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Manufacturing and Testing of Braking Material-Amc 3

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Abstract

Braking system is an integral part of automobile mechanism. for certain unique automobiles like go-kart systems, the braking system must be designed with accurate and material importance. this is done to keep in accordance with various parameters such as economy and weight of the automobiles etc. the braking systems have to provide enough force in order to decelerate by completely locking the wheels. the report concentrates on explaining the engineering aspects of designing a braking system and its material for go-kart. this report explains objectiveness, assumptions and calculations made in designing a go-kart braking system.A comparative study for the braking system made of grey cast iron (i.e; conventional material), Ti-alloy, 7.5 wt

Index terms—

1 Manufacturing and Testing of Braking

Material-Amc 3

Shaik Himam Saheb ? & M. Naveen Kumar ? Abstract-Braking system is an integral part of automobile mechanism. for certain unique automobiles like go-kart systems, the braking system must be designed with accurate and material importance. this is done to keep in accordance with various parameters such as economy and weight of the automobiles etc. the braking systems have to provide enough force in order to decelerate by completely locking the wheels. the report concentrates on explaining the engineering aspects of designing a braking system and its material for go-kart. this report explains objectiveness, assumptions and calculations made in designing a go-kart braking system. A comparative study for the braking system made of grey cast iron (i.e; conventional material), Ti-alloy, 7.5 wt% WC and 7.5wt% TiC reinforced Ti-composite and 20% SiC reinforced Al-Cu alloy (AMC1) and 30% SiC reinforced Al-Cu alloy (AMC2) was done. The purpose of this project was to analyze the test results and implement a better perspective for the installation of braking system in a Go-Kart automobile mechanism. The test parameters considered are compressive strength, coefficient of friction, wear rate, specific heat, specific gravity etc. which are believed to be the most important parameters for the operation of a braking system.

2 I.

3 Literature Review

ing et al. ??2000) have designed and manufactured a front brake rotor by semisolid stirring plus liquid forging process. Then the brake rotors are subjected to dynamometer test and the performance of the MMC brake rotor is compared with the conventional cast iron rotor. They have concluded that the MMC rotors have higher wear resistance, low temperature rise, high friction coefficient. Pai et al. ??2001) have presented the low cost processing of MMCs, surface treatment of reinforcement, process parameters and the role of alloy additions with the special reference to the Al-graphite system, Al-silicon carbide, and Al-short fibers carbon systems. They have also highlighted the manufacturing of MMC components like piston rings, pistons, cylinder sleeve and connecting rods for light weight automotive applications. Pillai et al. ??2001) in their investigation, they have

concluded that the semisolid processing of aluminium composites have better properties like minimum interfacial reactions, uniform distribution of reinforcements and high percentage of reinforcement can be added with the matrix alloy. Degischer and Prader (2000) have presented the functions of thematic network in assessing the applications of metal matrix composite materials in all technical fields. They have also presented the role of the thematic network in sharing information on processing, testing, modeling, application and marketing of MMCs. Goni et al. **??**2000) have suggested that the high processing cost of MMCs, as the important barrier for using it in automotive applications. They have also suggested that the cost of MMC components can be reduced either by locally reinforcing the reinforcement or by reinforcing the MMC inserts in the required positions of the automotive components. Degischer et al. (**??**001) have presented the functions of thematic network in developing the processing and applications of MMCs. They have also presented the activities of the thematic network in sharing information on processing, testing, modeling, application and marketing of MMCs

4 II. About Existing Braking System

Three major problems exist with this aluminumcomposite rotor. First, because of the density difference between aluminum and SiC, segregation or inhomogeneous distribution of SiC particles during solidification cannot be avoided. Also, adding SiC particles in an aluminum matrix dramatically reduces the ductility of the material, resulting in low product liability. The third problem is a lack of a solid lubricant, such as graphite. The lack of graphite in the system results in low braking efficiency, adhesive wear, and galling. In a cast iron rotor, graphite is always present in the iron. As the break wears, the graphite is freed from the iron matrix to be used as a solid lubricant on the wear surface.

Apart from These problems there are no disadvantages of the existing braking system but we can further improve the efficiency and performance of the braking system of the automobile by making the new composition of AMC 3 material with composition of the Aluminium of 35% , copper of 40% and silicon carbide of 25% by manufacturing with stir casting technology and it can be proved by the a method of selection for any material ,it is named as a digital logic method. This metal-matrix AMC3 is then poured into the graphite crucible and put in to the coal-fired furnace at 1000°C temperature. The furnace temperature was first increases above the composites completely melt the scraps of aluminium and copper and then cooled down just below the components temperature and keep it in a semi-solid state. At this stage the preheated SiC were added with manually mixed with each other. It is very difficult to mix by machine or stirrer when metal-matrix composites are in semi molten state with manual mixing taking place.

5 Figure 1: Melting of Alloys

When the manual mixing is complete then automatic stirring will carried out for ten minutes with normal 400 rpm of stirring rate The temperature rate of the coal-fired furnace should be controlled at 1000 $\pm$ 10°C in final mixing process. After complete the process the slurry has been taken into the sand mould within thirty seconds allow it to solidify. Tests should be taken of solidified samples like hardness and impact tests. This experiment should repeatedly conducted by taking the composition of the composite powder of SiC (25%), weight of aluminium scraps in grams plus weight in grams of SiC powder. Finally we prepared the six sample including rounded bars and square bars. These final samples are now ready for further testing processes of hardness test, impact strength test and microstructure examination.

6 III.

7 Discussion

The major aim and objectives of this paper is to prepare aluminium, copper based silicon carbide particulate MMCs with an objective to develop a conventional low cost method of producing MMCs and to obtain homogenous dispersion of ceramic material. To achieve these objectives stir casting technique has been adopted. Pure Aluminium, copper and SiC has been chosen as matrix and reinforcement material respectively. These metal-matrixes are very popular, cheap and beneficial for the modern engineering fields. After getting the varying the composition AMC3 samples are ready for the testing. Further we will check the hardness test, impact strength test. A full factorial design for several readings for a given matrix of data would be treated using ANOVA (Analysis of Variance) based on the percentage of SiC around the prospective sample Our main target is to prepare a very hard metalmatrix sample which becomes very popular, cheap and beneficial for the modern engineering era.

1. Graph drawn between all materials compressive strength: As this test requires a small piece of sample specimen and it fitted to the pin on disc machine and the tests are conducted with varying the load and speed. this machine also gives the friction coefficient factor as a output with the help of the disc which is fitted to it and it helps the machine to caliber the material surface property of coefficient of friction. We have tested our specimen with this machine and got the results of wear rate test and coefficient of friction tests. 3. Graph drawn between all materials wear rate:
4. Graph drawn between all materials specific heat (or) thermal capacity:
5. Graph drawn between all materials specific gravity:

6. Graph Showing The Performance Index (Î?") Of All Materials:

IV.

8 RESULTS

All the tests carried with all the precautions without having parallax error and the values are rounded values but not the exact or accurate values as we know that mechanical machines will be taken the values on a average.

Therefore the parameters of our AMC 3 material are as follows:

9 SPECIFIC GRAVITY

Specific gravity digital logic method showed the highest performance index for AMC 3 material and identified as an optimum material among the candidate materials for brake disc. In the digital logic method, the friction coefficient and density were considered twice for determining the performance index and the cost of unit property. This procedure could have overemphasized their effects on the final selection. This could be justifiable in this case as higher friction coefficient and lower density are advantageous from the technical and economical point of view for this type of application Several confronts must be surmounted in order to strengthen the engineering usage of AMC 3 or AMC's such as processing methodology, influence of reinforcement, effect of reinforcement on the mechanical properties and its corresponding applications. The major conclusions derived from the prior works are:

? SiC reinforced with Al and Cu MMCs have higher wear resistance than other MMCs. ? SiC reinforced with Al and Cu MMCs are suitable materials for brake materials as they have high wear resistance. ? The wear resistance of SiC reinforced with Al, Cu MMC is higher than other reinforced MMC. ? AMC 3 exhibits high thermal conductivity and a low thermal expansion co-efficient. ? The wear resistance and compressive strength of AMC 3 is high. [1] [2]

Figure 1:

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[2] Manufacturing and Testing of Braking Material-Amc 3

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