Joseph Stokes et al., Ind Eng Manage 2015, 4:5
http://dx.doi.org/10.4172/2169-0316.C1.008

OMICS International
conferenceseries.com

2nd International Conference and Exhibition on
Industrial Engineering

November 16-18, 2015 Dubai, UAE

Effectiveness of using blended versus layered micro/nano sized WC-CO with Inconel 625 HVOF thermal spray coatings for wear/corrosion applications

Joseph Stokes, A A Al-Hamed, S Al-Mutairi, K Y Benyounis, H Y Al-Fadhli, B S Yilbas and **M S J Hashmi**
UK Dublin City University, Ireland
Saudi Aramco, Saudi Arabia
King Fahd University of Petroleum and Minerals, Saudi Arabia

To date economic and rapid solutions to equipment failure caused by wear and corrosion in many industries but particularly in oil and gas industries have been reduced through the deposition of cermets using HVOF thermal spray coatings especially tungsten carbide cobalt (Diamalloy 2004) deposits to reduce wear effects and Inconel 625 (Diamalloy 1005) to prevent corrosion. Research generally focused on monolitic coatings (single layers) or multi-layers where one material was applied upon another. However the trend is now moving towards the development of bimodal powders to form a composite coating structure and from here to the mixing of nano and micro size feedstock powders, through the addition of nano-structured WC-Co. This research paper demonstrates the benefit of using blended nano structured WC-Co with Inconel 625 over layered type coatings when subjected to hostile mechanical/wear/corrosion environments. This was achieved through design of experiment (DOE) analysis to study the influence of different powder percentage on the coating performance such as coating microstructure and coating mechanical performance, such as; three-point bending tests and hardness measurement. The results showed that 75% weight of nanostructured WC-12Co mixed with Diamalloy 1005 Inconel-625 was superior compared to any other percentage mixture of the two powders and compared to single layer deposition of each coating, due to the strong adhesion of WC nano size grains at the substrate/coating interface through improved mechanical interlocking and reduce the possibility of cracks initiation. The results show promise in terms of the current maintenance challenges experience by the Oil/Gas industry today; in terms of possibly extending the life of components, plus providing huge economic savings.

Biography

Joseph Stokes, Head of School of Mechanical and Manufacturing Engineering in Dublin City University, was awarded the degrees of BA and BAI in Mechanical and Manufacturing Engineering from Trinity College Dublin in 1997 and attained his PhD in Mechanical and Manufacturing Engineering from Dublin City University in 2003. He has been research active in the area of Surface Engineering since 1997. His professional achievement includes the production of coated and free-standing engineering components using the HVOF (High Velocity Oxy-Fuel) process, other processes include Atmospheric Plasma and Flame Thermal Spray (the only Thermal Spray facility in any University/Institution in Ireland), and Magnetron Sputtering PVD techniques, including Tribological Assessment. Applications of his research include: Wear Reduction, bio-coatings for implant replacement therapy, oil and gas protective coatings to mention a few. He is an active member of the Centre for Medical Engineering Research (MEDEng) and the National Centre for Plasma Science and Technology (NCPST).

joseph.t.stokes@dcu.ie

Notes: