High Speed Rail Inspection Using ACFM Technology

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This collaborative project between TSC and the University of Birmingham aims to develop a high speed Alternating Current Field Measurement (ACFM) inspection system for application in the rail industry. High-speed experiments are taking place at the University of Birmingham using a special rail rig that can rotate at speeds of up to 80 km/h. Further tests to validate the ACFM system under actual inspection conditions will be carried out in collaboration with the rail industry.

Developed and patented by TSC Inspection Systems, ACFM is an electromagnetic inspection method with a wide range of industrial applications.

The ACFM technique is capable of both detecting and sizing (length and depth) surface breaking cracks in metals based on the thin-skin theory developed by Lewis, Michael, Lugg, and Collins (LMLC theory). The technique is based on the principle that an alternating current (AC) can be induced to flow in a thin skin near the surface of any conductor. By introducing a remote uniform current into an area of the component under test, when there are no defects present the electrical current will be undisturbed. If a crack is present the uniform current is disturbed and the current flows around the ends and down the faces of the crack. Because the current is an alternating current it flows in a thin skin close to the surface and is unaffected by the overall geometry of the component. Associated with the current flowing in the surface is a magnetic field above the surface which, like the current in the surface, will be disturbed in the presence of a defect. An important factor of the ACFM technique is its capability to relate measurements of the magnetic field disturbance to the size of defect that caused that disturbance.