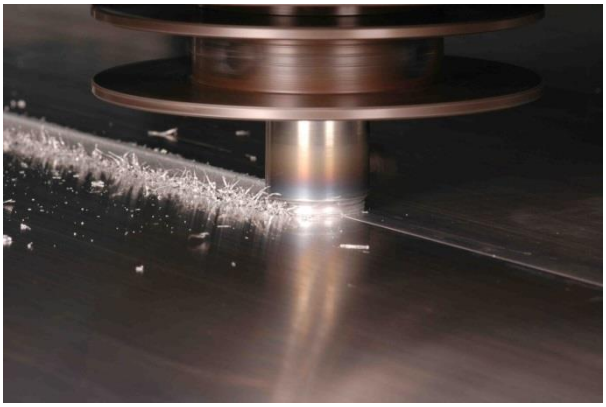
FrictionHarmonics – The on-line control of friction stir welding processes using ultrasonic test techniques

The FrictionHarmonics project idea arises from the problem of not being able to adequately non-destructively inspect safety critical fabricated Friction Welded structures for manufacturing in-process weld defects and particularly the zero volume defect known as 'joint line flaw' or 'kissing bond' defect.

Joint Line Flaws (Kissing Bond defects) can occur in solid state joined metals and its non-destructive detection is crucial for many critical structural applications that involve the use of the Friction Welding process (e.g. Friction Stir Welding (FSW) and Linear Friction Welding (LFW)).

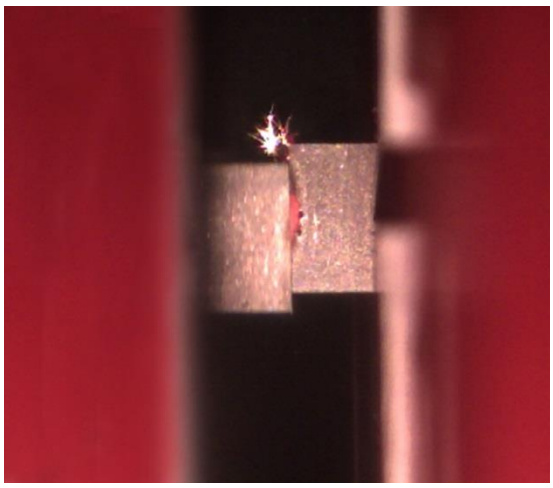


The project will be beneficial to the following industries in different technological areas:

1) Shipping: reducing the weight of top-side structures to maintain a low centre of gravity.
2) Road: reducing the weight of commercial and private vehicles to reduce fuel use and costs and therefore CO_2 emissions.
3) Rail: reducing manufacturing costs and reducing weight to reduce fuel use and costs and therefore CO_2 emissions.
4) Aircraft: reducing aircraft weight thereby reducing fuel use, costs and CO_2 emissions.

Project objective

The main aim of FrictionHarmonics is to develop a prototype Non-Linear, high frequency ultrasonic NDT system for the in-process inspection of Friction Stir Welds in aluminium, titanium and nickel alloys and steel structural components for the detection of manufacturing defects including 'kissing bond' defects and then to provide feedback software to the FSW process control to eliminate the further introduction of the detected manufacturing defect(s).



The key project objectives are:

- To develop new NDT testing techniques and procedures based on the developed Non-Linear high frequency ultrasonic technology.
- To develop Non-Linear ultrasonic transducer (NLUT) sets for the examination of Friction Stir Welds for kissing bond type.
- To develop a weld tracking automated scanner/manipulator to accurately position the NLUT transducer probe set and will track the weld axis during the examination.
- To develop software that will evaluate the ultrasonic test results and provide feedback to the Friction Welding control process.
- To demonstrate the prototype NLUT system performance and to validate the technique results against representative samples.

For further information, please visit the project website at **www.frictionharmonics.com**.

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