



Rare Earth Recycling Technology for Recovery of Neodymium Oxide from End-of-Life NdFeB Magnets

Overview

Based on the Lab scale principles developed at BARC the technology has been upscaled on Pilot scale at IREL (India) Limited, RETTP Bhopal. This enables the Recycling of Scrap or End-of life magnets for extraction of Neodymium Oxide under controlled conditions with emphasis on product quality, process stability, operational safety, and resource optimization. The technology package is available for transfer to industries and organizations interested in establishing indigenous recycling facility for scrap magnets hence promoting a circular economy initiative, resource conservation, waste minimization, and domestic value addition in the rare earth sector.

Process

The recycling process involves the treatment of spent or scrap NdFeB magnets through a sequence of mechanical, chemical, and purification operations designed to recover valuable rare earth constituents. The technology incorporates feed preparation, material conditioning, selective recovery, purification, impurity removal, rare earth concentration, and final product generation stages. The recovered rare earth values are converted into marketable neodymium oxide with controlled quality specifications.

The process is designed to maximize rare earth recovery while minimizing material losses and generation of secondary waste streams. Depending upon the feed characteristics and plant configuration, the process may be adapted to handle various categories of magnet scrap and end-of-life materials. The technology provides flexibility for integration with downstream rare earth separation, metal production, alloy manufacturing, and magnet production facilities.

Salient features

- Supports circular economy and sustainable resource utilization.
- Environmentally responsible approach for managing end-of-life magnets.
- Suitable for processing manufacturing scrap as well as post-consumer magnet waste.
- Promotes indigenous capability in strategic rare earth material recovery.

Advantages

- Recovery of valuable rare earth elements from discarded and scrap NdFeB magnets.
- Reduces dependence on imported rare earth raw materials.
- Converts waste materials into high-value rare earth products.
- Potential integration with existing rare earth processing facilities.

Areas of application

- Production of neodymium oxide for downstream rare earth processing.
- Feedstock generation for rare earth metal and alloy production facilities.
- Supply chain support for permanent magnet manufacturing industries.
- Strategic material recovery and import substitution initiatives.

Facilities required

- Adequate floor space for production, utilities, storage, and maintenance activities.
- Facilities for collection, segregation, and storage of magnet scrap.
- Material handling and storage facilities for raw materials and finished products.
- Cooling water, compressed air, and other utility systems.
- In-House Laboratory facilities for quality control and process monitoring.
- Environmental, health, and safety systems as per applicable regulations.
- Workshop and maintenance facilities for routine plant upkeep.