RECYCLING OF WASTE TYRES INTO RECLAIM RUBBER

Re-generated or Reclaimed rubber is produced by partial de-vulcanization of rubber granulate obtained from end-of-life tyres and other rubber products. The regenerated rubber has almost the original plasticity of virgin rubber, permitting the same to be compounded, processed and re-vulcanized or reused.

Regeneration can occur either by breaking the existing cross links in the vulcanized rubber (partial de-vulcanization) or by promoting scission of the main chain of the polymer (breakage of C-C bonds) or a combination of both processes.

Partial De-vulcanization means selective cleavage or breakage of Disulphide (S-S) chemical bonds (see: Figure below) leading to the separation of natural rubber polymer chains using **heat, mechanical shear force and assisted by peptizers** (like process oil & pine tar oil) and **reclaiming agent** (like Disulphides). The de-vulcanization is partial i.e. some and not all Disulphide (S-S) chemical bonds are broken. The main mechanism of de-vulcanization is by means of thermal – oxidative degradation and high shear force acting on the material.

![Figure: Vulcanized Natural Rubber (with Sulphur)](image)

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End Applications of Reclaim Rubber

- Automotive Tyre, Tube & Flap
- Bicycle Tyre & Tube
- Tyre Re-treading Material – Hot & Cold Tread
- Belting & Hose
- Moulded Rubber Goods
- Footwear - Shoe soles & Heels
- Flooring Sheet, Rubber Tiles, Automotive Mats & Mud Flaps etc.

Sectorwise Consumption of Reclaim Rubber (2009-10)
Advantages of Reclaim Rubber

✓ The cost of reclaim rubber is much lower as compared to virgin rubber (one-fourth to one-third); hence use of reclaim rubber reduces cost and improves economics of the rubber compound.
✓ Besides cost reduction reclaim rubber provides various technical and processing advantages like
✓ Lower power consumption during break-down and mixing. During manufacture, reclaimed rubber has already been thoroughly plasticized so that it breaks down and mixes more quickly than the virgin rubber.
✓ Lower mixing, calendaring and extrusion temperature.
✓ Reclaim rubber builds up less internal heat during extrusion & calendering hence imparting greater process (scorch) safety.
✓ Uniform Calendering and Extrusion leading to better surface finish.
✓ Improves penetration of rubber into the fabric during coating of nylon tyre cord fabric
✓ Improves tackiness and holds the same over a broad range of temperature.
✓ Reduces and retards blooming of sulfur from both cured and uncured compound.
✓ Low swelling and shrinkage on extrusion and calendering.
✓ Low Thermo plasticity. Due to the cross linked structure of reclaimed rubber, its compounds are less thermoplastic than virgin rubber compounds and therefore when extruded and cured in open stream, they tend to hold their shape better.
✓ Low volume cost for the product
Reclaim Rubber Production Flow Chart
(For cross-ply tyre)

Waste Tyre

Primary Shredding

Secondary Shredding

Vibrating Sieves
(Grading)

Magnetic Separator

Fiber separator

Fine Grinding

De-vulcanizer Autoclave

Mixing Mill 1

Mixing Mill 2

Strainer Extruder

Refining Mill

Reclaim Rubber

Reclaiming Agent
RP Oil
Pine Tar Oil
We can provide complete assistance for planning & implementation of the manufacture of Reclaim Rubber from scrap tyres. We can prepare a Techno Economic Project Report for your decision making. Once you decide to go for the project we can assist you in all activities related to the implementation of the project i.e. sourcing of plant & machinery, plant layout & architectural drawing, sourcing of utilities & support equipment, installation & commissioning of the plant, trial production, quality control & testing aspects, approaching major reclaim rubber buyers for technical qualification & approval purpose (e.g. Tyre companies).

As the first step we can prepare a Techno - Economic Project Report enabling you to understand different aspects of the project, approach Banks for loan purpose and Govt. departments for statutory clearances. The report will include

1.0 Introduction
2.0 Manufacturing Process & Technology
  2.1 Production Process Flow Diagram
  2.2 Input & Output Material Guiding Specifications / Standards
  2.3 End Applications / Key Markets
  2.4 SWOT Analysis
3.0 Plant & Equipment with basic Specifications & Indicative prices
  3.1 Utilities & Support Facilities with indicative prices
  3.2 Quality Control & Testing equipment with indicative prices
4.0 Manpower Requirement & Cost
5.0 Estimated Project Cost
6.0 Estimated Turnover, Production Cost, Profitability and Project Payback Period
7.0 Working Capital Requirement
8.0 List of Machinery & Chemical Suppliers
9.0 Reclaim Rubber Consumption / Production / Growth for last 10 Years
  Tyre Production Statistics (last 10 years), Market Scenario etc.
10.0 Land & Factory Building Requirement, Basic Plant Layout
11.0 Project Implementation Schedule (Bar Chart)
Services for Project Implementation

1) Selection and sourcing of technology, plant & machinery.
2) Modifying machinery technical specifications to suit local conditions, availability of spare parts etc.
3) Preparing Plant Layout & Factory Building Architectural Drawing
4) Selection and sourcing of Utilities & Support Equipment
5) Provide end product, raw material and processing additive specifications
6) Provide processing know-how
7) Assist in selection of Technical manpower
8) Quality Control & Testing system
9) Work with machinery supplier for trial production (Installation & Commissioning of the plant will be done by the machinery supplier). We will provide the Electrical cabling drawing, Water & Steam piping drawing, Dust Collection System, Pollution Control & Effluent Treatment system, Machinery Layout & Production Flow etc.
10) Product testing and technical qualification for approval purpose

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