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# ANTICIPATION POSSESSIONS FOR SEISMIC USE CARBON BLACK ON RUBBERS

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**Abstract:** Now a day in industries and many engineering fields rubbers are very important and they are needed to be manufactured with very high performance on friction and fatigue properties. Here in this project various compositions are derived with the variation in percentage of weight between carbon black and ISNR rubbers and the rubber samples are manufactured with Indian standards. Then these samples are tested in a wear testing machine called pin on disc tribometer and other mechanical tests are also done to know the damping capacity. Then various parameters are measured and graphs are plotted for the tested results and the best sample is noted from that readings and graphs. Then that rubber is made as a sheet with required dimensions and that is manufactured by the standard process and it is implemented for earthquake prevention on the basement of the buildings.

**Keywords:** Damper, Pin on disc, Carbon black, Indian standards, Earthquakes.

## 1. Introduction

### *A. Damping system in earthquakes*

Damping is an important abnormality in suppressing the beating or abreast of a building. Damping mainly causes the activity to be absent from beating to added activity sinks. So dampers can be installed in the structural anatomy of a building. These dampers are mainly acclimated to blot some bulk of activity entering into the architecture produced from earthquakes.[1-6]So the anamorphosis of the architecture is beneath and accompanying the accident is as well reduced. So a architecture with added accessories of dampers getting used. They are brownish dampers, abrasion dampers and adhesive dampers. In this paper, elastic is acclimated as a seismic damper to blot some activity traveling into the building.[7]

### *B. Constituents of rubbers*

There are more than 700 ingredients that can be used as chemicals in the rubbers and the performance of rubber depends on its wear and tear properties where that can be given out by the ingredients that are added to it where these ingredients are combined as constituents for the rubbers, they are[8-10]

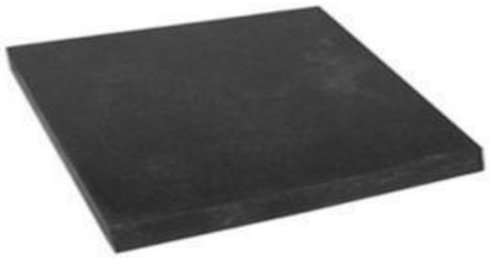

**Figure 1.** Damper design for earthquakes

- Compounding additives, which actuate the acerbity backdrop of rubbers and comprise a admixture of abrasives and lubricants
- Fillers, which abate the amount and advance the manufacturability of samples.
- Binder, which holds apparatus of a rubbers together
- Reinforcing abstracts which accommodate automated strength.

**Table 1.** Composition For Dampers

| S.NO | Ingredients added | % F1 | % F2 | % F3 |
|---|---|---|---|---|
| 1 | ISNR rubber | 6 | 9 | 8 |
| 2 | Zinc oxide | 8.2 | 8.2 | 8.2 |
| 3 | Stearic acid | 2.2 | 2.2 | 2 |
| 4 | BL oil | 1 | 2 | 2 |
| 5 | Sulphur | 3.5 | 3.5 | 3.7 |
| 6 | BSM | 1.04 | 1.04 | 1.04 |

| | | | | |
|---|---|---|---|---|
| 7 | Carbon black | 33.5 | 25.5 | 29.5 |
| 8 | Phenolic resin | 14 | 15 | 13 |
| 9 | Graphite | 8.06 | 8.06 | 8.06 |
| 10 | ZBC | 7.5 | 7.5 | 7.5 |
| 11 | additives | 15 | 18 | 17 |

## 2. Preparation of Rubber Samples

### *A. Mixing*

The ingredients are mixed thoroughly with rubber to get a uniform dispersion in the materials. The mixing was done in shear mixer with cutters and some samples [13]with vulcanization properties and agents are also mixed with it but before mixing it . the materials are heat treated for about 150ºc.[12]

### *B. Shaping and other processes*

This step involves 4 parts of processes, they are

- ➢ Extrusion
- ➢ Calendaring
- ➢ Coating
- ➢ Molding and casting

### *C. Two stage mixing*

The ingredients without vulcanizing properties are first added into the mixture, and then they are stirred well in the chamber at 250ºc. After normal mixing was done the ingredients are cooled and then they are mixed with vulcanizing additives[11-14].

### *D. Effect of carbon black*

Here carbon black is a non-vulcanizing agent of chemical and here it gives good colour and high resistance to wear rate. Since the carbon content is high for carbon black it give strength and good properties. So the co-efficient of friction value remains moderate for the rubbers and hence the mechanical properties are improved well. So carbon black improves fatigue and wear rate.[15-17]

## 3. Testings of Rubbers

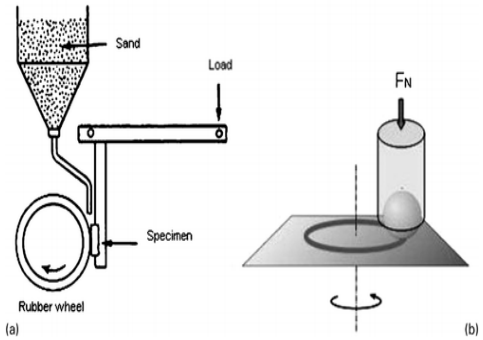


**Figure 2.** Testings for rubbers

### *A. Pin on disc test*

Friction tests were performed on Abrasion Coefficient Analysis rig as per IS 2742 /SAE J661. It is absolutely computerized and is programmable to abstraction abrasion acknowledgment adjoin speed, load, temperature and wear. New rotor discs and anchor lining blended samples were acclimated for anniversary test. Anniversary agreement was activated at atomic two times on the analysis rig to advance aplomb in the data.[18]



**Figure 3.** Pin on disc apparatus

The rig uses a pearlite gray casting adamant discs (diameter of 180 mm, array 38 mm) and a elastic analysis sample in the anatomy[18] of pin 8mm bore x 60 mm length. Anniversary analysis sample was army on the amount arm and apprenticed adjoin the alternating disc. The alternating casting adamant disc has a connected sliding acceleration of 9m/s and the analysis continuance was 80 min. The surfaces of the samples and the casting adamant discs had to be arena with 320-grid sandpaper afore alpha the test. The accustomed amount was assorted to accomplish a connected abrasion force.

The abrasion accessory was affected by barometer accustomed and microburst armament every 5s over the absolute continuance of the test.The weight and array of the samples were acclaimed afore and afterwards the abrasion analysis to account the absolute abrasion of anniversary sample. An bittersweet sensor was

acclimated to almanac the temperature of the acquaintance interface during the analysis and readings were recorded every second.[21]



**Figure 4.** Rubber sample as pin



**Figure 5.** Pin on disc at working condition

### *B. Damping performance*

The damping performance of rubbers depends on the fluid resistance and lubrication properties inside the dampers. Here samples of size 30cm x 30cm x 2cm was made with the derived composition of F1, F2, F3 and thus it was tested in a fatigue testing rig and continuous loads were given for thus samples with variation of time with respect to load. Thus loads are increased and decreased as per standards of rubbers and thus readings are tabulated.

**Table 2.** Readings For Dampers

| **Properties** | **F1** | **F2** | **F3** |
|---|---|---|---|
| Density | 1.23 | 1.42 | 1.62 |
| Porosity | 2.6 | 2.7 | 2.1 |
| Acetone Soluble | 2.8 | 3.0 | 2.7 |
| Tensile | 19.2 | 13.3 | 19.6 |
| Hardness | 66 | 61 | 62 |
| Shear strength | 8.51 | 4.61 | 5.58 |
| Compressive | 1.5 | 0.5 | 0.68 |

## 4. Discussions

The aggregate body of the carbon atramentous was bent in the ambit of 1.8 – 2.22 kg / cm2.From the graphs it can be assured that F1 is the acceptable actual composition. As it is accepting low density, top acerbity and top compressive strength. Aswell F1 is assuming acceptable achromatize attrition as it is not Varying with the temperature. The accessory of abrasion detected was consistently about 0.3. The absolute abrasion was as well low. Full calibration dynamometer tests are planned on these compositions in future.

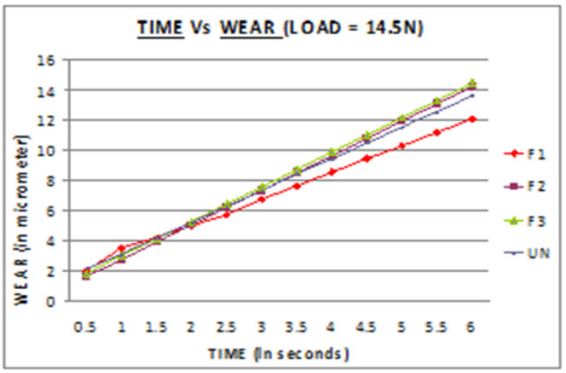


**Figure 6.** Time vs wear

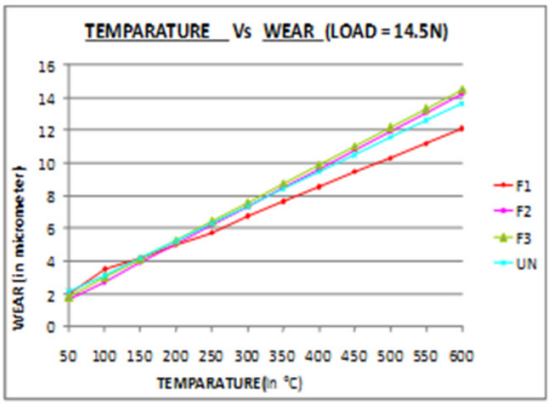


**Figure 7.** Temperature vs wear

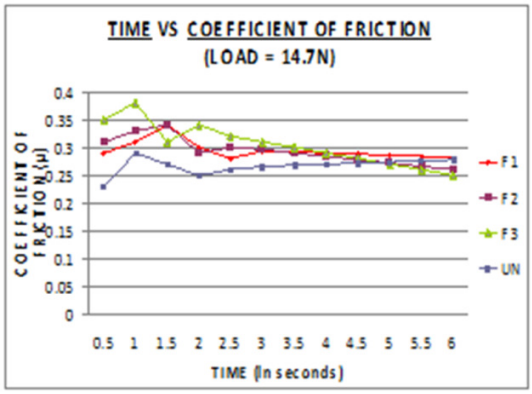


**Figure 8.** Time vs co-efficient of friction

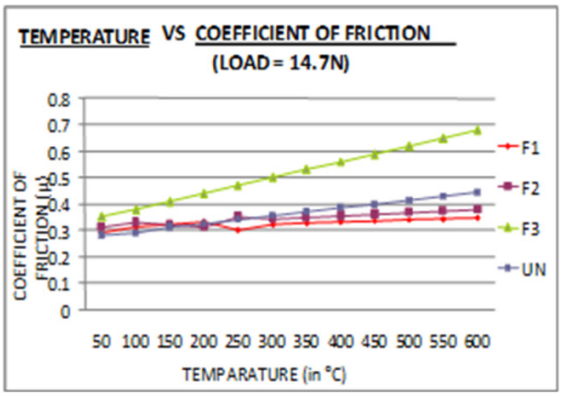


**Figure 9.** Temperature vs co-efficient of friction

### 5. Complete Result

From the above results we infer that .

- Composition F1 has wear rate ranging from 2-12 micrometer which is less compared to other composition and coefficient of friction is maintaining at 0.3 which is a constant value.

  Since higher the carbon black content lower the wear rate so here F1 has a moderate wear rate of co-efficient of friction.

- Composition F2 has wear rate ranging from 2-13 micrometer which is slightly higher value and coefficient of friction varies to 0.4 which is slightly higher than standard value.

- Composition F3 has wear rate ranging from 2-14 micrometer which is very high value compared to other composition and coefficient of friction is 0.6 which is also a very high value.

Thus we infer that **Composition F1** is best suited one from these compositions.

Thus from the above readings and graphs plotted for the composition F1, F2, F3 are noted and from the values and testings it is noted that F1 is best suitable sample.

Hence the composition was used for damping system in earthquake which the rubber formulation was made with the standards of rubbers and manufactured, the again some standard tests are done and damper was made and used in building constructions.

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