



SPICA

On stream strain measurement for creep life monitoring

Creep is a main failure mechanism in steam lines operating at high temperature and pressure. In most cases creep life consumption is guarded with typical design code evaluations. Despite the fact that these evaluations have a conservative nature, the prediction is also based on global rupture rather than localized exhaustion of lifetime and does not deal with possible present deviations from the design with respect to material properties, load or geometry.

Normally, several investigation techniques, such as surface inspection, investigation of the micro-structure and mechanical investigation are used for periodic inspection. However, local micro-structural changes in heat-affected zones are brought about in a rather late phase of the life time. The more stable alloys, such as the ferrite 9-12% Cr-steels, show an even more postponed micro-structural change. Predictions for future operation is difficult to make with evaluations based on micro structure.

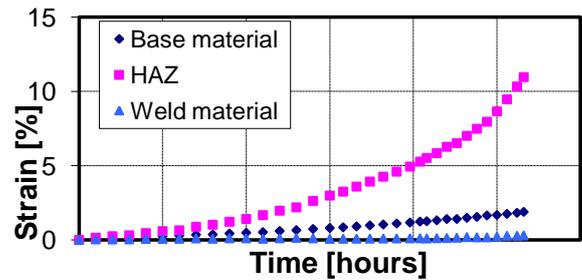
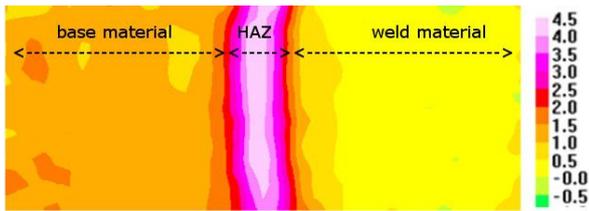
Creep strain is generally expressed in a creep damage parameter. The inelastic permanent strain due to creep can be measured with SPICA during operation. By using the strain fraction rule in combination with measured creep strain and creep strain limits, life time consumption can be effectively guarded.

How SPICA works

SPICA is measurement method especially developed for on stream strain measurement. This method includes:

- Selection of critical locations
- Mounting of sensors
- Taking pictures at high temperature
- Digital correlation analysis
- Evaluation of strain
- Determine creep life consumption
- Recommendations

SPICA results show the strain distribution in two orthogonal directions in which both local (Heat Affected Zone in welds) as integral strain are determined. If the strain is measured on a continuous base the strain rate and, with application of criteria for strain, the life time consumption due to creep can be predicted. This prediction is then based on the actual situation, i.e. material properties, geometry and load and for that reason very specific and relevant.



Benefits:

- Measurement of both local (Heat Affected Zone of welds) and integral strain
- In- service on- stream measurement
- Measurement of strain rate
- Higher safety with lower safety margins
- Prediction of creep life consumption
- Increased plant availability
- Cost savings due to:
 - reduction of inspection work during an overhaul
 - extension of inspection intervals
 - accurate life prediction, which allows for extended equipment service life, reduced plant downtime and increased production capacity

Why DEKRA?

The SPICA method has been developed in-home and there is over 20 years experience with strain measurement with SPICA. Extensive knowledge and experienced personal are available for condition assessment, failure analysis and RCA.



About DEKRA Material Testing & Inspections

DEKRA's Service Unit Material Testing & Inspection (MTI), which employs around 1,600 specialists worldwide, has recently been further strengthened by the integration of 24 experts from industrial classification, certification and advisory company DNV GL (formerly KEMA). The new team is based at DEKRA's purpose-built testing and laboratory facilities in Arnhem, The Netherlands. The acquisition is an important addition to DEKRA's industrial testing operations and marks a key step in the organisation's continued global expansion. DEKRA's MTI Service Unit is concerned with the inspection and testing of capital-intensive and business-critical systems and materials for numerous petrochemical, industrial and energy companies. DEKRA is one of the world's leading testing and certification organisations, with around 33,000 employees and activities in more than 50 countries. It is committed to ensuring longterm safety, quality and environmental protection in countless industries.

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