1st Biennial ESIS-CSIC Conference on Structural Integrity
(BECCSI 2025)

November 25-28, 2025, Metropol Palace, Belgrade, Serbia

DIRECT MEASUREMENT OF J INTEGRAL – ORIGIN, APPLICATIONS AND PERSPECTIVES

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Abstract

Direct measurement of J integral has been presented as a retrospective of more than 40 years of experience. Early efforts and experiments on welded wide plates and pressure vessels are presented and analysed in respect to the effect of material heterogeneity. Physical meaning of the J integral values obtained by direct measurements on a pressure vessel is explained to clarify its application. Different boundary conditions are also considered, to investigate options for simplified measurements. The possibility of applying simplified direct measurement of J integral for pressure vessel integrity assessment has been considered. Using favourable boundary conditions, J integral value is reduced to strain energy on the opposite side of the crack-like defect, which is often the case with pressure vessels. Such measurement can be easily performed during proof testing of a vessel. Finally, it is noted that the measurement of strains by digital image correlation instead of strain gauges can make a new life of this technique.

Keywords
J integral; integrity assessment; pressure vessel; digital image correlation