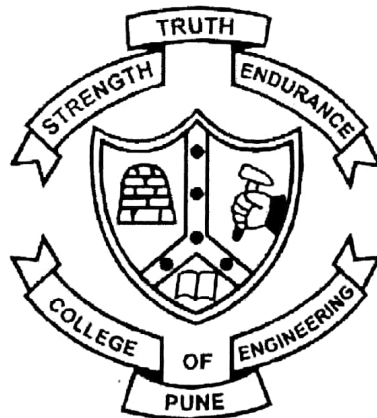


A
DISSERTATION REPORT
ON
**Dissolution and Erosion Behaviour of AISI H13 Shot Sleeve
in HPDC**

Submitted in partial fulfillment of the requirements
of the degree of
Master of Technology
(Physical Metallurgy)

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2016-2017

Abstract

In high-pressure die casting process (HPDC), shot sleeve undergoes erosion, wear and soldering due to cyclic thermo-mechanical exposure by the molten casting alloy stream with high temperature and high velocity. Gradual deterioration of sleeve surface during service affects the quality of resultant casting, lives of piston and sleeve. It also results in increased cost and downtime. Objective of this work is to study and reduce sleeve surface damage while casting the components weighing between 20 to 40 kg. As initial survey, the worn out sleeve was used to perform failure analysis to understand erosion mechanism. Simulation study was conducted to estimate impact force of liquid metal stream on sleeve surface at various sprout angles. Dummy pins were made from same steel that of the sleeve - AISI H13 and their erosion response to different surface conditions such as surface roughness, nitrided case depth, and coating chemistry was investigated. Erosion performance of a dummy pin made from steel with increased molybdenum and reduced silicon content was compared with the pins of AISI H13 steel. The pins were observed intermittently for size, weight loss and any crater formation on the surface. All the pins were characterized after subjecting to a maximum number of 4500 casting made. The pins were characterized for microstructure, chemical composition, and phase analysis. Surface roughness and micro-hardness were also measured. Pin made of W.Nr 1.2367 steel showed increased resistance against erosion, comparative to the pin made of AISI H13 steel under similar testing condition. TiAlN coated pin outperform all other pins in terms of resistance against erosion. Mechanism of progression of erosion in actual shot sleeve is proposed based on experimental design.

Keywords: Sleeve erosion, Dissolution, Wear, Surface coating, Nitriding