



## Review

## Residual stress influences on structural reliability

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## ABSTRACT

Structural integrity is affected by residual stresses in a number of ways, some of which are well known to be beneficial in terms of enhancing fatigue performance of engineering components and structures, e.g. surface peening. Knowledge of some of the other more detrimental consequences of residual stresses is more confined within the metallurgical and materials science community and their occurrence during manufacture or service can cause consternation. The purposes of this paper are thus twofold; firstly to introduce several examples of failures which demonstrate more interesting or unusual problems associated with residual stresses and, secondly, to briefly outline the origins of residual stresses and to consider powerful modern ways of measuring residual stress data in real components.

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## 1. Introduction

The magnitude and distribution of residual stresses in a component or structure are a significant source of uncertainty in engineering design and can also affect subsequent machining as well as life prediction and assessment of structural reliability [1]. Residual stresses are an unavoidable concomitant of almost all manufacturing and fabrication processes and can also arise during service; they will occur under any set of circumstances that leads to differential expansion or contraction between adjacent parts of a body in which the local yield strength is exceeded. Their influence depends on their magnitude,

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