



# COMPARATIVE ANALYSIS OF AL AND MG ALLOY WHEEL RIM

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**Abstract**— In any vehicle, wheel rim is a part which has to bear a continuous high stress. Conventionally used steel rim may subject to torsional and bending loads. A wheel rim should be able to withstand high amount of stress and should have less weight. These factors of cost, weight and performance are the main focus points of the manufacturers now days. There is a continuous searching among the manufacturers for component with lighter weight and higher performance. The lighter weight of the rim and wheels enables better handling, grip and reduce the overall mass of the vehicle which further reduced the fuel consumption. Conventionally steel is being used as a wheel rim material. From an implementation point of view any other alloy material can be used.

Magnesium has many problems to use, it is vulnerable to pitting, deterioration, cracking and it is also flammable, hence would start to break down in just a few months. Magnesium is used for flares and early flash lamps. Magnesium in bulk is hard to ignite but, once lit, is very hard to extinguish, being able to burn under water or in carbon dioxide, which are common extinguishing materials. Tires that caught fire could soon ignite the magnesium, creating difficulties for fire responders. Magnesium wheels required constant maintenance to keep polished. Apart from these issue Mg cost is much higher than any other alloy wheel material.

In this project, structural analysis of wheel rim with 3 different alloys of Al and one Mg alloy is done. This work mainly focus on implementing a new alloy material for wheel that can bear the same stress value as well as have less cost than other. As a conclusion of the analysis an Al- Si MD20 alloy material is suggested that has less cost than Mg alloy wheel also has suitable properties as an alloy wheel material.

*Keywords*-wheel rim; pitting; magnesium alloy wheel, Al-Si MD20

## I. INTRODUCTION

In this project, author has concluded a comparative analysis of wheel rim by using different alloy materials. Alloy wheels are the automotive wheels that are manufactured by Al or Mg metals or by the combination of both. Properties of alloy wheels are different from normal steel wheels. They have less

weight as compared to steel wheels which results in easy handling and reduces the overall weight of the vehicle resulting in lesser fuel consumption. Alloy wheels also have better heat conductivity which allows the fast heat dissipation at the time braking. This comparative study deals with the searching of new cheaper alloy material that can use as an alternative for high cost Mg alloy wheel and can overcome other limitations of pitting, deterioration, cracking and other issues that occurs in Mg based alloy.

Selection of a suitable material for wheel rim is a work of utmost importance because design of rim plays an important role in the performance of the vehicle. During 1960s magnesium was the choice of manufacture as a wheel rim material for racing cars. The magnesium based wheels are similar to the other die-cast wheels.

## II. WHEEL RIM

The rim of a wheel is that circular portion of the metal on which the inside edge of the tire is mounted. Main function of the rim is to support and seal the tire to the wheel. It ensures the proper fitting between tire and rim and retains air inside the tubeless tire. A standard steel wheel is manufactured by a rectangular metal sheet. The metal sheet is folded in cylindrical shape with two edges of the sleeve welded together at the end. To obtain a given thickness profile of the sleeve at least one cylindrical flow spinning operation is carried out. To support the cylindrical rim structure disc is manufactured by stamping a metal plate. Appropriate holes for the center hub and lugs are provided in to the disc.

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