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Remanufacturing of Oil & Gas Components: The Benefits in a Circular Economy

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Abstract: In this paper, the remanufacturing potential and life cycle energy savings of targeted Oil & Gas industry components are described and quantified. This project focuses on the benefits of advanced remanufacturing and materials technologies for applications related to repair/refurbishing/remanufacturing of metallic components with the highest likelihood of commercial acceptance in the local industry. Four components are covered including mud-motor-rotors, stabilizers, pump plungers, and cylinder heads. An example of the repair of worn out cylinder heads of generator engines is described in detail. The engines run on crude oil and are manufactured out of gray cast iron (highly sensitive material to fracture). Once the operational life of the components is over, repairing them implies the development of a well-studied procedure for remanufacturing that must overcome the source of damage and assure high reliability. The selection of the ideal hardfacing processes for the repair of the eroded walls of the cylinder heads included the study of overlays of CrC-NiCr by HVOF spraying, Fe–based alloy by arc spraying, NiCrBSiFe by powder spray welding, Ni-based alloys by laser cladding, cold spraying, and arc welding. The high temperature erosion mechanisms and the erosion rates of each of the hard coatings was evaluated according to ASTM G211 standard for erosion test modified to simulate the operating conditions of the engine. The approach allows to rank optimal hardfacing processes for this specific application.
The feasibility and economic aspects of the remanufacturing in the local industry in the context of circular economies and the need for democratizing remanufacturing procedures are discussed towards achieving sustainability.

Keywords: Remanufacturing, materials, technologies, repair, refurbishing, erosion, Hardfacing

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