Boiler Services
A Full Range of Capability

The power of sustainable energy solutions
With more than a century of designing, fabricating, erecting and starting our own equipment, we have the experience and capability to assess your boiler, recommend improvements, and predict the impact on performance, reliability and operation before any fieldwork is started.

Service is an integral part of our business. Preventive condition monitoring, expert maintenance, rapid response repair work, and replacement part deliveries are key factors in achieving maximum plant reliability and cost effective performance year after year.

Through our long-term service agreements, we provide comprehensive and cost effective maintenance programs, ranging from boiler inspections to outage equipment supply and construction services, resulting in minimum unplanned repair work.
Global Service Shop Network

We have been fabricating steam generation equipment for over 100 years. Our manufacturing facilities in China, Poland, Thailand, Finland and Sweden, along with our partner shops, form our global manufacturing supply network. This arrangement ensures the best combination of cost and schedule regardless of your location, or the complexity of your project.

**Power Machinery Company Limited**
- Established: 1994
- Location: Xinhui City, PRC (95 km NW of Hong Kong)
- Production Area: 50,000 sq. meters
- Capacity: 1,200,000 man hours per year
- Certifications: ASME code certifications S & PP, China Boiler Manufacturing Certificate Level A, ISO 9001

**FAKOP Sp. z o.o**
- Established: 1880
- Location: Sosnowiec, Poland
- Production Area: Several bays covering 11,000 sq. meters
- Capacity: 400,000 man hours per year
- 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

**Service (Thailand) Ltd.**
- Established: 2000
- Location: Chonburi, Thailand
- Production Area: 4,000 sq. meters
- Capacity: 160,000 man hours per year
- Certifications: ASME S & R stamp, NB certificate

**Service Center (Finland)**
- Established: 2000
- Location: Varkaus, Finland (eastern province)
- Production Area: 4,000 sq. meters of floor space
- Capacity: 100,000 man hours per year
- Certifications: ISO 9001, ISO 3834-2, OHSAS 18001, ISO 14001

**Service Center (Sweden)**
- Established: 1995
- Location: Norrköping, Sweden
- Production Area: 3,000 sq. meters
- Capacity: 75,000 man hours per year
- Certifications: ISO 9001, ISO 3834-2, OHSAS 18001
Replacement Parts

Engineered pressure parts
We have been fabricating steam generation equipment for over 100 years. We can fabricate virtually any steam generator pressure part from highly complex redesigned coils and panels to simple in-kind replacement parts.

Our best-in-class-quality manufacturing capability and worldwide sourcing of tubing, piping and attachments enables us to meet your needs at very competitive pricing. We have a proven track record of significant cost reduction.

- Superheater, reheater and economizer coils
  - Horizontal and vertical
  - 360° spiral weld overlay available

- Furnace and heat recovery area membrane panels
  - SLR and MCR tubing available
  - 180° fireside weld overlay available

- Roof tubes
- Dissimilar metal weld spool pieces
- Headers—all circuits
- Jumper bends, loose tubes, straight tubing

Non-pressure parts
We have satisfied many customers with a full line of high quality replacement boiler and air pollution control equipment parts for our own units as well as for units manufactured by others. Our replacement parts are known for their world class quality, competitive pricing and short delivery schedules.

We continually improve the design and materials of our replacement parts to consistently outperform original OEM parts. All of our parts are backed by a comprehensive warranty and customer service second to none.

Bottom Ash Coolers  CFB Grid Floors  Vortex Finders
Loop Seal Expansion Joints  Arrowhead Nozzles  Stripper Cooler Transfer Chutes
Basic Maintenance

Basic plant maintenance is a core component of our service offering. We tailor our basic maintenance services to best suit the individual needs of our customers and deliver these services through our local service centers. Our basic maintenance service spans a broad range of service scopes and capabilities covering all types of boilers and air pollution control equipment.

- Outage and emergency services
- Inspection & specialist services
- Spare part services
- Equipment tuning and optimization
- Material failure analysis and solutions
- Refractory maintenance and upgrades
- Maintenance planning and staffing
- Boiler operation and maintenance training
- Construction services and supervision

Tuning for plant optimization

- Comply with new regulations
- Reduce maintenance
- Improve plant heat rate and capacity
- Improve stack emissions
- Reduce limestone and ammonia use

Refractory upgrades

- Inspection and evaluation of refractory failures
- Upgrading refractory formulations and installation methods
- Customized solutions for refractory applications

Improving your ash systems

- Ash cooler operation improvements
- Retrofit drum and screw cooler solutions for expanding fuel range

Upgraded CFB loop seal expansion joints

- Ash packing resistant designs
- Customized for ease of retrofit
- Upgraded materials to tolerate both severe temperature and expansion

Improving CFB vortex finder reliability, life and maintenance

- Flexible cast segmented vortex finder retrofits
- Upgraded plate vortex finder designs

Quick-change durable fluid bed grid nozzles

- Solves erosion and corrosion problems
- Flexible twist-lock or seal weld drop-in style for ease of replacement
- Cost effective retrofit solution

FEATURED PROJECTS

Helen Salmisaari
Location: Helsinki, Finland
Customer: Helen OY
Start-Up Year: 1984
Capacity: 170 MWe
Service Provided: PC boiler, superheaters 1&3 replacement
Service Year: 2018

INEOS refinery
Location: Grangemouth, UK
Customer: INEOS Olefins & Polymers Europe
Start-Up Year: 2000
Steam Flow: 64 kg/s
Service Provided: HRSG boiler, superheater replacement
Service Year: 2016

Laanila
Location: Oulu, Finland
Customer: Laanilan Voima Oy
Start-Up Year: 2015
Capacity: 40 MWh
Service Provided: Transferring and rebuilding auxiliary boiler to new plant
Service Year: 2015
Technology Modifications and Upgrades

Our experienced service team provides a full range of Technology, Modernization and Upgrade (TMU) services globally:

- Fuel range expansions and conversions
- Capacity upgrades and process improvements
- BFB & CFB retrofits
- CFB scrubber, DSI and fabric filter retrofits
- Biomass gasifiers retrofits
- Plant optimization studies, CFD, 3D modelling

TMU projects are always tailored to the clients’ needs to achieve optimized cost effective solutions for power, steam & heat production. We provide the latest technology to clients so they can achieve the highest value from their existing boilers in a changing environment of fuels, emission limits and capacity needs.

Pressure part re-design starts with detailed CFD modeling and engineering:

- Fuel combustion and heat absorption modeling
- Heating surfaces fouling analysis
- Metal temperature analysis
- CFB 3D furnace modelling

FEATURED PROJECTS

**Enefit Retort Gas Project**
- Location: Narva, Estonia
- Customer: Enefit
- Start-Up Year: 2017
- Capacity: 100 MWe
- Fuel: Oil shale, retort gas

**TSE Naantali SCR retrofit**
- Location: Naantali, Finland
- Customer: TSE Oy
- Start-Up Year: 2015
- Capacity: 110 MWe
- Fuel: Coal

**ESE Mikkeli Step Grid Retrofit**
- Location: Mikkeli, Finland
- Customer: ESE
- Start-Up Year: 2013
- Capacity: 25 MWe
- Fuel: Forest residues, bark, peat
**CFB Scrubber Retrofits**

**A flexible multi-pollutant technology**

Our Circulating Fluid Bed (CFB) Scrubber efficiently captures all acid gases, metals and particulate matter down to the lowest levels. It is a versatile and flexible technology that can clean up flue gases from boilers and industrial processes using the least amount of water and project capital.

Our multi-pollutant CFB scrubbers reliably and economically capture:
- Oxides of sulfur
- HCl, HF, Hg
- PM10 and PM2.5

While providing many benefits over conventional technology:
- Uses 30-40% less water than wet FGDs
- 50% lower capital cost than wet FGDs
- Best capture of acid gases and metals
- Excellent capture of oxides of sulfur
- Very low operating cost and need for lime reagent with calcium rich boiler ash (ideal for CFB boilers)
- Low maintenance since it doesn't utilize lime slurry and rotary atomizers

If you do not need a full scrubber, we also offer advanced baghouse and DSI technology to reduce your plant’s dust, metals and acid gas emissions.

**FEATURED PROJECTS**

- **Zabrze, Poland**
  - Location: Zabrze, Poland
  - Customer: Fortum Heat Polska
  - Plant Capacity: 75 MW
  - Start-Up year: 2018
  - Fuel: Waste RDF, biomass and bituminous coal
  - Gas Flow: 457,920 m³/hr
  - HCl Removal: 98.6%
  - HF Removal: 96.4%

- **Harbin Electric Soma Kolin, Turkey**
  - Location: Soma, Turkey
  - Customer: Harbin Electric International
  - Plant Capacity: 2 x 225 MW
  - Start-Up year: 2016
  - Fuel: Turkish Lignite
  - Gas Flow: 2 x 1,217,200 m³/hr
  - SO2 Removal: 79%
  - SO3 Removal: 95%

- **Basin Electric Dry Fork Station, USA**
  - Location: Gillette, WY, USA
  - Customer: Nooter Erikson
  - Plant Capacity: 420 MW
  - Start-Up Year: 2011
  - Fuel: PRB Coal
  - Gas Flow: 3,060,000 m³/hr
  - SO2 Removal: Up to 96%
  - SO3 Removal: Up to 99%
Bubbling Fluidized Bed Conversions

We have converted over 30 pulverized coal, stoker-fired and gas/oil-fired boilers to bubbling fluidized bed units, greatly expanding the fuel flexibility and economic life of these boilers.

Our Bubbling Fluid Bed steam generators have a history of reliable operation and have brought value to many clients due to their ability to burn high moisture and high ash fuels. We have progressively advanced the state of BFB technology by incorporating design improvements like our rugged step grid, staged air mixing and gas recirculation systems.

- Stepped grid for most difficult fuels
- Conventional grid for cleaner fuels
- Fuel gas recirculation for bed temperature control avoids in-bed tubes
- High gas residence time to ensure lowest dioxin, CO, and fly ash carbon
- Multiple levels of secondary air to minimize NOx formation
- Retractable soot blowing to maintain high boiler efficiency and long tube life

<table>
<thead>
<tr>
<th>Original unit fuels</th>
<th>Converted unit fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grate Fired</td>
<td>Anthracite</td>
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<tr>
<td>Chemical Recovery</td>
<td>Coal</td>
</tr>
<tr>
<td>Pulverized Coal</td>
<td>Peat</td>
</tr>
<tr>
<td>Pulverized Peat</td>
<td>Graphite</td>
</tr>
<tr>
<td>Oil</td>
<td>Bark</td>
</tr>
<tr>
<td>MgO</td>
<td>Wood Residue</td>
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<tr>
<td>La Mont</td>
<td>Wood Chips</td>
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<tr>
<td>Pyrite Roasting</td>
<td>Waste Fiber</td>
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<td></td>
<td>Primary Sludge</td>
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<td></td>
<td>Bio Sludge</td>
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<td></td>
<td>De-inking Sludge</td>
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</table>

FEATURED PROJECTS

<table>
<thead>
<tr>
<th>Stora Enso</th>
<th>Metsä Board Simpele</th>
<th>Igelstaverket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Location:</td>
<td>Location:</td>
</tr>
<tr>
<td>Hyltebruk, Sweden</td>
<td>Simpele, Finland</td>
<td>Södertälje, Sweden</td>
</tr>
<tr>
<td>Customer:</td>
<td>Customer:</td>
<td>Customer:</td>
</tr>
<tr>
<td>Stora Enso Hylte AB</td>
<td>Metsä Board</td>
<td>Söderenergi Ab</td>
</tr>
<tr>
<td>Start-Up Year:</td>
<td>Start-Up Year:</td>
<td>Start-Up Year:</td>
</tr>
<tr>
<td>2006</td>
<td>1997</td>
<td>1995</td>
</tr>
<tr>
<td>Capacity:</td>
<td>Capacity:</td>
<td>Capacity:</td>
</tr>
<tr>
<td>66 MWh</td>
<td>27 MWe</td>
<td>120 MWh</td>
</tr>
<tr>
<td>Fuel:</td>
<td>Fuel:</td>
<td>Fuel:</td>
</tr>
<tr>
<td>De-Inking/bio sludge, demo wood</td>
<td>Bark, forest residues, peat, mill sludges</td>
<td>Waste wood, oil, coal, peat</td>
</tr>
<tr>
<td>Original Boiler Type: Grate/axon</td>
<td>Original Boiler Type: Pulverized peat</td>
<td>Original Boiler Type: PC</td>
</tr>
</tbody>
</table>
Metallurgical Waste Heat Boiler Service

We provide a full range of services for our own metallurgical waste heat boilers as well as units from all other suppliers. These services include:

- Capacity upgrades
- Modernizations
- Replacement tube walls, pendant screens and tube bundles
- Spare parts
- Repair services
- Condition assessment services

General design features:

- Tough small-diameter standard tube membrane walls
- Omega-tubes for robust heat transfer surface
- Smooth surface composite-tube to prevent corrosion
- Weld overlays applied to extend wall life
- Robust but flexible rapped tube surfaces
- Efficient dust removal arrangement
- Gas flow profile optimized by CFD
- Unique patented spring hammer rapping system

**FEATURED PROJECTS**

**Garfield Smelter**
- Location: Magna, Utah, USA
- Customer: Kennecott Utah Copper
- Start-Up Year: 1994
- WHB gas volume: 60,000 Nm³/h
- Service Provided: Replacement of front of radiation section with omega tube wall
- Service Year: 2014

**Chagres Smelter**
- Location: Chagres, Chile
- Customer: Anglo American
- Start-Up Year: 1992
- WHB gas volume: 22,000 Nm³/h
- Service Provided: Capacity upgrade, new baffle wall, full replacement of radiation screens and convection tube banks, spring hammer cleaning
- Service Year: 2005

**Boliden Harjavalta**
- Location: Harjavalta, Finland
- Customer: Boliden
- Start-Up Year: 1972
- WHB gas volume: 50,000 Nm³/h
- Service Provided: Modification of radiation parts
- Service Year: Lifetime support since 1972

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*Boiler Services* 9
SmartBoiler™

SmartBoiler™ is an advanced tool which enables plant operators and/or managers to monitor their boiler’s operation. SmartBoiler™ is cost efficient, providing operational support and troubleshooting services by our experienced performance engineers, remotely from our home office.

Value added by SmartBoiler™:
- Optimizes boiler operation for lower plant operating cost, plant downtime and extended boiler life
  - Reduces limestone, ammonia, additives, soot blowing and ash generation
  - Less fuel feed, ash removal, erosion, corrosion and agglomeration problems
- Fast fix reduces plant downtime
  - Live remote diagnosis and corrective action advice from our boiler experts
  - Precise rapid dispatch of material and staff
  - Boiler experts will have data history for improved diagnosis
- Predictive maintenance lessens outage cost and schedule
  - Early detection of problems before they lead to forced outages
  - Optimized component replacement schedules
  - Improved planning of outage activities and schedule for pre-ordering of materials and labor

How it works

Customer plant

Remote connection

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

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

FEATURED PROJECTS

MGT Teesside Limited
Location: MGT Teesside Limited
Customer: MGT Teesside Limited
Start-Up Year: 2020
Capacity: 299 MWe
Fuel: Wood pellets, wood chips

Metsä Board Simpele Smart Boiler
Location: Simpele, Finland
Customer: Metsä Board
Start-Up Year: 1997
Capacity: 27 MWe
Fuel: Bark, forest residues, peat, mill sludges
Through our long term service agreements (LTSAs), we provide comprehensive and cost effective maintenance programs, ranging from boiler inspections to outage equipment supply and construction services, resulting in minimum unplanned repair work.

LTSAs are an ideal and care free solution especially for customers with lean plant organizations. They area tailor made solution containing all needed services to match the customer's specific requirements and needs.

- Ensure resources are always available for each task needed in boiler maintenance ranging from experienced pressure vessel welders up to world class technical experts.
- Ensure that the plant operators are well aware of our latest product improvements and accumulated know-how from new boiler projects.
- Allows the full potential from your new boiler investment
- Ensure high plant availability.

**On-site LTSA services can include:**
- On-site support team
- Technical advisors deployed to site as needed
  - Process tuning
  - Material, refractory, process, I&C and operation specialists
- Condition monitoring of boiler parts and equipment
- Outage supervising
- Outage maintenance and/or repairs
- Spare part stocking and delivery
- Emergency support

**Off-site LTSA services can include:**
- Operation support and remote diagnostics via SmartBoiler™
- Engineering and specialist support
- Condition monitoring of boiler and air pollution control equipment
- Maintenance scheduling and outage planning
- Execution of outages

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### Featured Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>Customer</th>
<th>Boiler Type</th>
<th>Start-Up Year</th>
<th>Capacity</th>
<th>Scope</th>
<th>LTSA Service Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>INEOS refinery</td>
<td>Grangemouth, UK</td>
<td>INEOS Olefins &amp; Polymers Europe</td>
<td>HRSG</td>
<td>2000</td>
<td>64 kg/s</td>
<td>Plan and execute annual outages, works for pressure parts</td>
<td>2013-present</td>
</tr>
<tr>
<td>Tammervoima WTE</td>
<td>Tampere, Finland</td>
<td>Tammervoima Oy</td>
<td>WTE grate boiler</td>
<td>2016</td>
<td>58 MWth</td>
<td>Both mechanical and EIC: Daily maintenance, plan and execute annual outages, emergency services.</td>
<td>2016-present</td>
</tr>
<tr>
<td>NeVe, Suosioila</td>
<td>Rovaniemi, Finland</td>
<td>Napapiiriin Vesi ja Energia Oy</td>
<td>CFB and BFB</td>
<td>1995</td>
<td>96 MWth</td>
<td>Plan and execute annual outages, emergency services. Operation support and process tuning.</td>
<td>2015-present</td>
</tr>
</tbody>
</table>
Our vision is to provide sustainable energy solutions through decarbonization, decentralization and digitalization of the energy industry. Our capabilities cover customer needs in the fields of power generation utilizing circulating fluidized bed (CFB) technologies, long term energy storage, and related network services. We continuously broaden our portfolio of products and services by advancing our in-house technologies and developing further alliances with new partners.

**Our Values**

- **Respect for people.**
  - Valuing and inviting differing views and ideas

- **Committed to customers.**
  - Exceeding expectations and providing value

- **Safety, integrity and teamwork.**
  - Incorporating ethics in everything we do

- **Ownership of results.**
  - Personally ensuring that success is achieved

- **Passion to innovate and grow.**
  - Setting challenging goals for growth

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