CONTEMPORARY METALLIC MATERIALS

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Chapter 021

Reverse Engineering for Automotive Fuel Tank

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Abstract. There is a current demand of using lightweight material or replacing heavy material by lighter material especially in the automotive sector. An increasing the weight of the car, susceptible to the corrosion environment, produce more carbon dioxide and monoxide emission, these are criteria that need to overcome with the usage of metal fuel tank. This research deals with reverse engineering approach to study, examine and analyze the existence material used for the fabrication of local automotive car (PROTON) fuel tank. A series of morphology tests were performed to characterize the materials using XRD, Optical Microscopy and EDX. The mechanical testing includes hardness and tensile testing was also carried out in order to find the mechanical properties of the fuel tank material. The study shows the current fuel tank material ferritic steel fuel Tank with tin-galvanized surface coating. Based on the current study and analysis of the material it is possible to propose and develop a better and lighter weight material which would be suitable for the design and fabrication of future cost effective automotive fuel tank.

Introduction

Steel used for automotive fuel tanks, or any automotive application for that matter, is low cost and has a relatively stable price history over long periods of time [1]. It is extremely competitive against alternate automotive materials, such as magnesium, aluminum and plastics [1, 2]. A fuel tank is manufactured by press-forming steel sheets of upper and lower parts with complicated shapes and seam welding the halves together. Various members for example an inlet tube, a fuel tube, a fuel return tube, a sub tank and a drain plug are fixed to a body of the fuel tank by welding, brazing or the like [3]. Steel sheet are press-formed to shapes upper and lower halves by complicated process accompanied with drawing and bulging. Due to the complicated press forming, a steel tank is often cracked at heavily worked parts [4].

There is a current demand of using lightweight material or replacing heavy material by lighter material especially in the automotive sector. It is only possible through research and development using a reverse engineering approach. Moreover, it is well known that fuel tank that is fabricated from steel material that is heavier than plastic tank [5, 6]. For that reason, this project was undertaken firstly to find the existing fuel tank material using reverse engineering approach to develop a fuel tank material in line with lighter weight and less cost especially composite material for the future fabrication of the fuel tank.