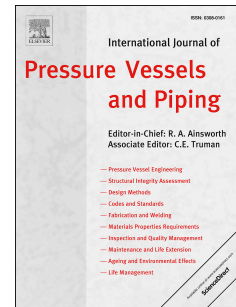


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Residual Stress Measurements in Steel Pipes using DSPI and the Hole-Drilling Technique

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Abstract

The oil and gas industry employs long distance pipelines to simplify the transport logistic and to reduce the final costs of petroleum derivatives. For the construction of pipelines, nowadays it is usual the application of pipes which are manufactured by cold forming operations. The high level of the non-uniform plastic deformation of the steel during the pipe manufacturing process produces residual stresses. These stresses are internally self-equilibrated, but locally can affect the structural integrity of the pipeline. Therefore, an accurate measurement of residual stresses is important to guarantee a safe and healthy pipeline network. This paper shows the application of a portable optical device combining digital speckle pattern interferometry and the hole drilling technique to measure residual stress fields in pipe samples manufactured by the UOE-SAW and ERW processes. A set of 72 measurements were performed in order to scan the residual stress distribution along the external surface of each pipe. On the other hand, a smaller set of measurements were performed in the internal surface of an ERW pipe sample. Considering all cases, the mapping has revealed the presence of stress profiles which were compressive in the first half of the hole and tensile in the second one. Additionally, the external measurements demonstrated a good repeatability between them, indicating a similar stress behavior along the circumferential and longitudinal directions of the pipe.

Keywords: Residual stresses, DSPI, pipelines, hole-drilling, ERW and UOE processes.

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