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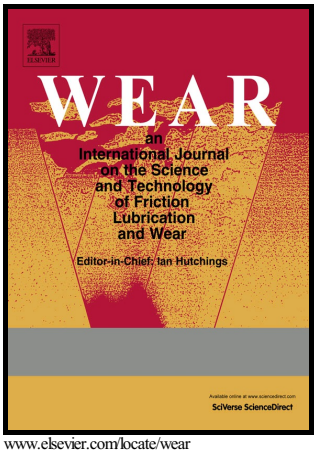

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Luca Girelli, Marialaura Tocci, Lorenzo Montesano, Marcello Gelfi, Annalisa Pola

University of Brescia, Department of Mechanical and Industrial Engineering, via Branze 38, 25123, Brescia, Italy

Corresponding author: Luca Girelli, l.girelli005@unibs.it, via Branze 38, 25123, Brescia, Italy

Abstract

This study investigates the cavitation erosion resistance of AlSi10Mg additive manufactured samples according to the ASTM G32 standard, in comparison with the cast ones. Samples were tested in different conditions in order to analyse the effect of T6 heat treatment and hot isostatic pressing, while cast samples were studied in as-cast and heat-treated conditions. It was found that additive manufactured AlSi10Mg alloy shows outstanding cavitation erosion resistance, in comparison to the cast alloy, mainly due to the ultra-fine microstructure. This superior performance of as-produced AlSi10Mg additive manufactured samples was demonstrated by the extremely limited mass loss and erosion rate measured during the tests, coupled with a remarkably long incubation stage. On the other hand, the heat treatment proves detrimental to the cavitation resistance of additive manufactured material due to the microstructure modification and pores enlargement. Hot isostatic pressing only partially improves the alloy performance.

Keywords: Cavitation erosion; Non-ferrous metals; Optical microscopy; Electron microscopy; Erosion testing.

1. Introduction

Additive manufacturing is a production process based on the selective layer-by-layer melting of metal powder (or wire) using a focused energy source [1, 2]. This technology has revolutionized components manufacturing and logistics by enabling production on demand, reduction of energy consumption [3] and manufacture sustainability [4]. It is largely used for aircraft and automotive fabrication [5], mainly because it allows design freedom and provides environmental/ecological