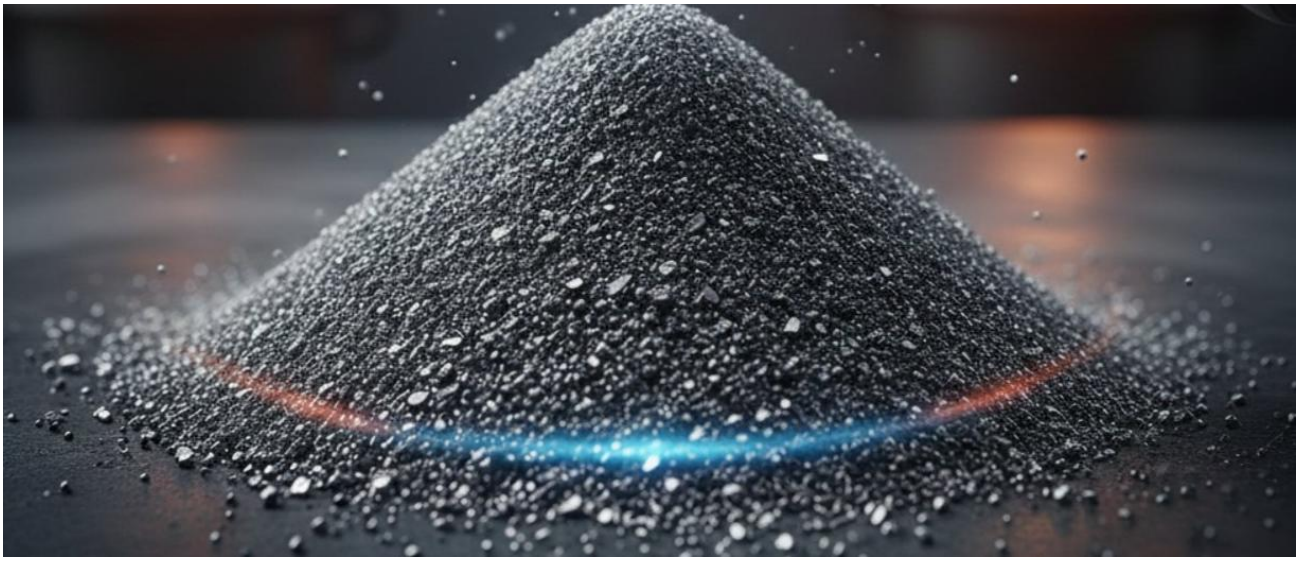
WHAT IS POWDER STEEL (POWDER METALLURGY STEEL / PM STEEL)



This is a high-tech grade of steel produced through the powder metallurgy method. In traditional or so-called cast steel, the material is liquefied and poured into molds, where it cools slowly. In the PM steel method, metal is atomized using gas or water into microscopic droplets that instantly solidify into a fine steel powder. This powder is then compacted under immense pressure and temperature [most commonly through Hot Isostatic Pressing (HIP)] to produce a monolithic block with exceptional properties.
The primary advantage of powder steels is their perfectly homogeneous microstructure, free of structural defects and large carbon clusters (carbides). This makes them simultaneously exceptionally hard, wear-resistant, and remarkably tough.

Key Stages of the Production Technology:

- **Atomization:** The molten alloy is injected under high pressure through a nozzle using an inert gas (such as argon) or water. The result is fine, perfectly spherical metal powder particles.
- **Blending and Encapsulation:** The powder is cleaned, sorted by particle size, and sealed in special steel capsules (containers).
- **Hot Isostatic Pressing (HIP):** The capsule is exposed to extreme pressure and temperature (around 1000°C+). This bonds the powder particles at a diffusion level, eliminating any porosity.
- **Final Processing:** The resulting block is forged or rolled into the final product.

Feature	Cast Steel	Powder Steel
Carbide Structure	Large, non-uniformly distributed	Exceptionally fine and homogeneous
Toughness (Fracture Resistance)	Lower (at high carbon content)	**Very high**
Wear Resistance	Limited by alloying capabilities	**Maximum** (allows for massive levels of vanadium)
Processing and Sharpening	Easier	Difficult (requires diamond abrasives)
Price	Affordable to moderate	**High (due to the complex process)**