB can bring high value to countries that have large reserves of low quality lignites, coals and waste coals from mining operations, like: Colombia, Germany, Turkey, Russia, South Africa, Vietnam, Thailand, Indonesia, India, China and Australia. Using conventional PC technology, these low-quality fuels drive boiler size, cost, and maintenance and plant downtime way up. After a long difficult experience with these fuels, many countries simply turn to importing high quality coals or LNG. Today, CFB technology has been proven at the large scale to economically, cleanly and reliability convert these low rank fuels into power and steam, lowering the countries energy cost and improving their energy security. The CFB technology also keeps the door open for co-firing coals, petcokes and biomass from either import or domestic sources, when prices or regulations is right, so you don't have to lock yourself into one fuel source.

In broader Asia, over the last 10 years, high moisture sub-bituminous Indonesia coal exports have exploded, driven by deep price discounts in the 15-40 per cent range.The same CFB boiler can fire the full range of these fuels with heating values spanning the 5000-3900 kcal/kg range, as well as, high quality Australian coals in the 5500-6000 kcal/kg range, capturing the full arbitrage of this fuel market. PC plant operates are forced to trade reduced plant performance, higher downtime and maintenance cost to capture a much smaller range of these fuels. Staying with PC technology, their only other option is to build another PC plant designed for another narrow fuel range.

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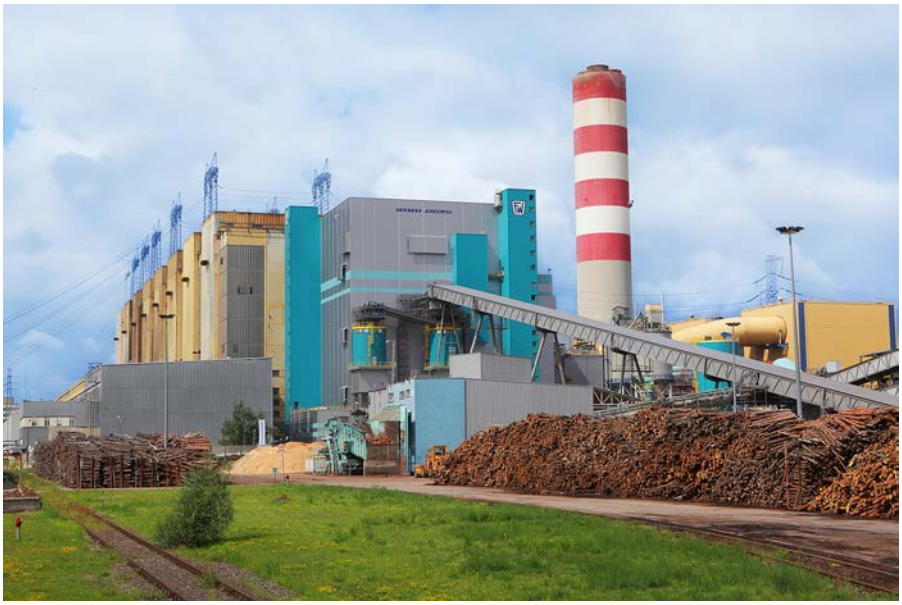
India has very low quality domestic coals, which represents their most affordable energy source. Plant operators have struggled for years to burn these coals with conventional PC technology and like Turkey has turned to importing higher quality, more expensive coals. Concerned about fuel security and raising energy costs, India's government has begun prioritizing the use of domestic coal over imported coal for future power projects. Some projects are forced to burn a mix of Indonesian and domestic coals, which is a struggle for PC boilers. CFB technology dovetails perfectly with the country's energy goals and objectives, including India's ultimate goal for being energy independent.

Japan is another good example where CFB technology can make a difference. The energy situation in Japan is critical right now, given that the country has shut down all but two or three nuclear units. The huge power gap is being filled with expensive LNG and liquid oil. Coal is a very economically attractive base load alternative for Japan. Historically, Japan has been firing the most premium grade 6,000 kcal Australian coals in its fleet of ultra-supercritical PC boilers to achieve the highest plant efficiency to minimize operating cost. Here, the CFB option can provide high plant efficiency with its ultra-supercritical designs, but more importantly, can tap into the much higher cost savings of utilizing lower cost, lower quality Indonesian coals. Further, we are seeing a declining supply of premium coals globally limiting supplier competition and Japan negotiating position. Large utility scale CFBs would break Japan out of this procurement box.

Q: What trends have you been seeing in the biomass energy markets?

A: Over the last 10 years, we have witnessed a competition for clean wood between the energy, construction, and furniture industries. After successful lobbying by the construction and furniture industries, governments have shifted their biomass energy program away from clean woods toward lower quality, recycled and demolition woods, as well as, agricultural waste streams and byproducts like palm kernel shells and bagasse.



These fuels are much more difficult to burn due their higher level of corrosive alkalis, chlorine and non-combustible debris. Responding to this change in policy, we developed robust CFBs designs to help our clients utilize these more challenging fuels.

The impact of this change in policy can best be seen at the low end of the size scale (50-100 MW), where we are seeing a growing market for multi-fuel CHP plants. As an example, we are currently suppling a CFB to a 75 MW CHP plant that will provide power and heat to the town of Zabrze in Poland. The plant will be fueled by locally sourced municipal waste, biomass and coal. It is a sustainable, closed-loop energy solution providing energy security, waste recycling and low carbon emissions at the community level.

In Korea and Japan, we are seeing a number of similar multi-fuel power and CHP plants using a combination of local waste and recycled woods, as well as, imported biomass pellets and agricultural byproducts. In Dangjin, Korea, we recently provided a CFB to a 105 MW power plant in Dangjin, Korea that fires wood pellets, recycle furniture chips and imported palm kernel shells. This plant originally fired coal as well, until the government changed its fuel import policy.

At the large end of the scale (150-300 MW), we are seeing some governments supporting large scale utility power projects fueled by dedicated biomass and agricultural sources. In Polaniec, Poland, we recently built a 200 MW power plant that fires biomass and agricultural byproducts and in Teesside, UK we are building a 299 MW plant that will fire imported wood pellets from the US.

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