Future HFO/GI exhaust valve spindle - DTU Orbit (08/08/2019)

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State of the art for exhaust valve spindles for large two stroke heavy fuel diesel engines is currently either a fully forged Nimonic 80A version or a cost effective version based on an austenitic valve steel weld coated by a specially hardened Inconel 718 seat hardfacing and Inconel 625 disc coating. These three alloys, originally developed more than 50 years ago for the gas turbine and process industry, show comparable corrosion resistance at usual heat load. The general trend in engine design is steadily pushing combustion chamber component temperatures towards higher levels and the hot corrosion resistance of these alloys is currently being tested to the limit. Furthermore operation on LNG will introduce new challenges. Indeed, it would appear that there is much room for improvement as no focused alloy development has been performed aimed at the special conditions found on the thermally and mechanically stressed parts of the exhaust valve spindle. In the present work new coating alloys, meeting the requirements for the future valve spindle, have been developed by combining litterature study, service experience, experimental data and numerical thermodynamic calculations. This paper describes the considerations and results of this alloy development as well as the details of a required new production technique for manufacturing a compound product by the Hot Isostatic Pressing (HIP) technology which has been developed applying advanced Finite Element Method (FEM) modelling.

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