Optimax BoilerLife
Monitor boiler components’ lifetime consumption
OPTIMAX® BoilerLife Challenge

- Increased use of steam generators for the cover of intermediate and peak load
- Higher load change rates
- Higher requirements for the design of highly stressed components
- Increasing efficiencies and therefore increased steam parameters
Features

- Online calculation of fatigue for critical boiler components
- TÜV-certified, EN12952-4 (10/2011)
- Monitoring of various units with one software package
- Archiving of all results in a database
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Solution examples of application

Thickwalled components
- Superheater
- Reheater
- Steam drum
- Separators
- T-compounds
- Pumps
- …

Piping
- Fittings
- Pipes
- Elbows
- …
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Creep and low cycle fatigue

High pressure and high temperature → Thick component wall → Temperature gradient

Creep damage → Low cycle fatigue

Limited service life

Replacement of components costs → (Un-)planned outage costs
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Design vs. operation

- Unit maintenance
- New unit operation
- Unit Trip

Design | Operation

- 14.11.84
- 11.08.87
- 07.05.90
- 31.01.93
- 28.10.95
- 24.07.98
- 19.04.01
OPTIMAX® BoilerLife Archiving

- Archiving of all relevant information over the entire service life of the power plant
  - Measuring values and calculation results are stored by the PGIM
  - Information about the stress and strain history is stored in the Optimax Lifetime Monitoring application database

- Advantage
  - Easy analysis of any process situation leading to increased service life consumption
  - Enable the engineers in charge of mechanical equipment to use the Lifetime Monitoring information directly at their desktop
  - The system is ready for future recalculation of the component status in case calculation algorithms will be changed
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Required instrumentation

- Data points for each boiler component
  - Steam Pressure
  - Inner surface (metal) temperature
  - Temperature difference calculation module replace mean wall (metal) temperature
  - Steam temperature instead of metal temperature is sufficient if the component is monitored for creep rupture only

- Data points for each boiler (statistics)
  - Boiler on/off
  - Main steam flow
  - Superheater outlet (metal) temperature
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Temperature difference $\Delta T$ and thermal stress

**TRD** (German guideline for steam boilers)
- With two measurements:
  \[ \Delta T_{\text{adjusted}} = \Delta T_{\text{measured}} \cdot f_k \]
  with $\Delta T_{\text{measured}} = T_x - T_m$ and $f_k$: correction factor

**TEDIBER** (temperature difference calculation)
- Only one measurement necessary ($T_x$)
- Calculation of $T_m$ with one dimensional heat transfer (Fourier)

**Advanced TEDIBER** without metal temperature measurement
- Main steam flow
- Steam temperature
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Used directives and standards

TRD 508:
long-term monitoring of boilers

TRD 508 Attachment 1
calculation methods when using computer-based monitoring

TRD 30x
stress calculation

TRD 10x
material requirements

VdTÜV 451-87/1 ; 451-87/3
451-87/1: load cycle count
451-87/3: requirements for the data acquisition
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TÜV certification
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Services and engineering

- Consulting and support
  - Recommendation: scope of monitoring
  - Engineering forms for acquisition of component and material data
  - Remote diagnosis and analysis
- Engineering
  - Acquisition of component data
  - Acquisition of material data
  - Input of data into the Optimax Lifetime Monitoring Database
  - Consistency check of the data
  - Integration test
- On-site installation and start-up
  - System and software
  - Startup and test
  - ‘As built’ documentation
- Training
  - On-site training and classroom training at ABB
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Benefits

- Have the information about the lifetime status of the critical components available online, whenever needed
- Be sure that components will:
  - not fail unexpectedly or
  - have to be replaced before they are written off
- Reduce costs for component surveillance
- Documented evidence of operational use of equipment
- Improved boiler maintenance scheduling, based on actual documented service life
- No sudden unexpected failure of thick-walled boiler components and therefore better exploitation of components
Power and productivity for a better world™
## OPTIMAX® BoilerLife

### References

<table>
<thead>
<tr>
<th>Power Plant / Customer</th>
<th>Size of Plant</th>
<th>No. Boilers</th>
<th>Components</th>
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