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## The Role of Hardness on Condition Monitoring and Lifting for High Temperature Power Plant Structural Risk Management

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### Abstract

In this work, the use of hardness data in a novel predictive lifing model is explored. This study provides for the first time large amounts of site hardness data acquired during successive outages on an ageing coal fired power plant and draws conclusions regarding interpretation of these data in accordance with current practice, which is included in a case study. A novel, phenomenological relationship between room temperature hardness and creep data, obtained by uniaxial creep and impression creep tests, has been found and used for an innovative lifing approach that includes hardness data in a creep damage model. The latter is discussed with a description of how it could be practically implemented and validated in-service.

**Keywords:** *Hardness; Creep; Replica; Damage Model; Condition Monitoring.*

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### Nomenclature

<i>a</i>	<i>Fitting constant</i>
<i>A</i>	<i>Curved area of indentation in Brinell standard test</i>
<i>b</i>	<i>Fitting constant</i>
<i>b<sub>l</sub></i>	<i>Length of impression creep sample</i>
<i>B</i>	<i>Material constant</i>
<i>C</i>	<i>Material constant in Monkman-Grant's relationship</i>
<i>D</i>	<i>Material constant in Liu and Murakami's model</i>
<i>d</i>	<i>Length of diagonal</i>
<i>d<sub>l</sub></i>	<i>Width of impression creep indenter</i>
<i>e</i>	<i>Neper's number</i>

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