

BoilerLife

Monitor boiler components lifetime consumption



ABB's BoilerLife monitors boiler and steam pipes thick-walled components lifetime consumption. The thick walled components are subject to creeping caused by steam pressure and cyclic strain exhaustion caused by thermal stress induced from temperature cycles.

Nowadays, the fluctuating load of wind and photovoltaic renewables require increasing flexibility of fossil fired power plants. The amount of start-ups and load changes are increasing, causing increased life time consumption. Plant maintenance personnel need to analyze thick-walled components in order to detect unexpected increase of life time consumption. In order to prolong the boiler operation concession of the local authorities the plant maintenance personnel are supported by documented evidence of lifetime consumption.

Challenge

Component stress in steam generators are strongly influenced by start-up and shut-down operations as well as varying load cycles in the form of varying steam pressures and high thermal stresses. The varying loads lead to cyclic strain exhaustion. Another impact is the steam pressure causing time dependent creeping. Service life of the pressure parts is dependent on both cyclic loading and creeping.

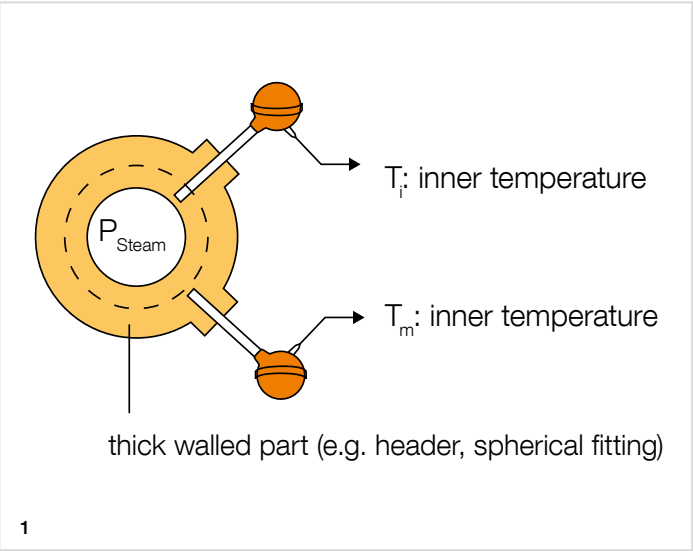
Solution

Optimax® BoilerLife Monitoring is a state-of-the-art lifetime monitoring package for boilers or heat recovery steam generators. It provides power plant operators, engineers, and plant managers with automatic monitoring and prediction of critical component exhaustion in accordance with European EN 12952-4 specification and German TRD 301, 508 rules.

ABB's BoilerLife documents the lifetime consumption towards concession authorities while the ABB's BoilerMax controls the lifetime consumption of thick-walled components.

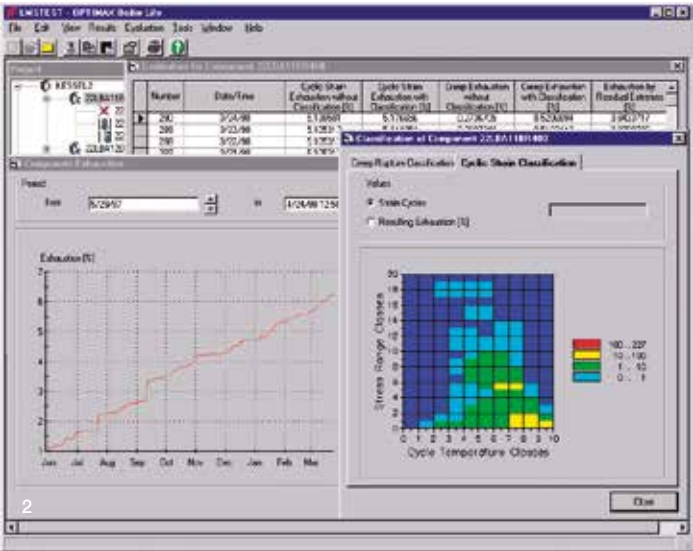
Services

ABB takes over complete turnkey responsibility for engineering, installation, training, commissioning and support.



1

1 Working Principle of BoilerLife | 2 Graphical user interface



2



1

1 Rostock Hardcole Power Plant, Germany | 2 Amer 8 STPP, Netherlands



2

Working principle of BoilerLife

The Optimax BoilerLife program system allows a computer-aided determination of the general degree of exhaustion of thick-walled steam-generating components which are subject to pressure and temperatures under consideration of the defined parameters in TRD 301, 508 and EN12952-4 plants.

The thick-walled components are defined with material and geometry parameters. The data required for the calculations such as pressure, temperature and wall temperature difference, are determined as a function of time and organized into classified data prior to further processing.

The process requires recording the values from three measuring points (pressure, temperature at the inner surface, middle wall temperature) for each component. If one of the measuring points is missing, the BoilerLife measurement data recording system offers the possibility of determining the point by utilizing existing measurements. The temperature difference between the inner surface and the middle wall temperature can thus be determined, for example, by utilizing the temperature reading near the inner surface in conjunction with the available program module TEDIBER.

The data is classified by temperature and pressure ranges (creep exhaustion) and by temperature and stress ranges (cyclic strain exhaustion). At the same time, the exhaustion of the component is calculated directly for every measurement cycle and added to an exhaustion counter ("Exhaustion without classification").

Program features

- Stress computation on the interior surfaces from sensor values (pressures, metal temperatures, temperature differences) according to TRD 301 annex 1
- Load cycle counting in accordance with a modified Rain Flow algorithm
- Validity checking by configuring optional limit parameters in the database (lower and upper limit, gradient, deviation)
- Temporary use of substitution values, in case of sensor faults, by automatically switching to substitution values (constant or another sensor)

Another strategy is to

- Estimate stress progression based on predefined comparable alternative components
- Data classification by grouping data into pressure/temperature ranges and cycle temperature/stress ranges; operation history is graphically depicted within these ranges
- Computed results are stored in the Optimax lifetime monitoring boiler database with the option of transferring specific outputs to the process data archive
- Certification to European EN 12952-4 specification and German TRD 301, 508 rules

The graphical user interface (see image 2) allows easy creation and maintenance of data sets for components, materials, measuring points, and allows the user to compose and trigger reports.

Benefits of BoilerLife

- Exploiting the results of BoilerLife for different ways to start-up the boiler, leads to improvement of plant start-up, plant shut-down and load transients with respect to minimized effect on overall boiler service life
- Increased lifetime consumption of similar boiler starts indicates faults, eg. leaks of water injection valves, excessive stress and costly repairs can be avoided
- Documented evidence of operational use of equipment including automatic report generation for authorities to shorten inspection time and save on inspection costs
- Improved boiler maintenance scheduling, based on actual documented service life
- The calculated lifetime consumption may be expressed as costs.

References

Rostock STPP, Germany

Coal fired unit 550 MWel, 30 thick walled components.

Amer 8 STPP, Netherlands

Coal fired unit 645 MWel, 24 thick walled components.

For more information please contact:

ABB Inc.

Power Generation

Wickliffe, Ohio, USA

Phone: + 1 440 585 3087

Email: powergeneration@us.abb.com

ABB S.p.A.

Power Generation

Genova, Italy

Phone: +39 01060731

Email: powergeneration@it.abb.com

ABB AG

Power Systems Division

68128 Mannheim, Germany

Phone: +49 621 381-1212

Email: powertech@de.abb.com

ABB Pte. Ltd.

Power Generation

Singapore

Phone: +65 6776 5711

Email: powertech@sg.abb.com

www.abb.com/power-generation

Note:

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB AG does not accept any responsibility whatsoever for potential errors or possible lack of information in this document

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB AG.

Copyright© 2014 ABB

All rights reserved