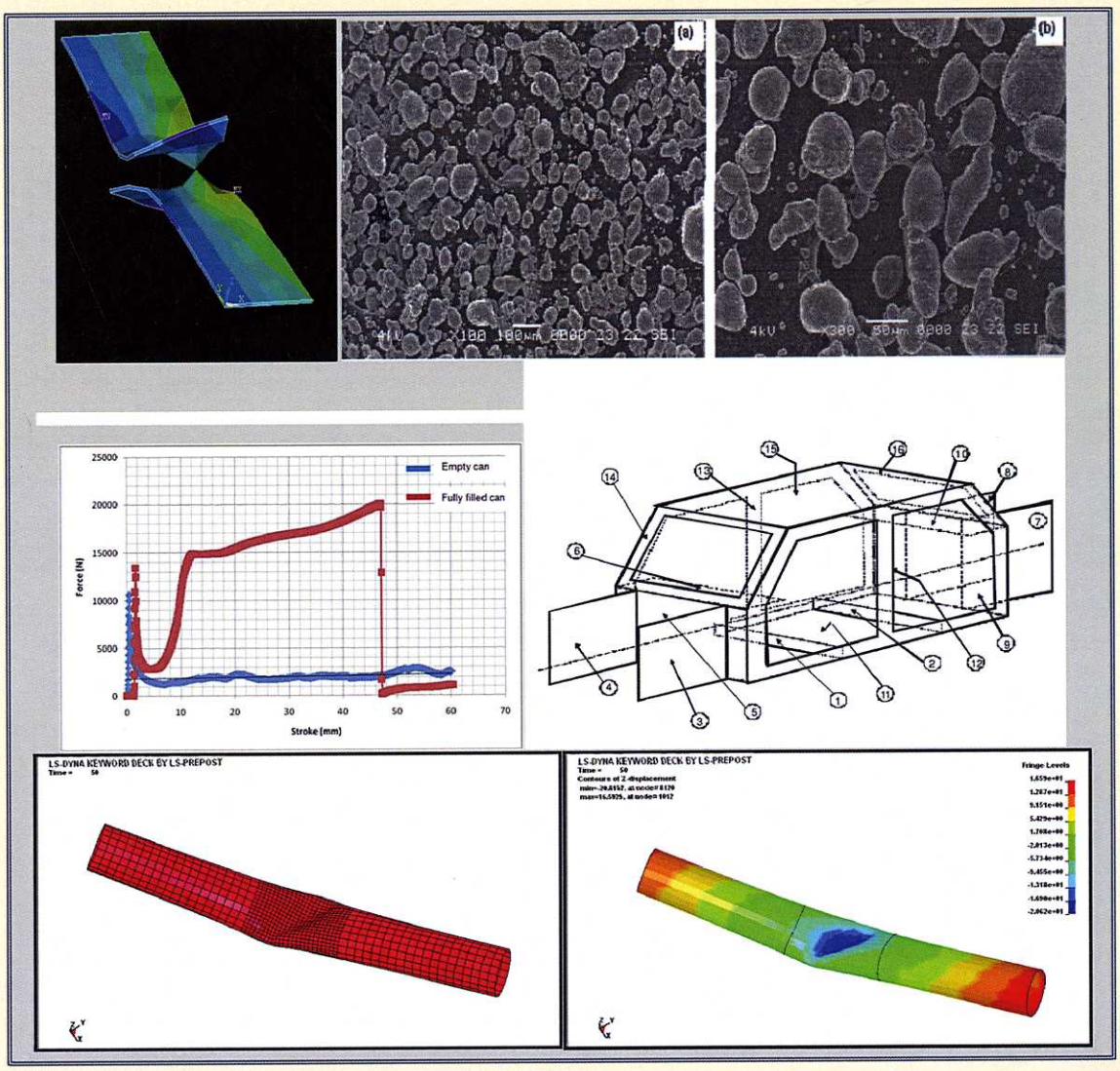
ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS



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Meftah Hrairi

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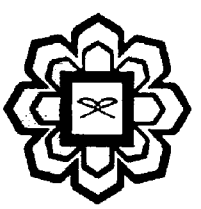

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MECHANICAL PROPERTIES OF SINTERED ALUMINUM ALLOY COMPACTS

Meftah Hrairi, Fadzly Mohamad Ravi

1. INTRODUCTION

Aluminum alloy A356 is used in automotive transmission cases, water cooled cylinder blocks, pistons, connecting rods, and also other moderate strength components [1]. Pistons are made from materials having properties such as high compressive strength and high hardness in order to handle the high temperature and pressure produced in the cylinder while combustion strokes take place. Pistons also need to have high corrosive resistance because they are exposed to highly combustible air and fuel mixtures. The reciprocating piston that goes up and down in motion also needs to be very wear resistant in order to maintain a longer life cycle of the piston. Based on the experimental study conducted in this work, the A356 produced parts using the P/M process seem to have better mechanical properties than similar parts produced using the conventional permanent mold cast process. This A356 material can also be applied to make the engine valves which require very similar characteristics to the piston.

In the current study, the advantages of the P/M process over a conventional mold cast process that can be applied to produce automotive parts is being investigated. The mechanical properties of the A356 alloy such as the compressive strength, Vickers hardness, and relative density, have been determined experimentally and compared to those of a component manufactured using the permanent mold cast process.

2. EXPERIMENTAL PROCEDURE

A356 used in the present investigation is a cast aluminum alloy that has Si 6.76%, Mg 0.38%, Fe 0.14%, and others less than 0.05% by weight. This alloy has good weldability, corrosion resistance, and resistance to hot cracking and solidification shrinkage. The A356 powder was shaped and compacted at a pressure of 3 tons (2000 psi) for 10 minutes using a uniaxial press. Cylindrically shaped specimens of