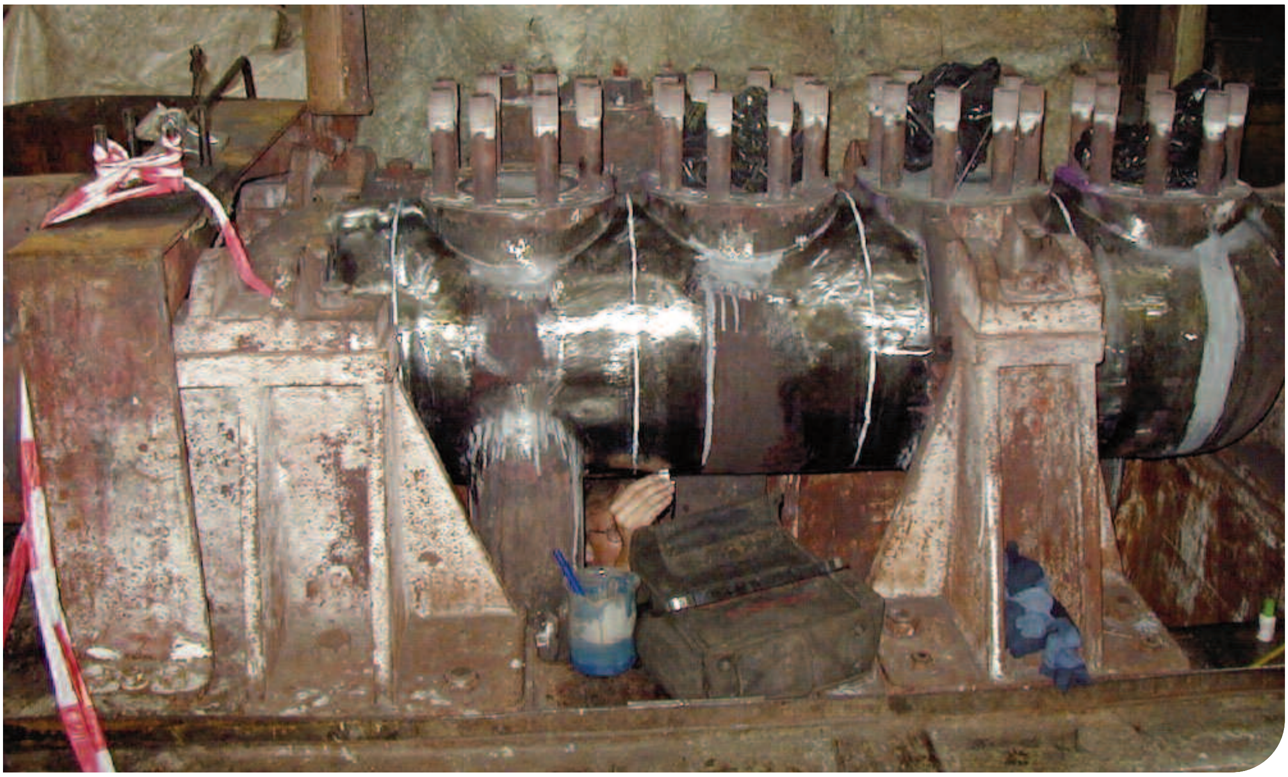
Fitness For Purpose.



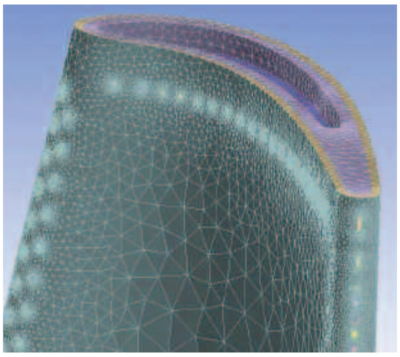
Background

FFP analyses provide information about how suitable 'used' components are for particular applications. In many cases, the analyses are performed on flawed components – parts that show signs of creep or fatigue, for example – which are expected to crack under the stresses associated with their operating loads. Standard procedures are used to determine whether a detected or postulated defect actually represents a danger and what loads the component can safely be subjected to in future. Where through-wall flaws are concerned, tests are also performed to establish whether a leak-before-break situation or – more seriously – a break-before-leak situation is liable to develop.

FFP findings tell the operator how long an acute repair or replacement decision may reasonably be postponed, making it possible to source complex components without loss of production. They also ensure that the technical service life of expensive plant is fully utilized.

Service

FFP analyses are conducted in accordance with British Standard BS 7910: Guide on methods for assessing the acceptability of flaws in metallic structures. The minimum material data provided by DIN are used in calculations. A 3-D finite element model is created at KEMA using ANSYS finite element (FE) software. Stress con-



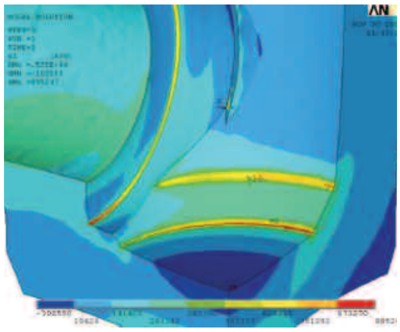
centrations and thermal stresses during operation are determined by 3-D FE analysis.

Benefits

- Large savings when repair/replacement of components can be postponed or be avoided altogether
- Recorded results, trending possibility: monitoring of degradation with time
- Visualization of results, supporting management and authorities decisions
- Possibility of rapid deployment all over the world
- Non-intrusiveness of the inspection saves cost: no necessity to open the vessel, remove internal structures, et cetera.

Case study

Inspection of a turbine valve housing after 275,000 hours' service revealed flaws extending to depths of up to 40 per cent of the wall thickness. A finite element model was accordingly used to determine the stresses on the fabric of the critical part of the valve housing. The output pointed to creep-related crack extension of 3.2 mm per year. So the housing could be expected to last for more than two years. Furthermore, the nature of the flaw was consistent with a leak-before-break situation.



Re-inspection after another year in service was recommended. The valve housing has since continued to function satisfactorily for more than a year.

Parameters:

Geometry
- External cylinder diameter: 530 mm
- Internal cylinder diameter: 450 mm

Operating conditions
- Operating pressure: 8.35 MPa
- Operating temperature: 525°C

Material
- Cast steel 14MoV63

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