

Toughness of PM HIP Steel
Proposal for a Project – rev 2
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Introduction

In the competition between conventionally cast and forged materials and materials produced by powder-HIP, toughness and fracture toughness are the most important properties to discuss. It is commonly believed that conventional materials show higher toughness values compared to PM steels. A hot forming process generally helps to increase toughness by cracking and dispending inclusions or oxides, by decreasing the grain size and by some other mechanisms.

Nevertheless, there is a lack of traceable and reliable data regarding toughness and fracture toughness of chemically identical materials that have been produced in different ways. These data could be beneficial in discussions regarding potential applications for PM-HIP technology and could be a base for standardization efforts. Moreover, in order to improve toughness of PM-products the exact reasons for the differences should be known in order to take the correct measures for each production step.

Objectives

The proposed project follows two objectives:

1. collect and determine data of toughness and fracture toughness for PM-HIP material and chemical identical, conventionally produced material.
2. identify the reasons for the differences in toughness by carefully analysing the microstructure and damage mechanisms and finding correlations to each step in the production chain from powder production to consolidation.

While the first target aims to get a well founded database that can be used for the development of new products and by this to widen the market for PM-HIP components, the second objective is important for material- and process improvement.