

## **Cryogenic Grinding of Rubber to produce Micronized Powder**

Superfine powdered rubber can be manufactured efficiently using a cryogenic process. Liquid nitrogen is employed to cool the feed granules below their glass transition temperature before they are pulverized with counter-rotating pin mills. The fineness and throughput are determined by the impact speed from the pin mill and nitrogen metering. A specialized rubber granulating system and nitrogen feeder in combination with specially designed screw cooler are important for the efficiency of the system.

In a typical tyre grinding system, the process starts with whole end-of-life tyres that are shredded into 1 to 3-inch chips by an ambient (room temperature) process. These chips are frozen with non-toxic liquid nitrogen at low temperatures, making them brittle and easier to fracture. The frozen chips then are impacted (or hammered) at high velocities to produce fine mesh powdered rubber.

Cryogenic processing refers to the use of liquid nitrogen to freeze tyre chips or rubber particles prior to size reduction. Most rubber becomes brittle or "glass-like" at temperatures below -80°C. Typically, the size of the feed material is a nominal 2-inch chip or smaller. The material can be cooled in a tunnel style chamber, immersed in a "bath" of liquid nitrogen, or sprayed with liquid nitrogen to reduce the temperature of the rubber or tire chip. The cooled rubber is ground in an impact type reduction unit, usually a hammer mill. **This process can be used to produce fine micronized rubber powder ranging from 30 mesh size (595 microns) to 300 mesh size (50 microns).**

Micronized rubber produced by cryogenic process behaves like reinforcing filler in a rubber compound. It is easily dispersed in the compound without lump formation and is partly again cross-linked during vulcanization. The high specific surface area of micronized rubber substantially improves mechanical properties of compound unlike when crumb rubber or reclaimed rubber is used. Incorporation of micronized rubber does not impair dynamic character (flexibility) of the product. **Micronized rubber powder price is much lower than virgin rubber and hence improves economics of the compound without sacrificing product performance and reducing carbon footprint.**

**Usage in tyre and rubber products:** Fine rubber powder ranging from 80 mesh size (177 microns) to 120 mesh size (125 microns) can be directly incorporated in new rubber compounds along with virgin rubber without sacrificing end product performance. The fine micronized rubber powder does not require any de-vulcanization prior to use in new rubber compounds, reducing carbon footprint.

**Usage in other rubber products** like – recycle for thermoplastic elastomers (TPEs) and thermoplastic vulcanizates (TPVs), waterproof roofing membranes, brake pads, antivibration mounts, earthquake bearings for buildings etc.

**Other Usage** – micronized rubber powder is used in epoxy coatings, acrylic / asphalt sealings for driveways, improve mechanical properties and impact resistance of polypropylene and polyurethane compounds etc.

As a first step we can prepare a Techno Economic Project Feasibility Report that will provide a realistic picture and help you to take an informed business decision, approach banks for project finance and government departments for statutory approvals. Typical contents of the project feasibility report are given below.

- 1.0 End-of-life tyre recycling- different processes and end applications
- 2.0 Why micronized rubber powder provides the best results?
- 3.0 Suggested production volume & project parameters
- 4.0 Production process & technology
- 5.0 Production flow diagram
- 6.0 Main plant & machinery with basic specifications and indicative price
- 7.0 Utilities & Support facility with basic specifications and indicative price
- 8.0 Quality Control & Testing Lab with indicative prices
- 9.0 Estimated Project Cost
- 10.0 Manpower requirement & cost
- 11.0 Estimated Product Cost (raw material, additives, production, overheads)
- 12.0 Estimated Turnover, Profitability & Project Payback Period
- 13.0 Working Capital requirement
- 14.0 Factory area & building requirement

- 15.0 Product guiding specifications & test standards
- 15.1 Product pricing vis-à-vis reclaimed rubber & recycled rubber granulate
- 15.2 Advantages vis-à-vis reclaimed rubber & recycled rubber granulate
- 15.3 Key market segments and end applications
- 16.0 Global Market Scenario
- 16.1 Present production & consumption, main players
- 16.2 Market potential and growth prospects
- 16.3 Key market segments – volume and growth prospects

Once you decide to go ahead with the project we can provide complete assistance for the project implementation i.e. selection and sourcing of plant & machinery, plant layout and factory design, selection & sourcing of utilities and support equipment, recruiting technical manpower, commissioning of plant, sourcing of additives, process know-how, quality control and testing systems, product technical qualification, target market segments, end application know-how, market intelligence, REACH compliance etc.

Best regards,

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