

Local wavefield velocity imaging for damage evaluation

ABSTRACT

Ultrasonic Propagation Imaging or Acoustic Wavefield Imaging has been widely used to evaluate structural damages and internal features. Inspecting complete wavefield time history for damage identification is tedious and error-prone. A more effective way is by extracting damage-related information into a single image. A wavefield velocity imaging method that maps the local estimates of group or phase velocity is proposed. Actual velocity values rather than arbitrarily-scaled intensities are mapped, enabling damage sizing without the need of supervised training or inspecting wavefield propagation video. Performance of the proposed method was tested by inspecting a 100 mm by 100 mm area of a 2 mm thick stainless steel specimen. Local phase velocity maps of A0 mode showed a half-thickness hole of 2 mm diameter as significant change in local phase velocity from the nominal 2 m/ms. Full width at half maximum of relevant velocity profiles proved the accuracy and consistency of the damage sizing.

Keyword: Wavefield velocity imaging; Damage evaluation