

# **Circumferential SH Guided Waves for NDT of the Cemented Layer of Steel Epoxy Sleeves**

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Steel epoxy sleeves have been widely used in pipeline damage repairs. The bonding quality and curing state of the cemented layer are crucial for the reinforcing effect of pipeline repair and the resin infusion rate during sleeve installation, respectively. However, due to the large difference in material properties of the structures and the difficulty of obtaining the interfaces, there are certain limitations for traditional non-destructive testing methods. In this study, the methods for monitoring the curing state of the resin and detecting the cavity defect in the cemented layer using Circumferential Shear Horizontal (CSH) guided waves generated by Electromagnetic Acoustic Transducers (EMATs) were proposed. Firstly, finite element simulations and experiments were performed to assess the feasibility of detecting an artificially created stepped-through cavity defect in the cemented layer using the CSH0 mode guided wave. The results demonstrate a fundamental linear positive correlation between the amplitudes of the CSH0 mode and the cavity sizes. This suggests the effectiveness of the employed method for both detecting cavity defects and distinguishing their sizes. Secondly, monitoring experiments were also conducted to assess the curing state of resin in a steel epoxy sleeve specimen. The results demonstrate that the attenuation curve of the CSH0 mode exhibits a monotonous increasing trend with the curing of the resin, which can effectively reflect the different stages of resin curing.