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MATERIAL SOLUTIONS TO REDUCE WEAR AND EROSION IN OIL AND GAS INDUSTRY

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Erosion wear with regards to the oil and gas industry is a damage mechanism wherein, surface of engineering materials are damaged and/or removed due to the frequent impingement by erodent particles flowing in and through production equipment, in mixture with the hydrocarbon fluids during production, transportation and processing operations. Solid particles impaction and liquid-droplets cavitation's are the major malignant material surface damage snags in the erosion wear process, which results in failure of components such as choke valves, separator internals, pipelines and other production equipment(s) in the industry, that result in financial loss. This study is concentrated on material solutions to reduce wear and erosion in the oil and gas industry. As oil and gas production moves into extreme harsh, hard to reach subsea environments, frequent equipment failure and maintenance is not a desirable venture. The need to use advance materials solutions in the design and manufacturing of critical components is and should be management's top priority. Damage to production equipment often comes with several environmental and economic issues. This paper extensively discussed a holistic investigation of the fundamental influencing factors/parameters for the material surface erosion wear phenomenon prevalent in the oil and gas industry. The damage mechanisms of two critical components (choke valves and separator internals) were assessed and Stellite alloys are selected as the cost effective advanced erosion wear resistant material for these component design. The chemical composition and microstructures including the physical and mechanical properties of the Stellite alloys are evaluated and a comprehensive engineering material surface treatment methods suitable for the materials is explained. A statistical analytic model prediction on the erosion wear rate of the selected alloys is also completed and compared with existing models, and a significant agreement is observed in the results.

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