



## INSIGHT INTO THE POWDER METALLURGY (P/M) INDUSTRY - POST COVID-19

As Indian industries navigate the challenges of the post-COVID era, manufacturing sectors that depend heavily on imported raw materials continue to struggle with supply chain disruptions. These circumstances compel industries to identify and adopt substitute materials to ensure sustainable operations.

Amid restricted movement of goods, people, and services—both domestically and internationally—technology itself faces limitations. Any industrial setup without alternate supply arrangements is likely to experience significant disruptions. One such lesser-known yet crucial industrial segment is the **Powder Metallurgy (P/M)** industry.

### Understanding Powder Metallurgy

Powder Metallurgy is a scientific art form involving the creation of metallic components from their constituent metal powders. These powders are compacted and sintered (diffusion-bonded) to form precise machine components. Broadly, the P/M industry is categorized into:

- **Ferrous Powders/Components** – Iron and its alloy powders
- **Non-Ferrous Powders/Components** – Other metal and alloy powders

Globally, 80% of metal powder usage pertains to **iron powders**, while the remaining 20% includes non-ferrous varieties. Each year, around one million tons of iron powder is used worldwide, with 90% employed in sintered component production—75% to 80% of which goes to the **automotive industry**. The remaining serves applications in appliances, tools, bicycles, and machinery.

### Historical and Global Context

India's tryst with sponge iron powder dates back to 350 A.D., with the iconic **Iron Pillar in Delhi**. In 1911, **Hoganas AB (Sweden)** reinvented the sponge iron process using chemical reduction with magnetite ore. By 1931, the process evolved into a two-stage reduction method to produce sponge iron powder.

Currently, **Hoganas Sweden** dominates the global market. Other global players like Quebec and Kobe manufacture **atomized and reduced grades**, while Chinese suppliers offer mixed-quality products at lower prices (~INR 65,000/ton). India remains heavily reliant on such imports despite its growing demand.

### The Need for Self-Reliance

Given the import-dependency and the integral role of iron powders in automotive, welding, and structural components, it is critical for India to initiate indigenous manufacturing. Technologies for producing various iron and non-ferrous powders **exist domestically** and do **not** require foreign assistance.

Legendary international expert **Dr. Henry H. Hausner** once told Mr. S. Mohanty (mentor of the author), "The basics of Powder Metallurgy is a game of sizes and shapes of powder particles—it is an art of its class."

## Indigenous Technological Achievements

Over four decades of pioneering research by Indian scientists and entrepreneurs have led to proprietary and patented technologies, including:

- **Patent No. 154181** – Two-stage reduction of mill scales
- **Patent No. 171292** – High-compressibility iron powder from mill scales
- Additional patents: 168601, 18635

**Involute Metal Powders Technologies LLP (IMPT)** has spearheaded efforts in setting up metal powder units in India for **copper, bronze, tin, diluted bronze**, and other alloys. Remarkably, India possesses the only alternative technology for sponge iron powder via reduction, apart from Hoganas.

## Applications of Iron Powder

- Self-lubricating bearings
- Components requiring high green strength and complex geometry
- Shock absorber parts
- High-density structural parts
- Clutches, pulleys, brake pads, and shoes
- Soft magnet applications
- Welding electrodes
- Metal cutting & scarfing

## Market Insights

- **Two-wheeler industry:** ~90,000 tons/year
- **Four-wheeler industry:** ~75,000 tons/year
- Total domestic demand: ~132,000 tons/year

Despite this demand, indigenous production is insufficient, resulting in costlier imports and market vulnerabilities. The global powder metallurgy market also extends to **medical, industrial, aerospace, and electronics** sectors.

## Future Outlook

With evolving global dynamics, India must set up **captive plants** and **larger manufacturing facilities** to serve both domestic and Asian markets. Under the '**Make in India**' and '**Atmanirbhar Bharat**' initiatives, government support for innovation, indigenous manufacturing, and self-reliance is imperative.

This strategic shift will not only address current market needs but also help establish a stronghold in the Indian iron powder market, ending reliance on monopolistic foreign entities.

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