When making a change, make it for the better

Operators of industrial power plants are constantly under pressure to improve efficiency, reduce operational costs and meet changing emission requirements. The growing awareness of environmental issues and the need to conserve resources are our incentive for innovation.

Upgrades to existing furnaces and combustion systems have become unavoidable as a result of ever more stringent legislation. The real challenge, however, is to ensure that the new applications comply with the rules without reducing plant efficiency and increasing operational costs.

Expert knowledge and innovative thinking – the key to effective solutions

Steinmüller Engineering has the knowledge and experience to convert a fuel’s stored chemical energy into usable energy. We have successfully realized a huge number of projects worldwide, covering various industrial sectors, types and sizes of plant. Special fuels and fuel combinations in particular are our area of expertise, including the development of customized solutions for process residues, biomass, biogas and fossil fuels. Our clients rely on us to find the best strategy for challenging retrofit projects, in accordance with their specific plant designs.

Turn our experience into your advantage!

Contact

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Proposals Combustion Systems

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+49 (0) 2261 / 78 950-309
### COMBUSTION SYSTEMS

#### LIQUIDS AND GAS FIRING SYSTEMS

**OIL AND GAS VORTEX BURNER**

- **HIGH COMBUSTION EFFICIENCY**
- **LOW EMISSIONS**
- **FLEXIBLE OPERATION**

#### APPLICATION

<table>
<thead>
<tr>
<th>Power Plants and Industrial Boilers</th>
<th>Technical Data</th>
<th>Scope of Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO&lt;sub&gt;x&lt;/sub&gt; reduction, extension of fuel type, efficiency increase</td>
<td>Capacity Gas: 0.6 – 100 MWe</td>
<td>Consultancy</td>
</tr>
<tr>
<td></td>
<td>Capacity Oil: 5 – 100 MWe (0.45 – 9 t/h)</td>
<td>Process engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CFD simulations of boiler furnace and combustion system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design of furnace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design of burner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supply of gas and oil burners including all related components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commissioning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Optimization</td>
</tr>
</tbody>
</table>

#### FUEL TYPE

- **Refineries:**
  - Refinery gas
  - Visbreaker residues
  - Vacuum residues
  - HSC-R
  - H<sub>2</sub>

- **Steel plants:**
  - Blast furnace gas
  - Coke oven gas
  - Converter gas

- **Power plants:**
  - Natural gas
  - Light fuel oil
  - Heavy fuel oil
  - Bio fuel

#### Scope of Supply

- Consultancy
- Process engineering
- CFD simulations of boiler furnace and combustion system
- Design of furnace
- Design of burner
- Supply of gas and oil burners including all related components
- Commissioning
- Optimization

#### LEGEND

- **PS:** Power Station
- **PF:** Pulverized Fuel
- **CHP:** Combined Heat & Power Plant
- **SCC:** Selective Catalytic Reduction
- **STP:** Standard Temperature and Pressure
- **HRSG:** Heat Recovery Steam Generator
- **FGD:** Flue Gas Desulfurization
- **CFB:** Circulating Fluidized Bed
- **ESP:** Electrostatic Precipitator

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### REFERENCE LIST EXCERPT

<table>
<thead>
<tr>
<th>Reference</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply and implementation of a new oil and gas firing system for a steam generator plus retrofit of a catalytic DeNO&lt;sub&gt;x&lt;/sub&gt; system, 200 t/h, Heavy Fuel Oil and Low-Pressure-Gas, Shell Wesseling, Germany</td>
<td>Shell Deutschland Oil GmbH, Wesseling, Germany</td>
</tr>
<tr>
<td>Study for capacity increase of firing system, Coke-Oven Gas, 240 MWe, CHP Hamborn 5, Germany</td>
<td>RWE Service GmbH, Germany</td>
</tr>
<tr>
<td>Basic engineering and supply for gas connection installation, retrofit for additional natural gas firing system, Tiefstack PS, Germany</td>
<td>Vattenfall Europe Hamburg AG, Germany</td>
</tr>
<tr>
<td>Engineering and supply of oil atomizer lances and atomizer sprayer, Mainova, Germany</td>
<td>MAINOVA, Frankfurt, Germany</td>
</tr>
<tr>
<td>Engineering and supply for retrofit of burner level oil-to-gas firing, 2x750 t/h, Refinery Residues and Heavy Fuel Oil, PCK Schwedt, Germany</td>
<td>PCK Raffinerie GmbH, Schwedt, Germany</td>
</tr>
<tr>
<td>Supply of oil control valve stations, Heavy Fuel Oil and Low-Pressure Gas, Shell Wesseling, Germany</td>
<td>Shell Deutschland Oil GmbH, Wesseling, Germany</td>
</tr>
<tr>
<td>Supply, erection and commissioning of 12 optimized oil burner inserts, CHP West Unit 2, Germany</td>
<td>MAINOVA, Frankfurt, Germany</td>
</tr>
<tr>
<td>Feasibility study for gas conversion, 300 MWe, Bituminous Coal, Tiefstack PS, Germany</td>
<td>VPC GmbH, Vetschau, Germany</td>
</tr>
<tr>
<td>Oil atomizer lances for an ignition system for the heat power plant 2x200 MWe, Bituminous Coal, Tiefstack PS, Germany</td>
<td>Vattenfall Europe Hamburg AG, Germany</td>
</tr>
<tr>
<td>Study for capacity increase, coke gas firing system, 2x307 MWe, Huckingen PS, Germany</td>
<td>RWE AG, Essen, Germany</td>
</tr>
<tr>
<td>Engineering and supply of optimized oil lances, 340 MWe, Knepper PS, Germany</td>
<td>E.ON Engineering GmbH, Gelsenkirchen, Germany</td>
</tr>
<tr>
<td>Supervision of revamping at refinery steam generators, life extension and environmental upgrading, Germany</td>
<td>MIRO, Karlsruhe, Germany</td>
</tr>
<tr>
<td>Engineering for retrofit of an SCR-DeNO&lt;sub&gt;x&lt;/sub&gt; plant, 200 t/h, Heavy Fuel Oil and Low-Pressure-Gas, Shell Rheinland Refinery, Germany</td>
<td>Shell Deutschland Oil GmbH, Wesseling, Germany</td>
</tr>
<tr>
<td>Review of firing concept for BAO Steel, 1,170 t/h, Blast Furnace Gas</td>
<td>Babcock Hitachi Europe GmbH, Oberhausen, Germany</td>
</tr>
</tbody>
</table>
COMBUSTION SYSTEMS

BITUMINOUS COAL AND SUB-BITUMINOUS COAL COMBUSTION SYSTEMS

SM V** COAL BURNER

**Registered trademark, Staged Mixing Burner

APPLICATION
Power Plants and Industrial Boilers
NOx reduction, extension of fuel range, efficiency increase

Benefits
- Optimized engineering based on CFD simulation calculations without expensive trials
- High availability and efficiency
- Increase in operational flexibility
- Reliable solution based on decades of experience

TECHNICAL DATA
Burner Type:
SM V** Coal Burner
Burner Capacity:
15 MWth – 100 MWth

Emissions:
- CO <100 mg/m³ (STP)
- NOx <280 mg/m³ (STP)

FUEL TYPE
Bituminous Coal
- Water: 5 – 38 % ar
- Ash: 10 – 40 % ar
- VMdaf: 15 – 45 %
- LCV: 12 – 32 MJ/kg

SCOPE OF SUPPLY
- Consultancy
- Design of burners
- Process engineering
- Design of furnace
- CFD simulations of boiler furnace and combustion system
- Supply and installation of firing system components including burners, OFA, etc.
- Adaptation of I & C
- Commissioning
- Optimization

REFERENCE LIST EXCERPT

REFERENCE
Modification and capacity increase of Low NOx firing system, Bituminous Coal, 330 MWel, Altbach PS, Germany
EnBW Kraftwerke AG, Karlsruhe, Germany

Modernization of firing system and extension of coal range, installation of Low NOx burners, 500 MWel, Bituminous Coal, Herne PS Unit 4, Germany
STEAG GmbH, Essen, Germany

Investigation and recovery scope development support after boiler damage, 600 MWel, Bituminous Coal, Duvha PS, South Africa
Eskom Enterprises, Johannesburg, South Africa

Modification of the firing system and installation of Low NOx burner, 550 MWel, Bituminous Coal, Rheinhafen-Dampfkraftwerk (RDK) PS Unit 7, Germany
EnBW Kraftwerke AG, Karlsruhe, Germany

Concept design study for Low NOx burner technology, 200 – 730 MWel, Bituminous Coal, ESKOM’s fleet, South Africa
Eskom Enterprises, Johannesburg, South Africa

Engineering support for manufacturing, installation and commissioning of PF burners, 200 MWel, Bituminous Coal, Camden PS, South Africa
Eskom Enterprises, Johannesburg, South Africa

Modification of the firing system and installation of Low NOx burner, 700 MWel, Bituminous Coal, Mehrum PS, Germany
Balcke-Dürr GmbH, Ratingen, Germany, for E.ON Power

Boiler design review and study for future change in coal quality, 6 x 600 MWel, Bituminous Coal, Tutuka PS, South Africa
Eskom Enterprises, Johannesburg, South Africa

Design study on coal range extension in supercritical utility boilers, 5 x 630 MWel, Bituminous Coal, Mundra PS, India
Coastal Gujarat Power Generation, Mumbai, India

Boiler concept study for coal range extension, 445 MWel, Bituminous Coal, CHP Altbach I, Germany
EnBW Kraftwerke AG, Karlsruhe, Germany

Concept study for coal range extension at 6 x 600 MWel, Bituminous Coal, Duvha PS, South Africa
Eskom Enterprises, Johannesburg, South Africa

Boiler concept study for capacity increase and coal range extension, 330 MWel, Bituminous Coal, CHP II Altbach PS, Germany
EnBW Kraftwerke AG, Karlsruhe, Germany

Conceptual design for adaptation of firing equipment to an extension of acceptable coal specification, 2 x 100 MWel, Bituminous Coal, Tiefstack PS, Germany
Vattenfall Europe Hamburg AG, Germany

LEGEND

PS: Power Station  SCR: Selective Catalytic Reduction  FGD: Flue Gas Desulphurization
PF: Pulverized Fuel  STP: Standard Temperature and Pressure  CFB: Circulating Fluidized Bed
CHP: Combined Heat & Power Plant HRSG: Heat Recovery Steam Generator  ESP: Electrostatic Precipitator
APPLICATION

**COMBUSTION SYSTEMS**

**CIRCULATING FLUIDIZED BED BOILER**

- Tailor-made design to meet customer-specific requests and space limitations
- Sub- and super-critical boiler design with and without reheater
- Advanced nozzle cap design for optimized fluidization
- Refractory protection for critical zones in furnace
- Cyclone configuration for optimal arrangement of plant components
- Convective pass with low erosion design

**BOILER TYPE**

- Natural circulation
- Once through

**FUEL TYPE**

- Lignite
- Bituminous coal
- Biomass
- Waste fuels
- Pre-dried lignite
- Co-firing of various fuel types

**SCOPE OF SUPPLY**

- Consultancy
- Sophisticated calculation tools for flow and heat transfer
- Engineering from concept to detail
- Supply of core components
- Site supervision, commissioning
- Optimization

**APPLICATION BOILER TYPE SCOPE OF SUPPLY**

- Power Plants and Industrial Boilers
- Circulating fluidized bed boiler with direct desulfurization

**Benefits**

- Tailor-made design to meet customer-specific requests and space limitations
- Sub- and super-critical boiler design with and without reheater
- Advanced nozzle cap design for optimized fluidization
- Refractory protection for critical zones in furnace
- Cyclone configuration for optimal arrangement of plant components
- Convective pass with low erosion design

**BOILER**

- Bunker
- Fuel handling
- Turbine

**REFERENCE LIST EXCERPT**

**REFERENCE**

- Layout and basic engineering for heat and power CFB steam generator, 901 t/h, Lignite, Tabor PS, Czech Republic
- Basic design review CFB boiler, 330 MWel, Lignite, Stanari PS, Bosnia & Herzegovina
- Basic design engineering for a process steam CFB boiler, 35 t/h, Bituminous Coal, new-built plant, Vietnam
- Basic and partial detail design for 2 x 270 MWel CFB boilers, Beel PS, India
- Engineering for CFB Boiler, Low Rank Coal, 2 x 80 t/h, Indonesia
- Study for CFB operation boiler 6, comparison of operation values with initial design parameters, Pre-Dried Lignite, 248 MWth, Merkenich PS, Germany
- Know-how transfer and training in the design of CFB boilers, Eskom Enterprises, South Africa
- Consultancy and supervision services – Owner’s engineer for the construction of the 330 MWel lignite-fired thermal power plant Stanari, Bosnia & Herzegovina
- Know-how transfer and technical training for circulating fluidized bed boilers (CFB), Indonesia
- Know-how transfer – Engineering for circulating fluidized bed (CFB) boiler technology
- Pressure part layout and design for CFB steam generators, 2 x 250 MWel, Lignite, Neyveli PS, India
- CFBC market study
- Engineering for standardization of CFB design, Biomass, IHI, Tokyo, Japan

**CLIENT**

- CKD Praha DIZ a.s., Prague, Czech Republic
- EFT Group, Belgrade, Serbia
- Martech Boiler Company, Ho Chi Minh City, Vietnam
- AE&E Lentjes GmbH, Ratingen, Germany
- PT. ZUG Industrie Indonesia, Jakarta, Indonesia
- RheinEnergie AG, Cologne, Germany
- Eskom Enterprises, Johannesburg, South Africa
- EFT – Rudnik i Thermelektra- na Stanari d.o.o., Belgrade, Serbia
- PT. ZUG Industrie Indonesia, Jakarta, Indonesia
- PJSC EMAlliance, Taganrog, Russian Federation
- AE&E Lentjes GmbH, Ratingen, Germany
- Babcock-Hitachi Europe, Oberhausen, Germany
- IHI Corporation, Tokyo, Japan

**LEGEND**

- PS  Power Station
- PF  Pulverized Fuel
- CHP  Combined Heat & Power Plant
- SCR Selective Catalytic Reduction
- STP Standard Temperature and Pressure
- HRSG Heat Recovery Steam Generator
- FGD Flue Gas Desulfurization
- CFB Circulating Fluidized Bed
- ESP Electrostatic Precipitator
### APPLICATION
- Power Plants and Industrial Boilers
  - NO\textsubscript{x} reduction, extension of fuel range, efficiency increase
- Benefits
  - Optimized engineering based on CFD simulation calculations without expensive trials
  - High availability and efficiency
  - Increase in operational flexibility and capacity
  - Reliable solution based on decades of experience

### TECHNICAL DATA
- **Burner Type:** RSM\textsuperscript{®} Lignite Burner
- **Burner Capacity:** 30 – 150 MW\textsubscript{th}
- **Emissions:**
  - CO: <200 mg/m\textsuperscript{3} (STP)
  - NO\textsubscript{x}: <200 mg/m\textsuperscript{3} (STP)

### SCOPE OF SUPPLY
- Consultancy
- Process engineering
- Furnace design
- CFD simulations of boiler furnace and combustion system
- Design of burners
- Supply and installation of firing system components including burners, OFA, etc.
- Adaptation of I & C
- Commissioning
- Optimization

### FUEL TYPE
- Lignite
  - Water: 25 – 70% ar
  - Ash: 0 – 50% ar
  - VM daf: 30 – 70%
  - LCV: 3.5 – 22 MJ/kg

### LEGEND
- PS: Power Station
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## COMBUSTION SYSTEMS

### DRY LIGNITE COMBUSTION SYSTEMS

![Dry Lignite Vortex Burner](image)

- **HIGH FLEXIBILITY, AVAILABILITY & EFFICIENCY**
- **RELIABLE USE IN CO-FIRING**

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>TECHNICAL DATA</th>
<th>SCOPE OF SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Fired Power Plants and Industrial Boilers</td>
<td><strong>Burner Type:</strong> Integrated Vortex Burner</td>
<td>Consultancy</td>
</tr>
<tr>
<td></td>
<td><strong>Burner Capacity:</strong> 10 – 100 MW</td>
<td>Design of burners</td>
</tr>
<tr>
<td></td>
<td><strong>Emissions:</strong> CO &lt; 100 mg/m³ (STP) NOₓ &lt; 190 mg/m³ (STP)</td>
<td>Design of furnace</td>
</tr>
<tr>
<td></td>
<td><strong>FUEL TYPE</strong> Pulverized Dried Lignite</td>
<td>Process engineering</td>
</tr>
<tr>
<td></td>
<td>Water: 10 – 20% ar</td>
<td>CFD simulations of boiler furnace and combustion system</td>
</tr>
<tr>
<td></td>
<td>Ash: 4 – 16% ar</td>
<td>Supply and installation of burners including all related components</td>
</tr>
<tr>
<td></td>
<td>VMdaf: 30 – 70%</td>
<td>Commissioning</td>
</tr>
<tr>
<td></td>
<td>LCV: 18 – 22 MJ/kg</td>
<td>Optimization</td>
</tr>
</tbody>
</table>

### REFERENCE LIST EXCERPT

<table>
<thead>
<tr>
<th>REFERENCE</th>
<th>CLIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering for C&amp;I implementation for dry lignite test burner, 20MWh, Lignite, RWE Ibbenbüren PS, Germany</td>
<td>RWE, Essen, Germany</td>
</tr>
<tr>
<td>Study for integration of TBK (pre-dried lignite) burner in anthracite slag-tap firing system, 848 MWel, Bituminous Coal, Ibbenbüren PS, Germany</td>
<td>RWE Service GmbH, Nordhorn, Germany</td>
</tr>
<tr>
<td>Engineering service for support during bidding phase for design of boilers including a co-firing concept, 2 x 550 MWel, Pre-Dried Lignite, Niederaussem PS Unit K, Germany</td>
<td>Ishikawajima-Harima Heavy Industries Co., Ltd., Tokyo, Japan</td>
</tr>
<tr>
<td>Concept design study for optimization of firing system considering dry lignite burners, 2 x 550 MWel, Lignite, Niederaussem PS Unit K, Germany</td>
<td>RWE Power AG, Essen, Germany</td>
</tr>
<tr>
<td>Concept study for a 1,100 MWel dry lignite-fired steam generator, Japan</td>
<td>Ishikawajima-Harima Heavy Industries Co., Ltd., Tokyo, Japan</td>
</tr>
<tr>
<td>Design study for a supercritical steam generator fired with Pre-Dried Lignite without flue gas circulation, Germany</td>
<td>RWE Power AG, Essen, Germany</td>
</tr>
<tr>
<td>Feasibility study for the implementation of dry lignite burners including test phase, Germany</td>
<td>RWE Power AG, Essen, Germany</td>
</tr>
</tbody>
</table>

### LEGEND

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RELY ON GOOD EXPERIENCES

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