



ROBERT GIGLIO

SENIOR VICE PRESIDENT OF STRATEGIC BUSINESS DEVELOPMENT FOR SUMITOMO SHI FW

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INTERVIEW WITH: ROBERT GIGLIO

Can you tell us about yourself, company & areas of expertise?

My name is Robert Giglio and I am a Senior Vice President of Strategic Business Development for Sumitomo SHI FW (SFW). I started with Foster Wheeler about 24 years ago as a R&D engineer, moved my way up the R&D ladder and then crossed over to market forecasting and business strategy. I am fortunate to have both the technical, market and business experience since developing business strategies involve all three areas. This connection is strongly emphasized in SFW, which utilizes a dedicated committee of R&D, engineering, technology and business leaders to steer the company's strategy. I have had the privilege of chairing this committee for over 9 years with the role of connecting our technology strategy to our market strategy.

Please tell us about the Sumitomo acquisition.

On June 23rd of last year, Sumitomo Heavy Industries (SHI) acquired Amec Foster Wheeler's (AmecFW) businesses related to fluidized bed technologies forming a new company named Sumitomo SHI FW, which we like to refer to as SFW.

In a lot of ways, you may not notice a big change since SHI bought AmecFW's three major fluidized bed operating companies in Finland, Poland and China, as well as, nearly the entire global strategic business development group, which are the faces most familiar to our clients. So our clients will be working with many of the same people and offices they already know from the Global Power Group of Amec Foster Wheeler. The new SFW Company has about

1000 employees with a portfolio of products and services related to fluid bed boilers, gasifiers and scrubbers, as well as, fabric filters, and specialized metallurgical waste heat boilers.

How is this acquisition good for the market and SFW clients?

Before the merger, the CFB boiler and other fluidized bed products resided in AmecFW as part of a larger product portfolio which included a full range of boiler technologies and air pollution control equipment.

Now as SFW, the product portfolio includes only fluid bed boilers, gasifiers and scrubbers, as well as, fabric filters, and specialized metallurgical waste heat boilers. This reduced portfolio will allow us to focus our talent, energy and quality of service exclusively on these products.

As our former CFB licensee, SHI has been our long time business partner and friend with deep knowledge and experience in fluid bed technology. Together, we will be stronger and more focused on these technology solutions than ever before.

The new SFW Company has delivered about one-third of the operating CFB fleet in the world today and holds the most experienced workforce in the global CFB business. We feel this scale of experience coupled with our global delivery network will allow us to offer the highest value to projects, no matter where they are located.

How will the acquisition be beneficial to Asian clients?

Both AmecFW's and Sumitomo's CFB boiler Companies have a long experience and large delivery networks in Asia. Now together as one company

we have increased our business focus, execution resources and experience in the Asian market. This provides a direct benefit to our Asian clients since it allow us to offer them more technology solutions and a broader range of delivery scope.

Asia holds the majority of the world's fastest growing economies. To support this growth, Asia will continue to need high levels of both new and replacement power and steam capacity. At the same time, Asian governments need to find the right balance of power reliability, affordability and environmental impact for power generation.

Our technology portfolio is strongly focused on fuel-flexible, fluidized bed combustion, gasification and flue gas cleaning technologies which will provide the most flexible solutions for our Asian clients.

Why is this acquisition a good fit for both companies?

For over 16 years, SHI had been a licensee of Foster Wheeler's (FW) CFB boiler technology supplying 70 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 spec-

trum 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.

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

Today, about 80-85% 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 four fundamental disadvantages: limited fuel flexibility, limited reliability, 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 conventional boiler technology. Even if the boiler market remains flat or even declines, CFB still has an upside growth potential of 80-85%.

Knowing all the benefits of CFBs why hasn't CFB technology already taken more of the overall boiler market share?

Most of the global boiler market is in the large coal utility sector. Like most other capital intensive sectors, the utility power market 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 MWe supercritical CFB went on-line at the Lagisza plant in Poland 9 years ago. At that time, this was the world's first supercritical and largest CFB unit in the world. Last year, we commissioned 2200 MWe of our ultra-supercritical CFBs at the Green Power Plant in Samcheok, South Korea. As of today, we have delivered 42 CFBs, each over 200 MWe in capacity, totaling over 12 GWe of electric capacity.

We heard a lot about CFB boiler technology, what benefits does it bring to the market?

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, petcoke 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.

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 to co-fire the highest levels of carbon neutral fuels and waste, significantly reducing their carbon profile. Crossing over to the transportation and chemical sectors, these gasifiers can also be integrated into biomass-to-liquid solutions to produce renewable biofuels and green chemicals. But the 100% 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 petcoke that have well established 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



Sumitomo SHI FW built the 74 MWe cogeneration facility at the Petropower Plant in Talcanuano, Chile, which has been successfully operating since 1998.

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

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 ener-

also vary seasonally, the fossil fuels can fill in as needed, providing energy security to consumers and financial security to project investors.

How do you see the CFB technology fitting into the global trend of renewables?

Globally we see nearly all markets strongly embracing solar and wind, which offer a true zero carbon solution,



Dangjin Bio-1 in South Korea, which features our multi-fuel CFB technology, produces 105 MWe of power from palm kernel shells, wood pellets and recycled wood chips.

Our advanced biomass CFB will cleanly and efficiently produce 299 MWe of power from carbon neutral biomass at MGT's Renewable Energy Plant in Teesside, UK.

and with dropping plant 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 (over 30%) 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 die down or clouds and stars 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.

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

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, 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 reliably 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, petcoke

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% 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 operator are forced to trade reduced plant output, higher downtime and maintenance cost to capture a much smaller range of these fuels. Staying

with PC technology, the only other option is to build another PC plant designed for another narrow fuel range. 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 most of their nuclear power plants. 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/kg 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 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's negotiating position. Large utility scale CFBs would break Japan out of this fuel procurement box.

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

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 programs 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 CFB designs to help our clients utilize these more challenging fuels. The impact of this change in policy can



The 510 MWe Soma Power Plant is the largest CFB project ever awarded in Turkey and features two of Sumitomo SHI FW's CFBs.

best be seen at the low end of the size scale (50-100 MWe), where we are seeing a growing market for multi-fuel CHP plants. As an example, we have recently delivered a CFB to a 75 MWe 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 MWe power plant in Dangjin, Korea that fires wood pellets, recycled furniture chips, coal and imported palm kernel shells. This plant originally fired mostly coal, until the government changed its fuel import policy. At the large end of the scale (150-300MWe), we are seeing some govern-

ments supporting large scale utility power projects fueled by dedicated biomass and agricultural sources. In Polaniec, Poland, we recently built a 200 MWe power plant that fires biomass and agricultural byproducts and in Teesside, UK we are building a 299 MWe plant that will fire imported wood pellets from North America.

Why do clients choose SFW's CFBs more than other CFB?

Unlike many of our competitors, nearly our entire business is centered around the supply and service of CFB boilers allowing us to focus nearly all our energy, talent and R&D on CFB technology. Over the last 40 years, we have supplied nearly 500 CFB boilers globally, more than all other suppliers. We stand out from our competitors due to our experience and constant technology advancement. Because we have fired the most diverse range of fuels in CFBs, we have learned the most about what works and what doesn't work. This experience is invaluable and

allows us, along with constant R&D and product improvement initiatives, to continually advance our designs. Clients also choose us for our reputation of being there when things don't go right. Technology evolution includes learning from unexpected outcomes, and when this happens on a commercial project, we have shown clients that we have the ability to find a solution that works both technically and commercially.

Many of our competitors license their CFB technology from others, offering designs that haven't changed in 10 or more years. Others offer CFB's as part of a much larger portfolio of products, finding it hard to invest a lot in just the CFB since it is not a major part of their business.

We are fortunate to be in the #1 position in the global CFB market. We don't take this for granted or believe we can slow down our technology or business improvement initiatives because of it. To ensure clients continue to choose our CFBs more than all others, we continue to improve our technology and delivery models to ensure they remain the most reliable, well-designed and competitive units on the market today.