steag

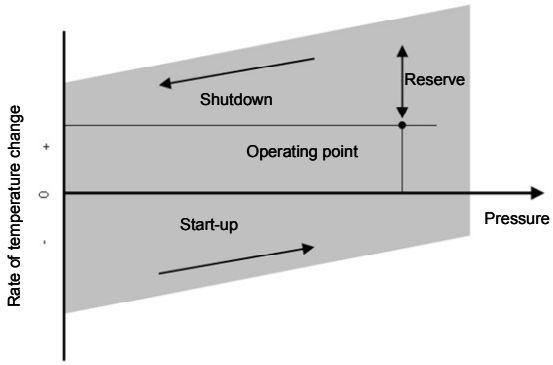
SR1
Lifetime Monitoring

Lifetime consumption of highly stressed, thick-walled components

How long can I continue to operate my power plant unit safely?

During operation, thick-walled components of a power plant unit have to continuously withstand high pressure and temperature loads. Sudden failure of such components is a serious safety risk. Hence, the expected material fatigue is taken into account in the dimensioning and design of the individual components. But the actual fatigue of the materials used does not increase in a linear manner as time passes; rather, it depends to a large extent on how the unit is operated. Consequently, after several years of operation, the operating risk and the uncertainty as regards the actual remaining life of the components increase.

Calculating the admissible temperature gradients and reserve



The reserve is the difference between the component-specific limit curves and the operating point.

So, SR1 can be equipped with a feature to calculate reserves. The difference between the admissible temperatures and the actual temperatures is shown as the reserve. This requires knowledge of the temperature field within the wall of the component.

The SR1 reports provide data

SR1 is a expert system for continuous monitoring of stress on thick-walled components of power plant boilers and turbines based on the procedure defined in the official TRD code and DIN EN 12952. The SR1 report provides the following results for each monitored component:

Total fatigue
= f (creep, fatigue)

Creep
= f (pressure, temperature)

Fatigue
= f (pressure, temperature, differential temperature)

Matrices for hours of operation and load changes

SR1 can determine the temperature profile within the wall of the component from the time-related changes in the temperature of the medium. In SR1, this is done by taking account of the heat transfer relationships of the inner and outer walls of the component. This reduces the need for technical measuring equipment. If the temperature profile inside the wall of the component has already been measured by technical means, SR1 can make use of this data.

Applications

- Plants with highly stressed, pressurised components, such as tubes, collectors, and other hollow components that are typically found in steam generators in industry. Because of the high process temperatures, these components are subject to time-related ageing and are usually the components with the shortest life expectancy.
- It is also possible and sensible to use SR1 in older plants in order to provide reliable data about past component fatigue so that a decision can be made whether to extend the operating time or not. This also applies when no continuous SR1 lifetime monitoring or

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IT-supported data storage has taken place before and when the operation data from the past is available only on paper strips.

- In addition, when online monitoring begins, it is possible to extrapolate backwards. When this is done, the currently registered fatigue gains are transferred to the history. After just roughly 5,000 hours of operation with online monitoring a reliable history can be generated.

- STEAG also offers the offline-calculation of consumed lifetime based on historical data as a service.

Benefits for the customers

Continuous lifetime monitoring with SR1 provides an important assessment basis for operators, certified monitoring bodies, and the responsible authorities in order to define and prolong the deadlines for legally prescribed recurring inspections. In the recurring inspections the components subject to the highest stress can be chosen on the basis of the continuous lifetime monitoring data. This allows inspections to be planned more precisely and effectively.

With the specific use of the existing reserves which can be determined optionally by SR1 start-up times can be reduced and the power plant can start generating electricity again sooner.

- Liberalised energy market:
  The effects of different block operation can be assessed in terms of material stress. The analysis allows decisions to be made regarding potential strategies for use of the units.

- Parallel to presentation in the SR1 reporting system at the site, the results of SR1 monitoring can also be exported to comprehensive data archives. This makes them available for deployment planning of an integrated power plant system.

- According to current regulations, lifetime monitoring with SR1 is deemed to be "condition analysis/ diagnostics during operation" and is an important module for condition monitoring and testing the components of boiler systems.

References

- Vattenfall, Germany: Reuter West, Moabit, Lippendorf, Boxberg, Wedel
- RWE, Germany: Neurath
- STEAG Power Saar, Germany: Weiher
- STEAG, Germany: Walsum
- NTPC, India: Simhadri, Rihand, Ramagundan, Vindhyachal, Bellary, Sipat, Kahalgon, Dadri, Korba
- DEWA, Dubai: Jebel Ali

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