**Turbomachine Technology**

World-wide service of steam turbines and generators. More than 20 years experience and extensive references.

**SERVICE OF STEAM TURBINES AND GENERATORS**

Babcock Borsig Steinmüller is an Independent Service Provider for steam turbines and generators including related systems and auxiliaries. Based on the experiences of successfully performed service activities on more than 130 steam turbine units up to a power output of 350 MW, Babcock Borsig Steinmüller has built up and secured a long-term know-how and has gained extensive experience in various design-types of almost all original equipment manufacturers (OEMs). Through its engineering and design competence Babcock Borsig Steinmüller is able to provide customers with improved solutions for parts and components.

**RANGE OF SERVICES**

Babcock Borsig Steinmüller addresses the complete range of customer’s service requirements from:

**CONDITION ASSESSMENT OF TURBINE COMPONENTS AND PARTS INCLUDING:**
- Rotors
- Casings
- Valves
- Steam path components (moving and stationary blades, rotor and casing seals)

**INSPECTIONS, MAJOR OVERHAULS AND REPAIR**
- Turbine inspections using endoscopes
- On-site management of major overhauls by experienced turbine specialists
- Non-destructive testing
- Planning of inspections and major overhauls
- Re-engineering of components and parts as well as their supply
- Repair solutions for damaged components and parts, execution of on-site repair work
- Re-conditioning and repair of components and parts at specialized workshops or on-site
- In-site machining of turbine components using portable devices
- Installation of blades on turbine rotors and casings with subsequent balancing of rotors
- Advisory services & supervision of customer activities
TYPICAL SERVICE ACTIVITIES

On the basis of condition assessments after disassembly Babcock Borsig Steinmüller offers for:

HP AND IP TURBINES
- Inspection of rotors, casings, inlet nozzles and components of steam path
- "Re-conditioning" of inlet nozzles (welding, thermal stress relief, machining)
- Supply of new inlet piston rings
- Weld repair of cracks in casings
- Repair of rotor and casing seals (fitting of new sealing strips using the Mobile Lathe of BBS)
- Cleaning and machining of grooves in casings (using portable machining devices)
- Inspection and overhaul of bearings with supply of new bearing shells
- Inspection and overhaul of valves with supply and installation of replacement spindles

LP TURBINES
- Inspection of rotors, casings and components of steam path
- Weld repair of blades (welding, reinstallation of stellite, thermal stress relief, machining)
- Weld repair of cracks in casings
- Installation of new sets of last stage blades (re-engineered and bought or from customers stock of spare parts)
SCOPE OF SUPPLIES

On the basis of condition assessment of components after disassembly Babcock Borsig Steinmüller offers:

- Planning and execution of complete major overhauls including supply (also new manufacture) of the required spare parts
- Repair and refurbishment of parts, components, equipment in workshops or on-site at the power plant
- Elimination of generic issues through supply of replacement parts with improved solutions

ON-SITE MACHINING OF COMPONENTS OF TURBINES AND GENERATOR ROTORS

For location-independent machining of components and repair work on large rotationally symmetric components, Babcock Borsig Steinmüller uses a specially designed Mobile Lathe with specialised operating personnel for:

- CNC machining of turbine and generator rotors of all types
- Execution of repair work within the framework of rotor service, for example:
  - Reworking of bearing journals
  - Corrective maintenance of sealing strips
  - Remachining of the shrouds of the moving blade rows
  - Low-speed balancing of components

ADVANTAGES OF USING THE MOBILE LATHE

- Minimizing of required outage time
- Direct incorporation into the general overhaul schedule
- Fast reaction in case of failure and findings
- Reduction of transport and failure risk of the equipment (risk of extended interruption of operation)
- Reduction in costs due to saving of transport costs and reduction in outage time
- Component-specific quality inspections and evaluation on site
- Professional and specialized operating personnel

TECHNICAL PARAMETERS

- Workpiece weight: Up to 50 tonnes (possible weight up to 100 tonnes, detailed review on request)
- Component diameter: Up to 4 meters (on request)
- Bearing journal diameter: From 100 to 1000 millimeters
- Distance between bearing journals: Standard up to 10 meters (or possible on request)
- Machining accuracy: Up to 0.01 millimeters
- Space requirement on site: About 75 square meters
- Electrical connection: 380 / 440V, 22kW / 110 / 220V / 50 / 60 Hz
- Control: CNC or manual control
- Transport: 20ft container-standard
PerFormance oF special repair work

Babcock Borsig Steinmüller offers its customers full technical competence and experience for the execution of special repair work on main components of turbines:

- Thermal straightening of rotors with final machining and dynamic balancing
- Rebuilding of damaged rotor discs by welding including heat treatment and final machining
- Restoration of turbine parts by weld repair, for example: repair of nozzle and moving blades

This work will be performed after detailed material testing (structure examination and hardness tests) and documentation of the damaged as well as of the original component geometry. By implementation of repair solutions, the full serviceability of the respective component is achieved. Lengthy and highly cost-intensive new manufacture of parts is avoided.

ADDITIONAL SERVICE

Beyond maintenance, overhaul and repair Babcock Borsig Steinmüller offers additional services, such as:

- Assessment and overhaul of turbine control systems
- Assessment and overhaul of turbine related auxiliaries
- Training of customers maintenance personnel
- Field advisory service on behalf of customers
- Re-engineering of parts and components

REFERENCES

TURBINE SERVICE (SELECTED REFERENCES)

2011 COBURG TS1 AND TS 2 WASTE INCINERATION CHP PLANT, ZAW, GERMANY
General inspection of the 5 MW Siemens steam turbine including corrective maintenance of the oil supply system, bearings and components of the turbine governing system, inspection and general overhaul of the generators

2010 ENSDORF POWER PLANT, UNIT 3, VSE, GERMANY
General overhaul of the HP turbine of a 315 MW Alstom (MAN) steam turbine including corrective maintenance of the steam chest and sealings, sealing areas of the diaphragms as well as of the rotor turning gear

2009 BREMEN, SWB, WIP (WASTE INCINERATION PLANT), GERMANY
Repair of turbine bearing and intermediate rotor of a 30 MW FTM steam turbine / generator

2008 BREMEN SWB, WIP, GERMANY
New installation of a 30 MW FTM steam turbine / generator including auxiliary systems
2007  TRIPOLI WEST POWER PLANT, GECOL, LIBYA
Repair of the HP rotor of a 120 MW BHEL steam turbine by thermal straightening including rebuilding of rotor disks as well as supply and installation of new moving blades with subsequent high-speed balancing of the rotor

2006  TUNÇBİLEC PS, EUAS, TURKEY
General overhaul of a 65 MW Elin turbine steam turbine: thermal straightening of the HP rotor, supply and installation of two rows of moving blades and balancing of the rotor, site management

2006  SUCEAVA INDUSTRIAL PP, SC AMBROS, ROMANIA
Partial upgrade of a Skoda steam turbine (supply and installation of the moving blading for all stages, replacement of the diaphragms), partial upgrade of a Skoda generator (inspection, replacement of rotor and stator windings, replacement of the end caps)

2002  KOSOVO “B” POWER STATION, MINISTRY OF ENERGY, EX-YUGOSLAVIA
General overhaul and repair of a 340 MW ALSTOM (MAN) steam turbine: replacement of the valve chest of a combined stop and control valve, inspection of the generator, supply and installation of new end caps

2000  ENSDORF POWER PLANT, UNIT 3, VSE, GERMANY
Major overhaul of a 300 MW ALSTOM (MAN) steam turbine: repair welding of the HP inlet nozzles and diaphragms, repair of the last-stage blades using new Stellite inserts

BABCOCK BORSIG STEINMÜLLER IS YOUR PARTNER FOR SPECIALIZED SERVICE OF STEAM TURBINES AND GENERATORS:
- Turbine maintenance, inspection, repair (supply of parts, repair of components, improvement of parts and components)
- Restoring of the turbine output after evaluation of turbines, components and systems
- On-site Machining during major overhauls of rotors with own Mobile Lathe
- On-site machining of casings and components