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 → 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
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

- Superheater/Reheater lifetime expired
- Burner belt slagging
- Air preheater leakages
- Uneven burner coal to air ratio
- Undersized mills
- Grinding fineness not adequate
- Uneven fuel distribution
- Mill reliability insufficient
- Excessive mill wear
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 independent 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\textsubscript{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
Mills and feeders

Gravimetric coal feeding

- World wide coal
- Dosing accuracy +/- 0.5%
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

to the benefit of our customers
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 issues
   - Investigation of remaining lifetime
   - Concept engineering for required modifications

Realisation of the project
Thank you for your attention

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