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Characterization of Stress In Engineering Materials By Special Non-Destructive Techniques

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Abstract

Characterization of discontinuities has been the main subject of interest for scientists and Engineers ever since commencement of design and production of engineering components. Extensive developments have taken place over the years in the field of characterization of fusion and metallurgical type discontinuities that are associated with manufacturing processes. While these developments have immensely benefited the industry to improve quality control measures during production of engineering components, the developments are relatively limited in the area of characterization of stress, especially residual stress in materials that may adversely affect the performance of the components in service. As characterization of residual stresses that remain in the materials after completion of welding play a key role towards ensuring in-service quality of the components, more attention and focus is essential to ensure safety and integrity of welded structures.

Often, Non-Destructive method of characterization is the most sought after technique in metallic materials that undergo extensive processing by way of forming, rolling welding, heat treatment etc. In tune with this, extensive work has been carried out at welding research Institute over the past two decades in this field of development and application of special non-destructive evaluation techniques. To characterize stress in welded structures, Strain gauging and X-ray diffraction based methods have been extensively studied and applied in real life components and structures used in defense, power, Aerospace and other heavy engineering sectors.

In this paper some of the major applications of the two special NDT techniques for characterization of stress field in critical welded components and structures have been highlighted. The tangible results and savings obtained by the application of the methods have also been highlighted in this paper.