Bold, bullish and an exceptionally good fit

The recent acquisition of Amec Foster Wheeler's circulating fluidised bed (CFB) boiler business by Sumitomo Heavy Industries Ltd is a big deal in the biomass to energy world. The new entity Sumitomo SHI FW (SFW) calls itself, "A new global leader in sustainable energy solutions," a seemingly bold and bullish statement that on closer examination has plenty of substance to it.

IN MARCH 2017, UK-headed Amec Foster Wheeler plc (FW) revealed that it had signed an agreement with Japan-headed Sumitomo Heavy Industries Ltd (SHI) to sell its "core boiler business" – the design, manufacture and installation of circulating fluidised bed (CFB) boilers – to SHI. The GBP 137 million (≈ EUR 161.8 million) deal was part of FW's "non-core" asset disposal programme and at the end of June, the deal was completed.

Sumitomo SHI FW (SFW) is the new name with CFB and BFB steam generators and gasifiers, CFB scrubbers, metallurgical waste heat boilers and aftermarket services now part of SHI's Energy and Environment Group offering.

FW was subsequently acquired in full at the beginning of October by Scotland-headed John Wood Group PLC, a global player in the delivery of project, engineering and technical services to energy and industrial markets.

Significant M&A

The FW-SHI deal is one of several industrial boiler combustion technology mergers and acquisitions (M&A) to take place over the last 18 months suggesting that there is movement towards further consolidation. However, a major difference with the FW-SHI M&A is scale – the company size, its global reach and the capacity range of its combustion technology capabilities.

The most recent comparable M&A that springs to mind is when Metso acquired Wärtsilä's share of the duo's MW Power Oy joint venture in 2012. MW Power subsequently ended up in Valmet Oyj after the Metso demerger at the end of 2013. Prior to that the A-Tec Industries AG and Austrian Energy & Environment Group (AE&E) bankruptcies in 2010 was also a rumble – an intricate affair with the latter being a subsidiary of the former.

Nonetheless, the end result was that Hitachi Zosen Corporation picked up AE&E Innova Holding with its moving grate technology to become Hitachi Zosen Innova AG (HZI) and Andritz AG assimilated the fluidised bed technology from AE&E into its offering to the industrial and municipal energy sectors.

New name with familar faces

Though the SFW name may be new, it's fluidised bed (FB) and circulating fluidised bed (CFB) boiler technologies are well-known within waste-to-energy, forest industries, municipal heat and power and energy utilities in North America, Europe and Asia. Furthermore, all 15 offices in said territories and the staff that worked with FW and SHI respectively prior the acquisition remain unchanged under SFW.

Thus FW and SHI are no strangers to the market or to each other for that matter – SHI has been a licensee of FW's boilers since 2001. This all ought to facilitate the organisational transition process. Testament to the close working relationship is that Tomas Harju-Jeanty, former President of Power Systems and Technology at FW's Global Power, is now CEO for SFW.

– We have gotten to know each other very well over the two decades of cooperation between us. During that period Foster Wheeler's CFB has grown to become a core business within Sumitomo's energy and environment group. So I believe that Sumitomo was ready to grasp the opportunity to acquire the business when it appeared, said Harju-Jeanty.

A CFB market leader

The first new order announced under the new SFW flag came already in July from Swedish municipal energy utility Mälarenergi AB, its third boiler order from SFW this century, suggesting continued confidence in the technology and in the new constellation. According to figures from SFW, it has over 670 fluidised bed installations around the world of which 482 are of CFB type – 66 of these CFB units were sold by SHI under license Harju-Jeanty revealed.

SFW estimates that it is the original equipment manufacturer (OEM) of almost 50 percent of "operating CFB's in our served markets". Combined, SFW installations total 37.4 GWe of power

capacity and have clocked over 30 million hours of operational experience using a diverse range of solid fuels including biomass, peat and waste.

Again figures from SFW show that although 90 percent of operating CFB capacity uses coal, petcoke or lignite as a primary fuel, 10 percent use biomass, waste or peat as the primary fuel source – Mälarenergi (Sweden), Summit Handa Power (Japan) and MGT Teeside (UK) being recent pipeline projects in point.

Multi-fuel capability

The operative word is "primary" as it is this multi-fuel capability that makes CFB combustion technology such an attractive proposition for industrial and utility applications. Whilst energy plant owners and operators in the Nordics may be very well versed and operationally proficient with biomass, waste and peat fuels, the same cannot be said elsewhere where experience is limited or non-existent. And with increasing demands being put on energy utilities and industries to clean up thermal energy generation, increase the share of renewables and reduce the carbon footprint of production, the fuel flexibility of CFB's allows wiggle room and a certain degree of risk mitigation, at least as far as fuels and technology are concerned.

Leveraging CFB advantages

Taking CFB's inherent multi-fuel capability to the next level by incorporating it into the original plant design is the Zabrze CHP Plant (ZCP) project, a municipal combined heat and power (CHP) plant currently under construction in southern Poland. Being developed by Fortum Zabrze S.A, a Polish subsidiary of Finland-headed energy utility Fortum Oyj, the 145 MWth thermal and 75 MWe electrical capacity plant will use a wide range of locally sourced fossil and biomass fuels.

On commissioning which is scheduled in 2018, the plant will be initially configured to burn up to 100 percent domestic hard coal with up to 40 percent Refuse Derived Fuel (RDF), thus complying with the European Union's (EU) Waste Incineration Directive (WID), Industrial Emissions Directive (IED) and Large Combustion Plant, Best Available Technology (LCP BAT) requirements.

– The fuel supply system is designed with separate day silos and chain conveyors that supply each fuel to the front and rear walls of the CFB boiler. There are also provisions in the plant design to add the capability to burn up to 100 percent biomass, including agro biomass and up to 60 percent coal slurry. On the back-end there are provisions in terms of space and capacity for additional flue gas cleaning systems, said Harju-Jeanty.

Widening the CFB capacity range

Harju-Jeanty also disclosed that the ZCP project plant design serves as a model blueprint for next generation multi-fuel CHP plants in eastern European countries like Poland. However, its relatively large output size restricts it to a limited number of towns and cities whereas there are hundreds of smaller communities with old inefficient district heat boilers that would benefit immensely with a CHP.

To address this potential, SFW has piloted a scaled-down CHP concept on the drawing board – 26 MWth and 10 MWe but with same multi-fuel capabilities and emissions performance as the original ZCP plant. The size is applicable to hundreds if not thousands of municipalities in Poland and elsewhere in Europe.

From a SFW perspective, this is micro-size for CFB given that a 100-200 MWe unit, typically found in large municipal CHP plants and in industrial applications, is considered small to medium. On the other end of the scale, SFW has developed CFB with supercritical once-through steam generation technology for units over 300 MWe.

– This allows us to offer our utility clients all of the benefits of CFB combustion technology, together with the high efficiency of supercritical steam technology, said Harju-Jeanty.

Such large units tend to be the domain of fossil fuelled power utilities as storage space, logistics and material handling required for the volumes needed for 100 percent biomass firing are challenging. Here though co-firing comes into play with the multi-fuel capability of a CFB.

Big just got bigger

Just recently, the upper capacity boundaries of SFW CFB boilers were pushed even further. Korean Southern Power Company (KOSPO) selected SFW to supply four 550 MWe ultra supercritical CFBs for phase 1 of its Green Power Project in Samcheok, South Korea. Currently the world's largest CFB project, phase 1 began full commercial operations in June this year.

Built in pairs, each CFB unit pair has a "2 in 1" parallel system that combines two boilers into a single 1 GW turbine. The first unit fired up in December 2016 and unit 2 fired up in February this year. The plant uses coal and biomass.

Unique heritage

A unique non-technical asset for SFW is the name "Sumitomo". Although an entirely independent company, Sumitomo Heavy Industries is one of 33 companies that belong to the Sumitomo Group Public Affairs Committee. In essence, a business and heritage association where common values, culture and business philosophy that have been handed down through the generations ever since the House of Sumitomo's founding 400 years ago. Sumitomo companies within this group span a wide range of sectors including finance, construction, energy, commidity trading, logistics, forest industry to mention a few.

Complete value chain

Looking at SFW from a biomass to energy value chain perspective, it is worth considering that within the Sumitomo Group, the value chain portfolio already includes interests in upstream biomass fuel production in Brazil and Canada – the Cosan Biomasa 50:50 joint venture with Brazilian ethanol major Cosan SA and the recent stake in British Columbia wood pellet producer Pacific BioEnergy. Add in shipping, logistics and interests in at least three Japanese biomass power plant projects using SFW CFB technology then it becomes very clear why the FW boiler acquisition is such an exceptionally good fit.

Text & photos: Alan Sherrard
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(Above) Photo rendering showing the siting of Mälarenergi's Block 7 biomass-fired CHP at its Västerås facility. The order, a 152 MWth CFB, is the first under SHI FW (image courtesy Scheiwiller Svensson Arkitektkontor AB). (Left) The new 75 MWe Summit Handa Power Corp. biomass power plant.