CreepImage

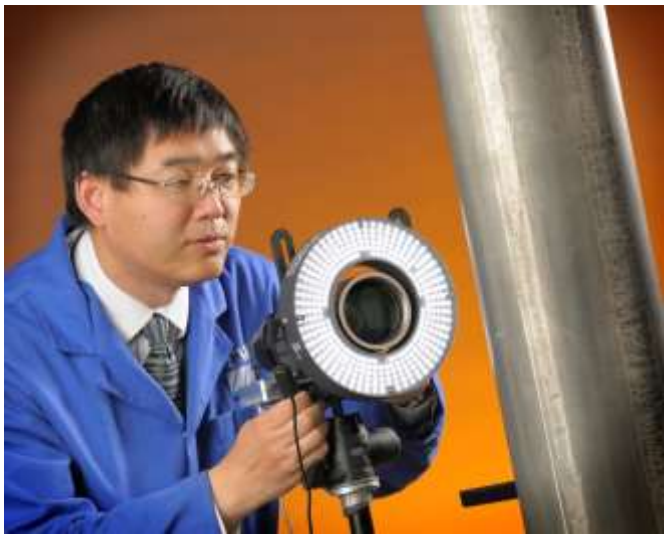
Inspecting Creep Damage in Critical Power Plant Components

The ever increasing demand for low-cost energy is forcing many of our power stations to run well beyond their original design life. In the past, ill-informed decisions have resulted in failures of superheated steam pipes with serious consequences such as power cuts, financial losses and risks to human life.

The safe extension of a power station's operating life requires new inspection techniques which must accurately detect creep damage and predict the remaining life of a component. CreepImage, a project run by a group of European companies and funded by the Research Executive Agency of the European Commission, is developing an optical inspection technique for long-term monitoring of creep deformation in engineering structures.

The inspection process is particularly suited to the harsh operating conditions of a power station, where high temperatures and radiation often prevent the use of routine inspection methods.

In this non-contact, non-intrusive approach a high-temperature resistant grid pattern is superimposed on the surface of the component under test, and a high-definition digital camera captures images of the grid over a period of time.



Computer software then analyses the changes in the digital images to calculate the creep deformation. Finally, creep-life prognosis software predicts the remaining life of the component.

CreepImage will potentially help power plant operators to:

- Reduce risk, by providing enhanced safety assurance.
- Increase revenue, by improving the availability of power plant.
- Optimise inspection scheduling, thereby reducing costs.

To learn more about CreepImage, visit the project website at www.creepimage.eu or contact the Project Coordinator, Dr Jinaxin Gao (jianxin.gao@twi.co.uk)

The research leading to these results has received funding from the European Union's Seventh Framework Programme managed by REA Research Executive Agency http://ec.europa.eii/research/rea ([FP7/2007-2013] [FP7/2007-2011]) under grant agreement no 284986.

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High temperature resistant grid pattern superimposed on P91 pipework.

Creep deformation is monitored via a dense grid pattern that can sustain the high temperatures and resist oxidation, and thereby maintain a stable appearance over the period of inspection (a timeframe covering at least two outages). A series of digital images are obtained both during power plant operation and during outages. The images are processed by the CreepImage software to obtain incremental strain values over the period of inspection, and hence the creep strain rates. These rates are then used to predict the component's remaining life using the American Petroleum Institute's API 579 Omega Method.

Rapid CreepImage inspection performed using a camera positioning jig.

Assessment of CreepImage repeatability and reliability performed on a high temperature steam pipe during a power plant outage.

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