EHLA Joint Industry Programme – Evaluation of a Step Change in Coating Technology
(Extreme High-speed Laser Application)

New Project Opportunity

Concept

The application of a protective coating to the surface of a component is a common industrial process used to enhance corrosion resistance and/or reduce wear. It can be applied using a range of different methods and materials, depending on a number of factors such as substrate size, complexity and access to a surface, coating thickness, performance, and cost. However, there is always a trade-off between speed of deposition and level of adhesion (which is directly proportional to the quality of coating). For example, a thermal sprayed coating has high coverage rate (125cm^2/min) but the bonding mechanism can be weak (mechanical interlocking with some diffusion) leading to poorer performance in harsher environments.

In 2017, the extreme high-speed laser application (EHLA) process was developed; evolved from laser metal deposition, it is capable of applying fully fused metallic coatings with a maximum coverage rate of 250cm^2/min (i.e. >10x faster), and brings with it great potential for new capability. This is achieved by melting powder prior to reaching the substrate, thereby reducing the time/energy that would otherwise be needed to achieve melting of the substrate. EHLA is also capable of producing thinner coatings than conventional LMD (20µm-300µm rather than >500µm) due to very little dilution between substrate and deposited material (5µm-50µm). The characteristics of a low dilution also opens up the technology to develop coatings with dissimilar materials.

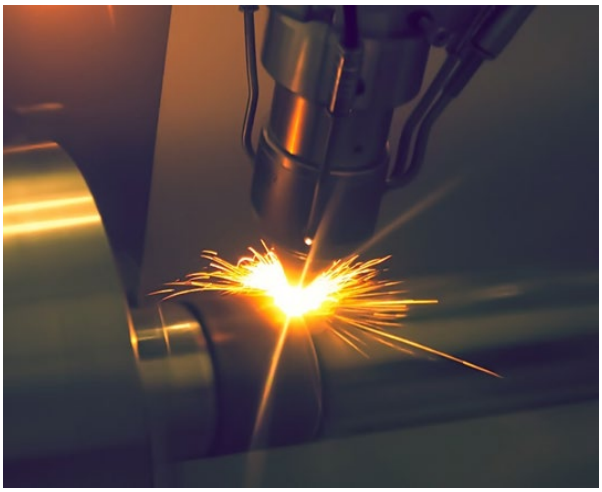

Figure 1 TWI's EHLA system depositing In625 on a 316L shaft at 65m/min.

In addition, environmental legislation, including REACH, is becoming increasingly restrictive for coating processes using the alloys of Co, Cr, Ni, and a number of other elements. Hence, there is a drive to reduce the use of these materials across a wide array of industries and applications. There are a number of new 'green' materials which could be exploited using EHLA. These materials feature lower cost binding elements, with carbide additions such as WC or SiC, including materials like FeCrAl-WC as a replacement for CoCr-WC.

Objectives

- To investigate the capabilities of the new technology as a replacement opportunity for hexavalent chrome plating and thermal spray processes.
- To investigate REACH compliant material solutions suitable for participating industries.
- To understand the cost implications of the EHLA process with comparison to state-of-the-art coating technologies.

Benefits

- Insight into and access to novel technology not currently available in the UK and wider industry.
- Awareness of novel coating materials suitable for achieving REACH compliance.
- Independent performance data of EHLA coatings.

Further Information

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Expected project duration: 24 Months **Expected start date:** Q3 2020