# Preparation of Oil seals from Leather and Textile Industrial Solid waste

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**Abstract**

Oil seals are rotary shaft seals that close a gap between stationary and moving components and prevent lubricant to escape and thus stop contamination through the clearance. Oil seals are widely used in aircraft and automobile, medical devices and industrial machines farm equipment. The role of elastomers and its ingredients play vital role in the development of excellent oil resistance properties in oil seals. In this present study, oil seals were prepared by waste generated by leather and textile industry as a low cost reinforcing short fiber in rubber formulations. Good oil resistance performance can be achieved through effective blending of elastomers and fillers with suitable cure systems and modifying the level of other compounding ingredients such as zinc oxide, stearic acid, resin and paraffin wax. Cost reduction is achieved through increasing filler loading and also with incorporation of the fibrous nature of chrome shavings obtained from leather processing industries. Compound formulations are prepared on the basis of critical studies which include employing various cure system, increasing zinc oxide content, stearic acid content, blending of rubbers and fillers. Based on these technical approaches served, formulations are developed. Out of these formulations, NBR 60 Phr /EPDM 40 Phr with leather chrome shavings and Textile weaving hard waste up to 40 Phr rubber formulation compound exhibit excellent oil resistance performance at lower cost.

## Introduction

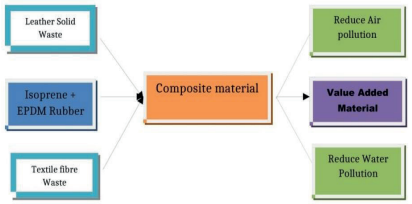



Fig:Flow diagram of this research work

**Materials and Methods**

**Machines Involved:**

1. Two Roll mill
2. Compression Moulding Machine
3. Strap Cutting Machine

To prepare the oil seal samples, accurately weighed quantities of the ingredients were fed to a two roll rubber mixing mill (with roller dimension D=220mm and L = 450 mm) maintained at a temperature of 47-67 °C and rolling at a speed of 15 rpm. Composite of 5–6 mm thickness were made and stored at room temperature.

**Chrome Shavings:**

- Obtained as waste material when chrome tanned leathers undergo shaving operation.
- Available in 1-2% on the weight of the raw H/S in fibrous shredded form .
- Exists in trivalent state
- Ts -110 c



**Textile Hard waste:**

Several types of wastage are found during the processing of row cotton in spinning mill 12-13% wastage are produced for card process and 25-30% wastage are produced for combed process.

The hard waste occurs mostly at the final stage, i.e., in post spinning process (Cone winding machine). These hard wastes are not reusable in spinning industry.

- The hard waste level obtained in cone winding machine ranges from 0.3 to 0.8 per cent.
- The hard waste level obtained in warping machine ranges from 0.1 to 0.4 percent
- The hard waste level obtained in weaving machine ranges from 0.1 to 0.6 percent




| Composition of the different Trials | | | Role of the material | Trail-A Quantity(PHR) | Trail-B Quantity(PHR) | Trail-C Quantity(PHR) |
|---|---|---|---|---|---|---|
| NBR Rubber | EPDM Rubber | NBR Rubber + EPDM rubber | Base polymer | 100 | 100 | 100 |
| Chrome shaving | Chrome shaving | Chrome shaving | Solid waste / filler | 20 | 20 | 20 |
| Weaving hard waste | Weaving hard waste | Weaving hard waste | Solid waste / filler | 20 | 20 | 20 |

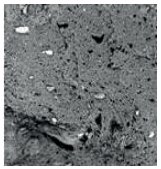
| Composition of the different Trials | | | Role of the material | Trail-A Quantity(PHR) | Trail-B Quantity(PHR) | Trail-C Quantity(PHR) |
|---|---|---|---|---|---|---|
| Zinc oxide | Zinc oxide | Zinc oxide | Activator | 2.2 | 2.2 | 2.2 |
| Stearic acid | Stearic acid | Stearic acid | Activator | 5 | 5 | 5 |
| Coumarone Indane Resin | Coumarone Indane Resin | Coumarone Indane Resin | Tackifier | 5.5 | 5.5 | 5.5 |
| Dioctyl phthalate | Dioctyl phthalate | Dioctyl phthalate | Plasticizer | 10 | 10 | 10 |
| Silica | Silica | Silica | Filler | 15 | 15 | 15 |
| Whiting $TiO^2$ | Whiting $TiO^2$ | Whiting $TiO^2$ | Filler | 5 | -- | -- |
| High Abrasion Furnace carbon black N330 | High Abrasion Furnace carbon black N330 | High Abrasion Furnace carbon black N330 | Reinforc-ing filler | 5 | 5 | 10 |
| General Purpose furnace Carbon black | General Purpose furnace | General Purpose furnace | Reinforc-ing filler | 5 | -- | 5 |
| Fast Extrusion Furnace Carbon black | Fast Extrusion Furnace | Fast Extrusion Furnace | Reinforc-ing filler | 20 | 25 | 15 |
| Wood Rosin | Wood Rosin | Wood Rosin | Antioxi-dant | 1 | 1 | 1 |
| Paraffin Wax | Paraffin Wax | Paraffin Wax | Antioxi-dant | 1 | 1 | 1 |
| Trimethyledi hydro quinolone (TDQ) | Trimethyled ihydro quinolone (TDQ) | Trimethyled ihydro quinolone (TDQ) | Curative | 1 | 1 | 1 |
| 4020 Dimethyl Butyl, PheylParaph eny-lenediamide | 4020 Dimethyl Butyl, PheylParaph eny-lenediamide | 4020 Dimethyl Butyl, PheylParaph enyl-enediamide | Delayed primary accelerator | 1 | 1 | 1 |
| Sulphur | Sulphur | Sulphur | Secondary accelerator | 2.2 | 2.2 | 2.2 |
| Cyclo Hexyl Benzothiaz-ole Sulphona-mide (CBS) | Cyclo Hexyl Benzothiazo leSulphona mide (CBS) | Cyclo Hexyl Benzothiaz-oleSulphona -mide (CBS) | Activator | 1.0 | 1.0 | 1.0 |
| Tetra Methylene Thiurim-Disulphide (TMTD) | Tetra Methylene Thiurim-Disulphide (TMTD) | Tetra Methylene Thiurim-Disulphide (TMTD) | Activator | 1.2 | 1.2 | 1.2 |

**Result and Discussion:**

Composite samples were successfully made using the chrome shaving waste and hard weaving waste with rubber and additives. The SEM images showed that the chrome shaving waste and hard weaving wastes having good compatibility with both NBR and EPDM rubber. The samples with lesser proposition of EPDM rubber showed good physico-mechanical characteristics. However, incorporation of NBR and EPDM rubber along with the solid waste improved the tensile strength of the samples. Therefore, the 70-Phr of NBR + 30-Phr of EPDM + 50-Phr of Leather and Textile waste composite can be considered for further development, which in turn could be a sustainable way of making use of the solid waste generated by the leather and textile industry.

**Conclusion:**

It is concluded that efficient use of the fibrous nature of waste from textile and Leather industry would not only avoid the environmental problem but also become a source of sustainable value-creation from these solid wastes.



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**Note**