Sumitomo SHI FW (SFW) Services
SFW Aftermarket Service Network
Locations

- Varkaus
- Sosnowiec
- Norrköping

- Bangkok, Thailand
- Hanoi, Vietnam
- Chonburi, Thailand
- Seoul, Korea
- Tokyo, Japan
- Shanghai, China
- Manila, Philippines
SFW Services Overview

Asia

Markets
- Utility Generators
- Non-Regulated Subsidiaries
- Independent Power Producers
- Industrial Plants

Products/Services
- Pressure Parts
- Engineering Studies
- Field Services
- Construction Services
- Replacement Parts
- Auxiliary Systems
- Weld Overlay solutions
- Training
- Boiler Tuning
- Refractory
- Retrofits and Upgrades
- Long Term Service Agreements
Asian Service Market Drivers

- Fuel changes – lower fuel cost
- Emission reduction (NOx, SOx, particles)
- Availability improvement
- Erosion and Corrosion mitigation
- Reduction in maintenance costs
- Material handling improvements (fuel, ash)
- Process advisory needs
Basic Maintenance Service
Basic Maintenance Services

- Local service corner
- Outage and emergency services
- Process optimization for combustion air and fuel flows for reduced erosion and corrosion
- Condition monitoring of pressure parts
- Inspection & specialist services
- Spare part services
Expert Maintenance Services

- Boiler Corrosion/Erosion/Fouling Analysis
- Material laboratory and failure analysis
- Burner tuning
- Refractory / casing issues
- Weld Overlay Products
- Smart boiler
Construction Services

- Field Service/ Site Inspection
  - Boiler Operation and Maintenance Training
  - Boiler Service Yearly Agreement
  - Boiler Condition Inspection and Refractory Condition Inspection
  - Supervision services

- On-Call 24 Hours
  Boiler Repair Service in Thailand

- Operation and Maintenance solutions.
Our Manufacturing Network Delivers Quality Products for New Equipment and After Market Service

Poland

Established: 1880
Location: Sosnowiec, Poland
Production area: 33,000 m²
Capacity: 400,000 man-hours
Certifications: ISO 9001, ISO 14001, OHSAS 18001, PED, ASME S & U stamp, Germany and Poland service certifications (HPO and UDT), EN 1090, laboratory certified EN ISO/IEC 17025

Finland

Established: 2000
Location: Varkaus, Finland
Production area: 4,000 m²
Capacity: 100,000 man-hours
Certifications: ISO 9001, ISO 3834-2, OHSAS 18001

Sweden

Established: 1995
Location: Norrköping, Sweden
Production area: 3,000 m²
Capacity: 75,000 man-hours
Certifications: ISO 9001, ISO 3834-2, OHSAS 18001

Thailand

Established: 2000
Location: Chonburi, Thailand
Production area: 4,000 m²
Capacity: 160,000 man-hours
Certifications: OHSAS 18001, ISO 18001, ASME Code Certification S,R,NB Stamp

Global

We supplement our manufacturing capacity with a network of partner shops
Finished components from Service workshop (Thailand)

- YFY Taiwan: Economizer
- Waster Heat Boiler for Japan
- Water Wall Panels for Duke Energy, USA.
Raw materials Inventory

Large Stock of Tubes/Pipes for emergency boiler repair work.

- Boiler Tubes and Pipes in
  - Carbon Steel
  - Alloy Steel
  - Stainless Steel
- Standard Offered: ASME, ASTM, EN

Other standards are available upon request
BM Service example photos

- Cast type Vortex finder
- Overlay welding
- Grid nozzles
- PC boiler OFA air openings
- Superheaters, economizers and airheaters
- Fuel feeding and bottom ash equipment
CFB boiler fuel feeding chute improvement
Case: Sinopec Maoming, China

- Original fuel petcoke replaced by coal, existing secondary air system and fuel feeding arrangement needed improvement
  - New fuel chutes with spoon air and refractory lining
  - New vortex type secondary air nozzles
- Results
  - Improved fuel and secondary air distribution into the furnace => improved combustion
  - New refractory lined feeding chutes don’t suffer furnace radiation as the old chutes did => less maintenance
Long Term Service Agreements
Energy market is changing

- Conventional power under pressure
- High availability expectations
- Cost reductions
- Long term improvements needed

SUMITOMO SHI FW’s value proposition
- Long Term Service Agreement (LTSA)
LTSA, what does it mean for Plant Owner?

Advantages through LTSA:
- Continuous support
- Ensured resources
- OEM’s know-how
- Technology improvements
- Experienced teams
- Shorter outages
- High performance
- Reliability centered maintenance
- High availability
Long Term Service Agreements levels

- LTSA maxi
- LTSA medium
- LTSA basic
Modules to pick and choose for LTSA

- Daily maintenance
  - Technical Advisors on-shore
  - Expert services off-shore
- Spare parts storage
  - LTSA Frame agreement
  - Nominated plant organization
  - Operation support
  - Boiler condition monitoring
  - Outage maintenance
  - Improvement engineering
LTSA

Reference Plants

Tammervoima, Tampere Finland
- Boiler type: WTE grate boiler
- Start-Up Year: 2016
- Capacity: 58 MWth
- Scope: Both mechanical and EIC: Daily maintenance, plan and execute annual outages, emergency services.
- LTSA Service Period: 2016-present

INEOS refinery, Grangemouth UK
- Boiler type: HRSG & gas fired boiler
- Start-Up Year: 2000
- Steam Flow: 64 kg/s
- Scope: Plan and execute annual outages works for pressure parts
- LTSA Service Period: 2013-present
SmartBoiler™ operation support services
What is SmartBoiler™ service concept?

- Intelligent operation support service concept
- Combining IoT tools and human experience
  - Intelligent diagnostic tools
  - Performance analysis
  - Troubleshooting services

Advantages through SmartBoiler™
- Maintain high performance level
- Supporting boiler operators
- Fast remote troubleshooting
- Improved life cycle management
Smart Boiler™ service concept and structure

- Efficiency analyses
- Deviation management
- Disturbance management
- Operator support services
- Troubleshooting services
- Regular process reporting

SFW Process specialists

- Daily system administration
- Software updates
- Virus and data protection

SFW IT specialists
SmartBoiler™ basic platform

Features
- Trending tools
- DataPick software

Benefits
- Process data high data accuracy
- Data transfer
SmartBoiler™ Diagnostic modules

- Boiler mass and energy balances
- Fuel diagnostics
- Bed diagnostics
- Fouling diagnostics
- SmartBoiler™ Main display
- Messages
- Reports (Option)
- Corrosion on-line probe (Option)
Smart Boiler
Reference Plants

Poludniowy Koncern Energetyczny (PKE) Elektrownia Łagisza,
▶ Location: Bedzin, Poland
▶ Supercritical Once-Through CFB Boiler
▶ Smart Boiler since 2009
▶ Capacity: 460 MWe
▶ Fuel: Bituminous coal

Metsä Board Simpele
▶ Location: Simpele, Finland
▶ BFB boiler
▶ Smart Boiler since 2010
▶ Capacity: 27 MWe
▶ Fuel: Bark, forest residues, peat, mill sludges
Value of LTSA and SmartBoiler™

Resources  Experience

Availability

Performance

Efficiency

Know-how
Technology, Modification and Upgrade (TMU) Services
Sumitomo SHI FW TMU Services

- Fuel range expansions and conversions
- Capacity upgrades and process improvements
- Plant optimization studies, CFD, 3D modelling
- BFB & CFB retrofits
- Environmental retrofits (SNCR, SCR,)
- CFB scrubber, DSI and fabric filter retrofits
- Biomass gasifiers
- Steam Temperature Short Falls
- Boiler Efficiency Improvements
- Convection Surface Redesign
  - Slagging / Fouling / Plugging
  - Erosion (Baffles, Tube Shields, Weld Overlay, Tube Spacing)
Typical scope for TMU project

Depending on how difficult the demand

Process assessment (what is the current process situation)
- Process data review
- Process measurements

Performance calculations and CFD modelling
- Performance calculations by SFW tools
- 3D combustion modelling

Engineering
- Performance & Conceptual
- Design of auxiliary equipment
- Detailed engineering

Modification

Commissioning and tuning
Fuel changes - SFW has the Widest Fuel Experience

We know how to burn difficult fuels
Coal selection concerning erosion

- Heating value (low HV, more fuel)
  - High heating value better than low
  - Low moisture better than high

- Ash composition
  - Ash High better than low
  - High Sulfur better than low

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<th>US</th>
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Ash and Sulfur (limestone need), more circulation, heat transfer, bed removal
**CFB boiler secondary air modification**

**Case:** Glow CFB Unit 1, Thailand

- **Problem:** CO corrosion in the furnace tubes caused by changing coal quality from low volatile to high volatile
- **Solution:** SFW provided problem solving analyse, furnace 3d modelling, conceptual & detailed engineering, parts delivery for the modification, installation and boiler tuning
- **Result:** CO rich areas were reduced significantly minimizing corrosion effects

![Modeled O2 profile before modification](image1)

- **Left:** Modeled O2 profile before modification
- **Right:** Modeled O2 profile after modification and tuning No 0% O2 regions in bare tube area
- No high O2 concentrations on side walls
- Air is meeting the fuel much better
CFB boiler secondary air modification
Case: Glow CFB Unit 1, Thailand
CFB boiler secondary air modification
Case: National Power Supply Co., Ltd, Unit 7 CFB, Thailand

- **Problem**: CO corrosion in the lower furnace
- **Solution**: SFW provided problem solving analyse, conceptual & detailed engineering for secondary air modification, parts delivery for the modification, installation and boiler tuning
- **Result**: CO rich areas were reduced significantly minimizing corrosion effects
CFB boiler fuel change
Case: Siam Kraft Industry Co. and Thai Paper Co., Thailand – modification to 2 units

Target
- Enable 100% bituminous coal firing (original design fuel lignite)
  - High heating value range taken into account with recirculation gas system and upper primary air system
- Enable burning paper mill waste sludge to larger extent
  - Corrosion taken into account with upgraded superheater materials
  - Foreign material removal taken into account with step grid retrofit
- Repair broken pressure parts
  - For PB #11 due to hydrogen embrittlement, the evaporating tubes have been found in bad condition.
  - All furnace walls and evaporative screen were renewed.
CFB boiler fuel change
Case: Siam Kraft Industry Co. and Thai Paper Co., Thailand – modification to 2 units

Scope
- Water wall replacement (to 1 unit only)
- new grid
- 2 pcs wingwalls with feeders and risers
- upgrade superheater # 3 (to 1 unit only)
- recirculation gas fan
- 0,5 m primary air level

Result
- After modification units were able to fire new fuels safely
- With added new systems, boiler is more fuel flexible giving a chance to utilize leftover materials from papermill as well as opportunistically experiment new coals
Step grid replacement

- Step grid enables effective removal of impurities like iron, stones and other impurities from recycled wood, waste fuels etc by
  - Horizontally blowing nozzles
  - Inclined grid towards ash outlet chutes
- Retrofits possible for existing BFB and CFB boilers incase fuel quality changes (to worse)
- Both partial or full step grid constructions available
- Scope of step grid upgrade:
  - Pressure part modifications
  - Step grid nozzles and refractory
  - Bottom ash extraction conveyor modifications part
- Benefits
  - Improved impurity extraction
  - Improved air/bed material/fuel mixing resulting better combustion and lower emissions
  - Improved availability

- SFW step grid with excellent extraction of impurities from grid
- Other supplier’s grid with poor extraction of impurities from grid
Modification due to fuel changes, coal to bio

Case: Adven Kauttua Finland, CFB

- Original fuels: Coal, Peat
- New secondary fuels: RDF, mill rejects (paper, plastics)
- Step grid installed year 2000 to improve extraction of the impurities (iron, inert particles)
Fluidized bed boiler retrofits
BFB Retrofits

BFB retrofit means conversion of the existing boiler to Bubbling Fluidized Bed Boiler

Boiler types SFW has modified to BFB’s:

- PC boiler => BFB
- Recovery boiler => BFB
- MgO boiler => BFB
- Grate boiler => BFB
BFB Retrofit
Case: Metsä-Board Simpele, Finland, 27 MWe

- Metsä Board Simpele, Finland
- Original construction: Pulverized peat fired boiler, start-up year 1976
- Start-Up Year of retrofitted boiler: 1997
- Fuels after retrofit: Bark, forest residues, peat, mill sludges

Results
- Biomass (100 %) and mill sludges added to fuel envelope
- Steam production capacity increase by 20 %
- Reduction of NOx, SO2, CO, particles and UBC
- High availability
Bubbling Fluidized Bed Boiler Retrofit

Case: Metsä-Board Simpele, Finland
Bubbling Fluidized Bed Boiler Retrofit
Case: Metsä-Board Simpele, Finland
Environmental retrofit projects
Environmental Retrofit, SOx and NOx reduction in CFB
Case: Yuen Foong Yu Paper, Taiwan

Scope

- Evaporative wing walls to cool the furnace
- Improvement of limestone feeding system changed from mechanical to pneumatic feeding
- New ammonium feeding system.
- Relocation of fly ash recirculation

Target was to reach new emission limits

- NOx < 100 ppm @ 6 % O2 dry.
- SO2 < 100 ppm @ 6 % O2 dry.

Both targets were easily reached
Environmental Retrofit, SCR added to existing PC boiler
Case: TSE Naantali, Finland

- TSE Naantali, Finland
- Start-Up Year: 2015
- Capacity: 125 MWe
- Fuel: Coal, biomass
- Scope: SCR reactor and catalyst materials, flue gas ducts, ammonia systems, ID fans, construction and commissioning

Results
- New emission limits met
- All guarantees met
- High availability
CFB Scrubber

- High Multi-Pollutant Capture Capability
  - Up to 99% Capture of SO2, SO3, HCl, HF, Hg
- Low Installed Cost
  - 50% less than wet FGD
- Low Water Use
  - 30-40% less than wet FGD
- High Reliability and Low Maintenance
  - No slurry preparation, handling, dewatering, liquid waste streams
  - No mechanical atomizers or spray heads
  - No paddle mixers
- Compact Foot Print
- High Operational Flexibility
  - Capture not limited by flue gas due point temp
  - Can be integrated with CFB boilers using boiler ash as reagent
- We have a Long and Broad Experience
  - 77 units operating globally since 1989
  - Wide Fuel experience: Coal, Lignite, MSW, Oil
CFB Scrubber at Kolin’s Soma Plant in Turkey

- Location: Soma, Turkey
- Customer: HEI, Kolin Power
- Plant Start-up year: 2018
- Plant Output: 2x 225 MWe
- Fuel: Lignite
- Flue Gas Flow: 716,000 ACFM, 1,215,000 m³/h per unit
- AQCS Configuration: 2 x 1 CFB, 1 Baghouse
- SO₂ Removal: 79%
- SO₃ Removal: 95%
- HCl Removal: 90%
- HF Removal: 77%
- Dust Removal: 99.5%
- Outlet SO₂: 70 ppmwd @ 6% O₂ (200 mg/dNm³ @ 6% O₂)
- Outlet SO₃: 0.7 ppmvd @ 6% O₂ (2 mg/dNm³ @ 6% O₂)
- Outlet HCl: 5 ppmvd @ 6% O₂ (10 mg/dNm³ @ 6% O₂)
- Outlet HF: 7 ppmvd @ 6% O₂ (15 mg/dNm³ @ 6% O₂)
- Outlet Dust: 0.008 gr/acf, (30 mg/dNm³ @ 6% O₂)
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