

Babcock Borsig Steinmüller GmbH

Modernisation of Hard Coal Fired Steam Generators

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Some good reasons for modernisation



- Contribution to assure sufficient generation capacity
- Fast track realisation
- Same additional life time as a new plant
- Efficiency increase \rightarrow lower operating cost
- Emission of NOx and CO meet EU regulations
- Modernisation projects financially attractive
 - meeting the project time schedule
 - project cost substantially lower than for new built
 - reaching ROI





BBS Rehabilitation Experience

More than 600 executed projects and studies over last 30 years

- Re-vitalisation back to original design and performance
- Solution for plant specific problems •
- Upgrade of firing system, NOx reduction, fuel change
- **Increase of performance and efficiency** •
- Improvement of reliability and availability
- Lifetime extension
- **Capacity increase**





Typical steam generator problems





Typical measures



- Pressure part modification to reach steam temperature and pressure
- Update of the combustion system to state-of-the-art
- Improve existing mills or install new mills for new coal features
- Optimization of excess air ratio
- Reduction of air heater leakage
- Reduction of ducting leaks
- Repair / modification / replacement of important components



Coal burner technology

Low NOx burner





- Outstanding flame stability
- Low burner part load
- Operation performance independant on coal
- Low NOx emission

Burner design for perfect flame stability



- ✓ Flame stabiliser design
- ✓ Fine grinding of coal dust
- Uniform distribution of pulverized fuel and air to the burners
- ✓ Flow pattern in the near burner flame



Designed by CFD analysis







Velocity distribution in the near burner flame

Operating with desired performance





Dream team – State-of-the-art burners and a well designed furnace





Low-NO_x-burner

- Special flow pattern in the near burner area
- Ignition at burner tip
- Minimum oxygen in the primary flame
- Controlled mixing process in the near burner flame

Optimised air balance in the furnace

- Total air ratio as low as possible
- Reasonable air ratio for the burners
- Air staging by over fire air and
- Side wall air to avoid furnace wall corrosion



Coal preparation technology

BBS bowl mill





Line of sizes

Capacity range 30 - 110 t/h

Designed for hard coal

HGI	35 -120
Water content	7 - 22 %

International standards

NFPA, EN, GHOST

BBS-245 mills in Voerde P.S.

- Designed for world wide hard coal
- Capacity: 110 t/h for guarantee coal
- Grinding table: 2450 mm
- Water content: 8 19 %
- Coal dust Fineness: 6 10 % R 0,09 mm
- Operation since 2009



POWER SYSTEMS

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BILFINGER

Mills and feeders



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Gravimetric coal feeding

- World wide coal
- Dosing accuracy +/- 0,5 %

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Experience

Modernisation experience Belchatow units 3 - 5 and 7 - 12

Lifetime extension, capacity and efficiency increase, NOx reduction

- Modification of Eco heating surface
- Enlarging the SH1 superheater
- Adjusting the RH1 reheater surface
- Replacing the final superheater and reheater
- Redesign of evaporator walls
- Replacement of furnace hopper, p.f. lines, burners and over-fire air systems
- Replacement of steam pipes and valves





Operating experience – hard coal plants



Combustion of various coals from

- South Africa and South America
- Russia and Poland
- Germany

Improvement of operating performance

- NOx reduction and flame stability
- Service life of wear parts
- Boiler efficiency
- Availability of the plants



Project procedure

1. Investigate actual status of the plant

- Collect operating data and available documentation of the plant
- Understand operating problems, constraints, causes for failures etc.
- Check actual arrangement and accessibility

2. Develop the appropriate modernisation concept

- Thermal calculations and strength calculations
- Combustion analysis including CFD for the furnace and special flow isssues
- Investigation of remaining lifetime
- Concept engineering for required modifications



Realisation of the project







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Thank you for your attention

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