Ultrasonic guided wave generation by magnetostrictive transducers

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This experimentally focused project provides the opportunity to design and build ultrasonic transducers and instrumentation for the generation and detection of ultrasonic guided waves on safety critical components that might be used in industry or on civil infrastructure. The work will involve finite element modelling with commercial packages, CAD and rapid prototyping, developing instrumentation and signal processing. The student will develop a sound knowledge of the physics of ultrasonic guided waves [1], the underlying physics behind the phenomenon of magnetostriction [2,3] and how it can be applied to industrially relevant testing challenge [4].

Our preliminary ground work [5,6] on a feasibility study demonstrates the viability of using magnetically soft Fe-Co alloys to generate ultrasound via magnetostrictive patches (MPTs), as opposed to using the current magnetically and physically hard alloys of Fe-Co. This project will provide a complementary strand to our research into ultrasonic transduction and NDT. The high Curie point of these materials also provides entirely new avenues of research for transducers suited to use in hostile environments.

This PhD project work will help us to develop a new research strand and in future will help us to bid for an EPSRC grant in the area. It will to real world impact (and Impact Case Study material for the Research Excellence Framework) and new products, but is also will give Warwick a clear research lead in the area.

1. Rose JL, Ultrasonic waves in solid media, Cambridge University Press, 2008
2. Lewis JA, The small-field theory of the Joule and Wiedemann effects, Quarterly of Applied Mathematics 20, pp13-20, 1962