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Ultrasonic Time of Flight Diffraction (TOFD) Sizing of Cracks in Thin Structures

G. Baskaran², G. Jothinathan¹, Krishnan Balasubramaniam³, C.V. Krishnamurthy, Lakshmana Rao², and B. C. Baumick⁴

Centre for Nondestructive Evaluation, Indian Institute of Technology, Madras, India

¹Dept. of Metallurgical Engineering

²Dept. of Applied Mechanics

³Dept. of Mechanical Engineering

⁴Vikram Sarabhai Space Center, Tiruvananthapuram, India.

Abstract

It is desired to determine the exact defect size in order to prevent catastrophic failure and/or evaluate the residual life of engineering structures. Defect sizing through conventional pulse echo ultrasonic method uses the echo amplitude and DGS curves. This technique is tedious and often unreliable when realistic cracks are encountered, due to amplitude based measurement. Ultrasonic Time of Flight Diffraction (TOFD) method, based on time measurement between crack tip diffracted echoes is an effective method for both location and sizing the defect. This method has been shown to be successful in thick structures i.e. thickness greater than 10 mm. This paper describes efforts to extend this method to thin plates i.e. thickness less than 10 mm. An analytical model based on ray tracing was employed to design special transducers and for signal interpretation of the various mode-converted signals during TOFD investigation of thin plates. Both analytical and experimental results will be discussed.