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Proposal for Technical Contribution, CIRP2020 Winter Meeting – STC E

Title of presentation

Removal of surface contaminants using laser cleaning process

Contributors

Debajyoti Bhaduri^{1,*}, Jose Naranjo Espinosa², Samson Patole², Douglas Figueroa², Samuel Bigot¹

¹*School of Engineering, Cardiff University, Queen's Buildings, The Parade, Cardiff, CF24 3AA, UK*

²*Tata Steel, Cogent Power, Stephenson Street, Newport, NP19 0RB, UK*

Abstract

Laser cleaning is an attractive alternative technique to the conventional cleaning methods such as mechanical or chemical cleaning as the former technology is faster and more environment-friendly than the latter, and offers better selectivity, controllability, and flexibility to achieve complete removal of surface contaminations [1]. The present research centres on the removal of surface oxides from low carbon strip steel using laser cleaning. A full factorial design of experiments involving 27 tests with varying laser energy density (2.5, 6.2 and 9.9J/cm²), pulse distance (2.9, 5.7 and 8.6µm) and hatch distance/step-over (3, 6 and 10µm) is undertaken on the steel sheets to identify the initial process window. The surface roughness of the specimens laser cleaned with 6.2 and 9.9J/cm² energy density are lower/comparable (S_a : 0.17-0.27µm) with that of the as-rolled sheets (S_a : 0.24-0.27µm). Based on these results, the rolled strip steels are laser cleaned using energy densities of 6.2, 8.7 and 9.9J/cm², pulse distances of 5.7 and 8.6µm and hatch distances of 3, 6 and 10µm.

The laser cleaned areas will be analysed to detect the presence of contaminants (e.g. organics, microparticles etc) using SEM, EDX and XPS. Further research scope includes corrosion behaviour study of these laser cleaned specimens.

[1]F.D. Zhang, H. Liu, C. Suebka, Y.X. Liu, Z. Liu, W. Guo, Y.M. Cheng, S.L. Zhang, L. Li, *Corrosion behaviour of laser-cleaned AA7024 aluminium alloy*, *Applied Surface Science* 435 (2018) 452–461.

Presenter Information

Dr. Debajyoti Bhaduri

School of Engineering, Cardiff University, Queen's Buildings, The Parade, Cardiff, CF24 3AA

BhaduriD@cardiff.ac.uk