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THE TRIBOLOGICAL PROPERTIES OF PTFE COMPOSITE FILLED WITH CARBON FIBER, MOS2, BRONZE REINFORCEMENT

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ABSTRACT

PTFE that is Polytetrafluoroethylene has huge growing demand due to the fact of its special residences like low coefficient of friction, excessive chemical resistivity, and excessive temperature stability. However, PTFE famous terrible put on resistance, mainly abrasion. The put on resistance of PTFE can be notably expanded by means of addition of appropriate reinforcement (filler) materials. Among the most frequent filler substances are glass fibers, MoS2 and bronze. In this paper, it is introduced a evaluate of tribological residences of composite substances with PTFE matrix and above noted filler materials. Now a day there has been a considerable increase in the large-scale manufacturing of polymers and polymer matrix composites. Polymer composites on the whole used as structural aspects that are very regularly subjected to friction and put on loadings underneath use. In some situations, the coefficient of friction is of the perfect importance, however mainly the mechanical load-carrying capability and the put on existence of factors that decide their acceptability in industrial functions underneath unique working conditions.

Keywords: Ptfe, Carbon Fibre, Mos2, Bronze, Composite Material

1. INTRODUCTION

Tribology is the science of rubbing surfaces in relative motion. It is the find out about of the friction, put on and lubrication of engineering surfaces with a view of perception floor interactions in element and then prescribing upgrades in given applications. One of the essential goals in tribology is the legislation of the magnitude of frictional pressure in accordance to whether or not we require a minimal or a maximum. This goal can be recognize solely after a critical perception of the frictional manner for all prerequisites like load, sliding velocity, lubrication, floor finish, temperature and cloth properties.

Now a day there has been a large boom in the large-scale manufacturing of polymers and polymer matrix composites. Polymer composites by and large used as structural elements that are very regularly subjected to friction and put on loadings underneath use. In some situations, the coefficient of friction is of the best importance, however normally the mechanical load-carrying potential and the put on lifestyles of aspects that decide their acceptability in industrial functions underneath unique working conditions.

Sr.no	Composite pin
1.	PTFE+15% CF+5% MoS2+5% Bz
2.	PTFE+20% CF+5% MoS2+5%Bz
3.	PTFE+25% CF+5% MoS2+5%Bz
4.	PTFE+30% CF+5% MoS2+5%Bz

Fig. 1.1 Composite pin

PTFE and a range of composites towards MOS2 crammed distilled water had been comparatively investigated by way of thinking about the parameters like hundreds and sliding pace of current bearing of motor. Wear assessments are carried out by using rubbing the check pin of PTFE composites in opposition to stainless metal disc floor in moist circumstance the usage of a pin-on-disc Tribometer.

The impact of everyday load, percent of Mos2 in distilled water and proportion of carbon fiber is mentioned in outcomes and discussion.

2.TRIBOLOGICAL THEORY AND PTFE

2.1 Introduction

Tribology is described as the science and science of interacting surfaces in relative motion, having its beginning vicinity in the Greek phrase 'tribos' which capacity rubbings with a view of appreciation ground interactions in . It is the discover out about of the friction, lubrication and put on of engineering ground component and then prescribing enhancements in given applications. Since World War II the fast cost of technological improvement has required incredible expansion in look up on what to do about surfaces that rub.

One of the crucial desires in Tribology is the rules of the magnitude of frictional strain in accordance to whether or not or no longer we require a minimal or a maximum. This goal can be realized completely after the grasp of the frictional gadget is bought for allconditions of temperature,

sliding velocity, lubrication, flooring stop and material properties.

3.PROBLEM DEFINITION AND OBJECTIVE OF THE PROJECT

3.1 Problem Definition

1. India is the largest sugar producing in the world & sugar corporation in India is the 2nd best manufacturing industry. Presently Indian sugar industries are working at one-of-a-kind cane crushing capacity ranging from one thousand to 10,000 loads per day. In sugar corporation juice from sugar cane is extracted in milling section. The sugar mills use huge range of strolling factors fabricated with ferrous and non-ferrous alloys which requires ordinary or continuous lubrication.

These mills often go thru from corrosion associated problems which in flip consequences in the prefer for large maintenance, thereby developing the manufacturing cost. Now there is a scope to restrict the charge of sugar manufacturing and amplify the effectivity of the sugar mills via the use of altering some of the usual fabric elements with the resource of these of newly developed moderate weight composites.

3.2 Objectives of the Project

Following are the dreams of the venture work,

1. To suggest the extremely good splendid self-lubricating PTFE composite material for the journal bearing features from the examined PTFE composite components for the existing hydrostatically lubricated gun metal or brass journal bearing used for Rolling mills.

2. To find out out the habits of the new composite fabric from put on & friction component of view and the influence of a range of sliding speeds and heaps on it.

3. To confirm the indispensable criminal suggestions of friction.

4. To enhance relationship of entire put on with the utilized everyday load, sliding tempo and share of with the aid of potential of mathematical modeling the use of regression analysis.

4. EXPERIMENTAL METHODOLOGY

4.1 Experimental Setup:-

Experimental set up is as shown in following fig. 5.1. Using a pin-on-disc Tribometer (TR-20LE) reading of wear and frictional force are taken.

Fig. 4.1 Photograph of experimental set up (Tribometer TR-20LE).

4.2 Construction-

The TR-20LE Pin on disc put on trying out is superior concerning the simplicity and comfort of operation, ease of specimen clamping and accuracy of measurements, each of put on and frictional pressure alongside with lubrication and environmental facility.

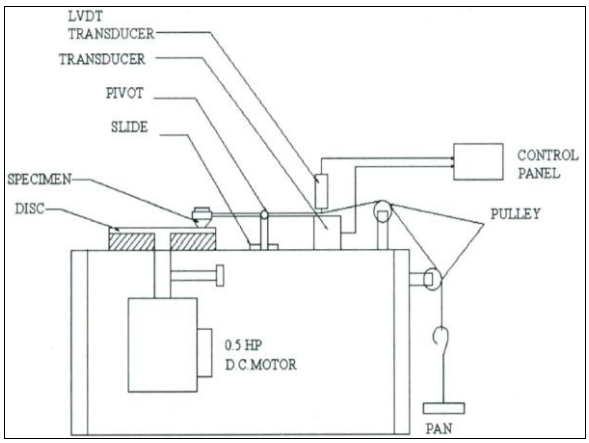


Fig. 4.2 Experimental setup of Pin on Disc Tribometer

The laptop computer is designed to comply with heaps up to 20 kg and is intended every for dry and lubricated take a look at conditions. It permits locate out about of friction and put on characteristics in sliding contacts under favored take a seem to be at stipulations internal computing system specifications. Sliding takes vicinity between the stationary pin and a rotating disc. Normal load, rotational pace and put on track diameter can be a number to swimsuit the take a appear at conditions. Tangential frictional strain and put on are monitored with digital sensors and recorded on PC. These parameters are on hand as a attribute of load and speed.6.3

5. OBSERVATION TABLES

Table 5.1 Experimental Data of Lubrication- PTFE + 15% carbon fiber + 5% mos_2 + 5%BZ

Sliding velocity: 012 m/sec, Time -60 min, load-100.91N, Speed -152.78 rpm.

Sr. No	Setting Time(Min)	Wear (Micron)	Frictional Force (N)	Coefficient of Friction
1	0	0	0	0
2	5	3.1	6.2	0.0615
3	10	3.2	6.2	0.0615
4	15	4.1	6.1	0.0605
5	20	4.2	6.1	0.0605
6	25	4.2	6.0	0.0695
7	30	5.1	5.7	0.0665
8	35	5.2	5.6	0.0655
9	40	6.1	5.6	0.0655
10	45	6.2	5.7	0.0665
11	50	7.2	5.7	0.0665
12	55	8.2	5.6	0.0655
13	60	8.2	5.5	0.0645
		Total Wear=8	Avg F.F=5.6	AVG. C.O.F.=0.0655

Table 5.2 Experimental Data of Lubrication- PTFE + 20% carbon fiber + 5%mos_2 + 5%BZ

Sliding velocity: 012 m/sec, Time -60 min, load-109.049N, Speed -65.48 rpm.

Sr.No	Setting Time(Min)	Wear (Micron)	Frictional Force (N)	Coefficient of Friction
1.	0	0	0	0
2.	5	6.2	5.9	0.0549
3.	10	7	5.7	0.0530
4.	15	7	5.6	0.0521
5.	20	7.2	5.7	0.0530
6.	25	8	5.7	0.0530
7.	30	8.9	5.5	0.0512
8.	35	9	5.6	0.0521
9.	40	9	5.3	0.0494
10	45	9.5	5.2	0.0485
11	50	11	5.1	0.0475
12	55	12	5.2	0.0485
13	60	12	5.1	0.0475
		Total Wear=8	Avg F.F=5.4	Avg. C.O.F.=0.0485

Table 5.3 Experimental Data of Lubrication- PTFE + 25% carbon fiber + 5%mos_2 + 5% BZ: velocity 012 m/sec, Time -60 min, load-113.070N, Speed -152.78 rpm.

Sr. No	Setting Time (Min)	Wear (Micron)	Frictional Force (N)	Coefficient of Friction
1	0	0	0	0
2	5	3.9	5.2	0.0559
3	10	4.2	5.0	0.0542
4	15	5	4.8	0.0524
5	20	6.5	4.6	0.0506
6	25	7	4.4	0.0589
7	30	8	4.2	0.0471
8	35	9	4.2	0.0471
9	40	10.1	3.8	0.0436
10	45	11	3.7	0.0427
11	50	13.2	3.8	0.0436
12	55	15	4.0	0.0453
13	60	15.3	4.0	0.0453
		Total Wear=8	Avg F.F=4.3	Avg. C.O.F.=0.0489

Table 5.4 Experimental Data of Lubrication- PTFE + 30% carbon fiber + 5% mos_2 + 5% BZ velocity: 012 m/sec, Time -60 min, Load-117.189N, Speed -65.48 rpm.

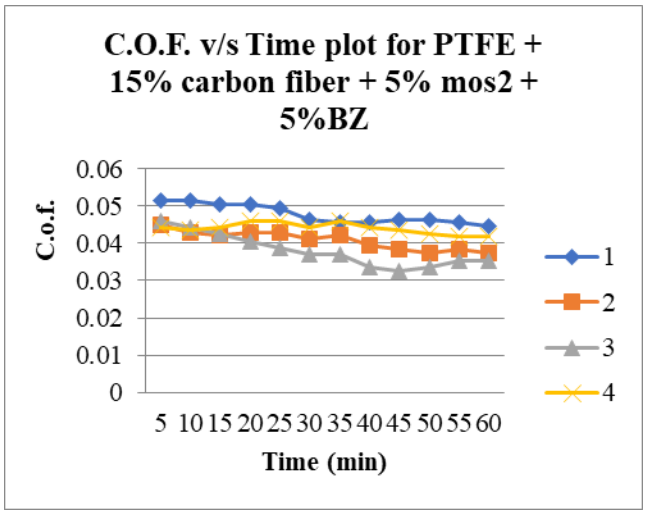
Sr. No	Setting Time(Min)	Wear (Micron)	Frictional Force (N)	Coefficient of Friction
1	0	0	0	0
2	5	6.1	4.9	0.0544
3	10	7.2	4.7	0.0535
4	15	8.1	4.6	0.0544
5	20	9.1	4.7	0.0561
6	25	10.2	4.7	0.0561
7	30	11.3	4.5	0.0544
8	35	12.2	4.6	0.0561

9	40	13.1	4.3	0.0544
10	45	14.2	4.2	0.0535
11	50	15.3	4.1	0.0527
12	55	17.2	4.2	0.0518
13	60	17.2	4.1	0.0518
		Total Wear=8	Avg F.F=4.6	Avg. C.O.F.=0.0543

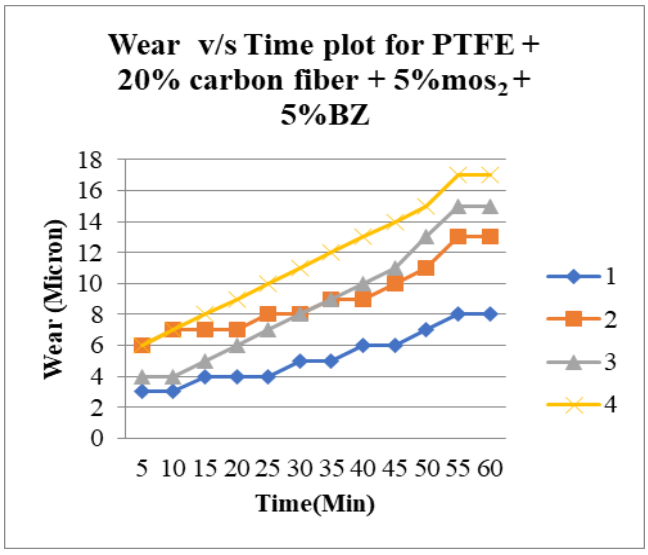
6.RESULTS AND DISCUSSIONS

6.1 Graphs

6.1.1 Lubrication- PTFE + 15% carbon fiber + 5% mos_2 + 5%BZ



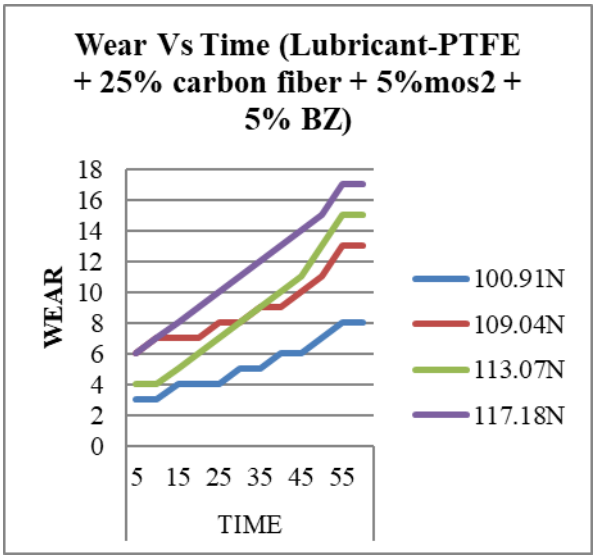
Graph No.6.1: COF v/s Time plot for run 1 to 8



Graph No.6.2: Wear vs. Time plot for run 1 to 8

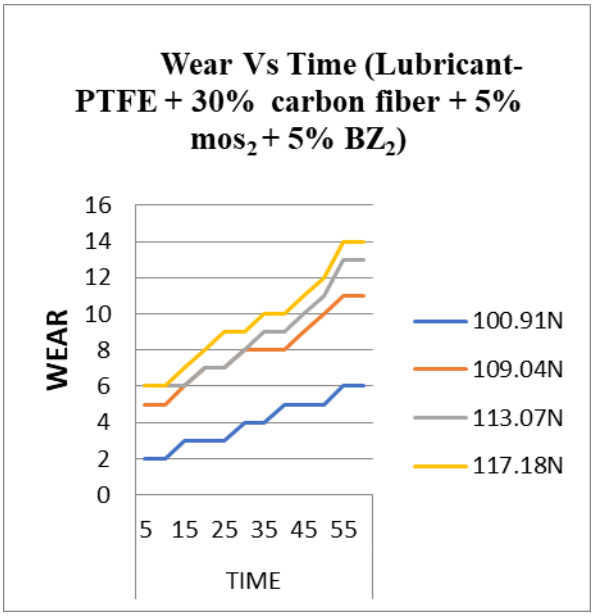
7. Effect On Wear

A) Effect on wear for lubrication-PTFE+25% carbon fiber +5%mos_2



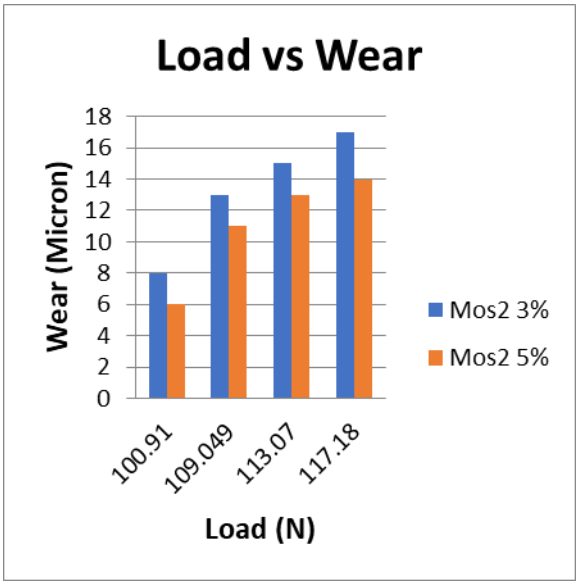
Graph No.7.1: Wear vs. Time plot

B) Effect on wear for lubrication- PTFE + 15% carbon fiber + 5% mos_2 + 5% BZ



Graph No.7.2: Wear vs. Time plot

7.1.4 Effect of load on Wear



Graph No.7.3: Wear Vs. Load plot

CONCLUSIONS

Based on existing find out about the following conclusions can be drawn:

1. For the PTFE + up to 30% carbon fiber the glass fiber composites, in the beginning put on is extra & after sure sliding time put on curve indicates very small put on with time or it receives stabilized .This might also be due to formation of extra & extra uniform switch movie on the counter face.

2. Frictional coefficient at first will increase with sliding time & later it stays nearly consistent due to extra compact and uniform switch film.

3. Wear will increase with enlarge in utilized load.

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