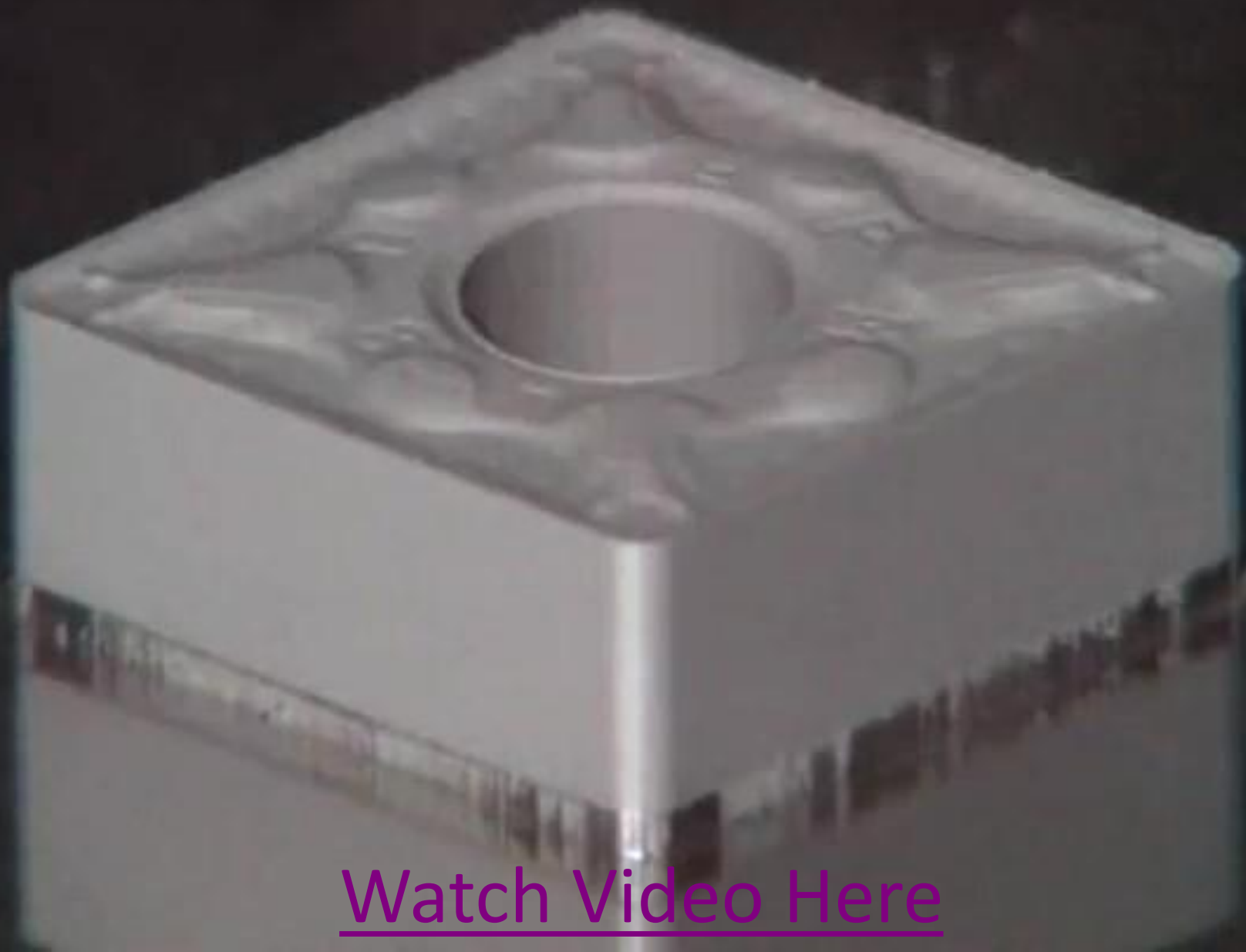


Powder Metallurgy



[Watch Video Here](#)

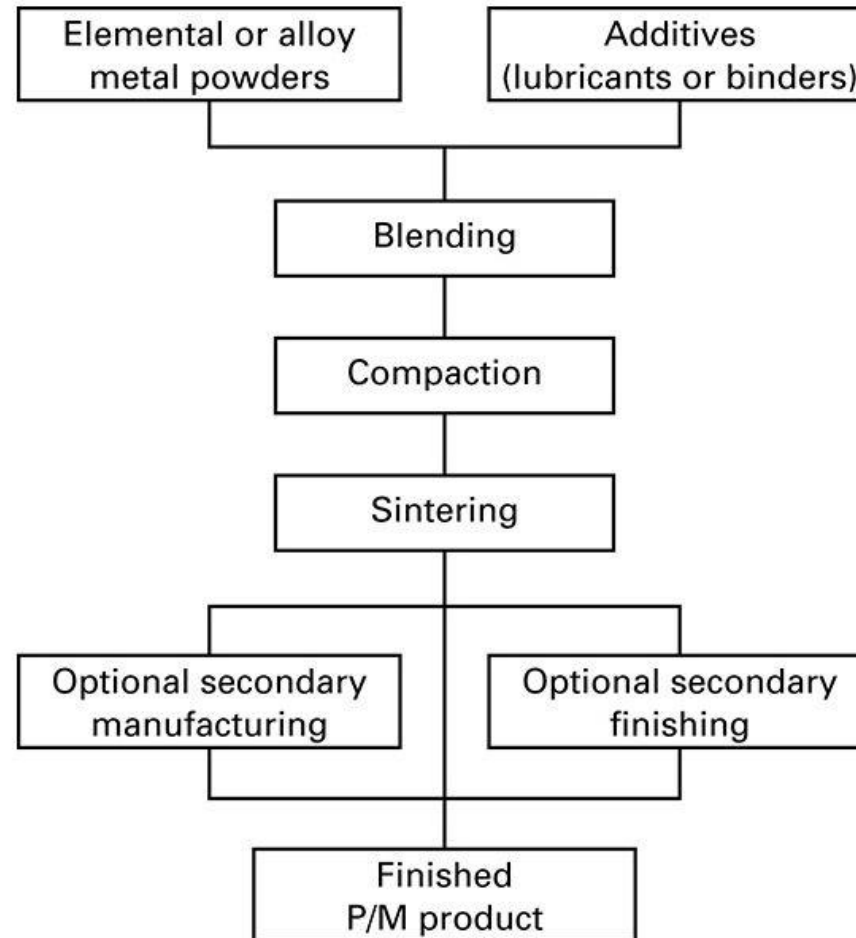
Powder Metallurgy in Cars

- 21 lbs in 1990
- 30 lbs in 1995
- 36 lbs in 2000
- 45 lbs in 2005
- 32 lbs in 2008 Cadillac V-6 engines
- 15 – 25 lbs in automatic transmissions

METAL POWDER PRODUCTION

[Watch Video Here](#)

Basic Powder Metallurgy Process



Powder manufacture

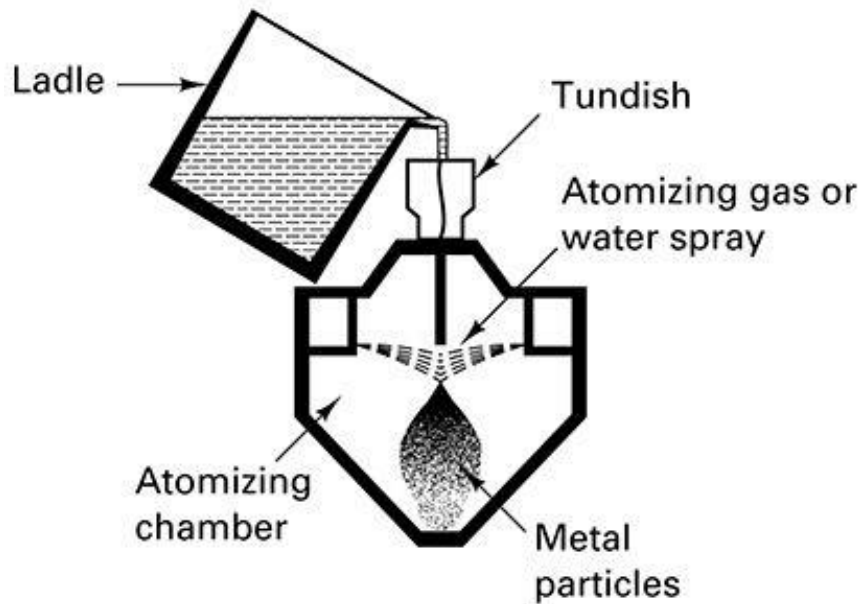
Important variables:

- particle size
- size distribution
- shape
- surface texture

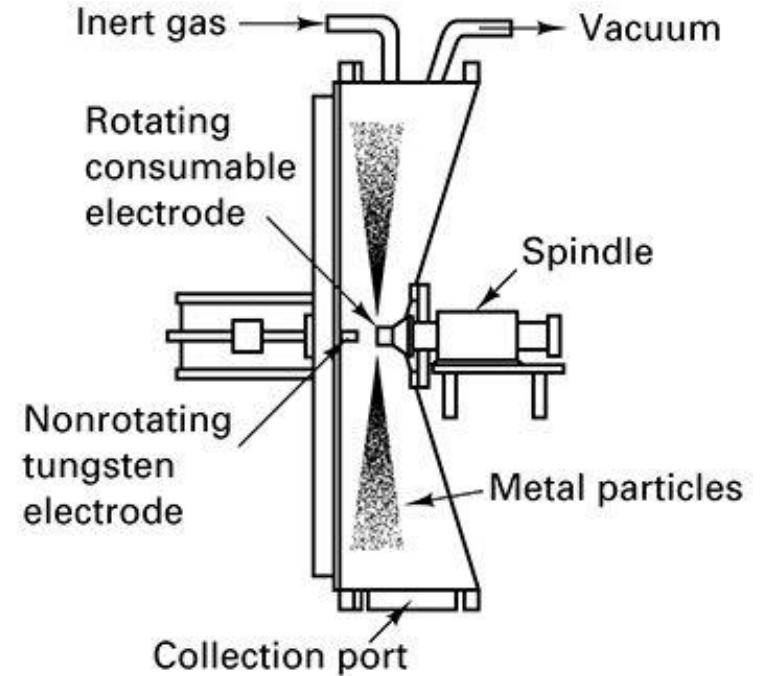
Significance of these four characteristics

- Affect density
- Enhance compaction

Melt Atomization



(a)

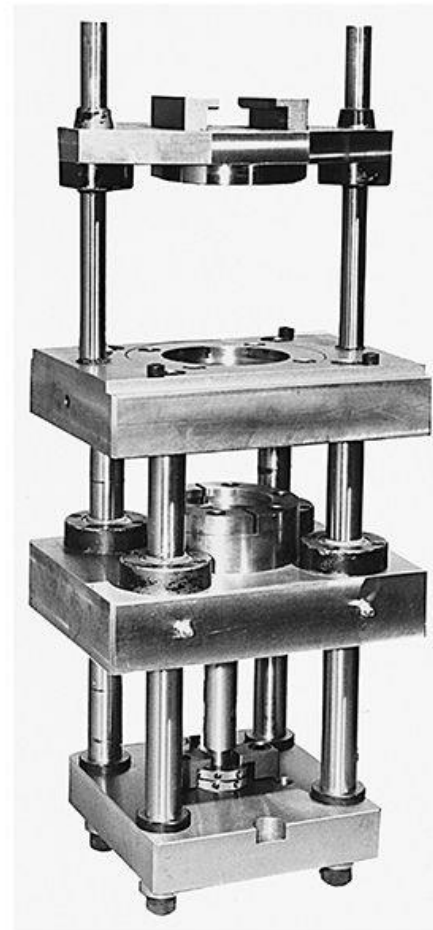
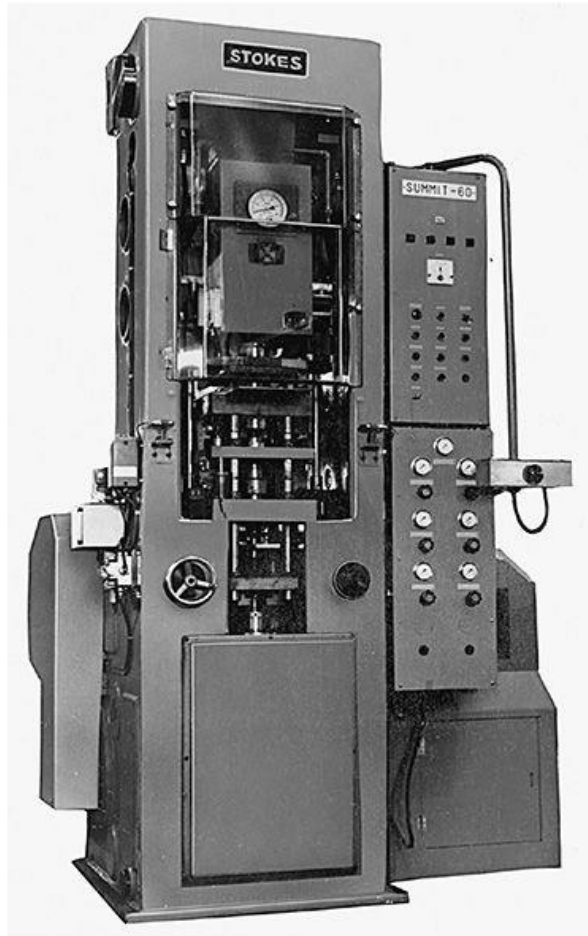


(b)

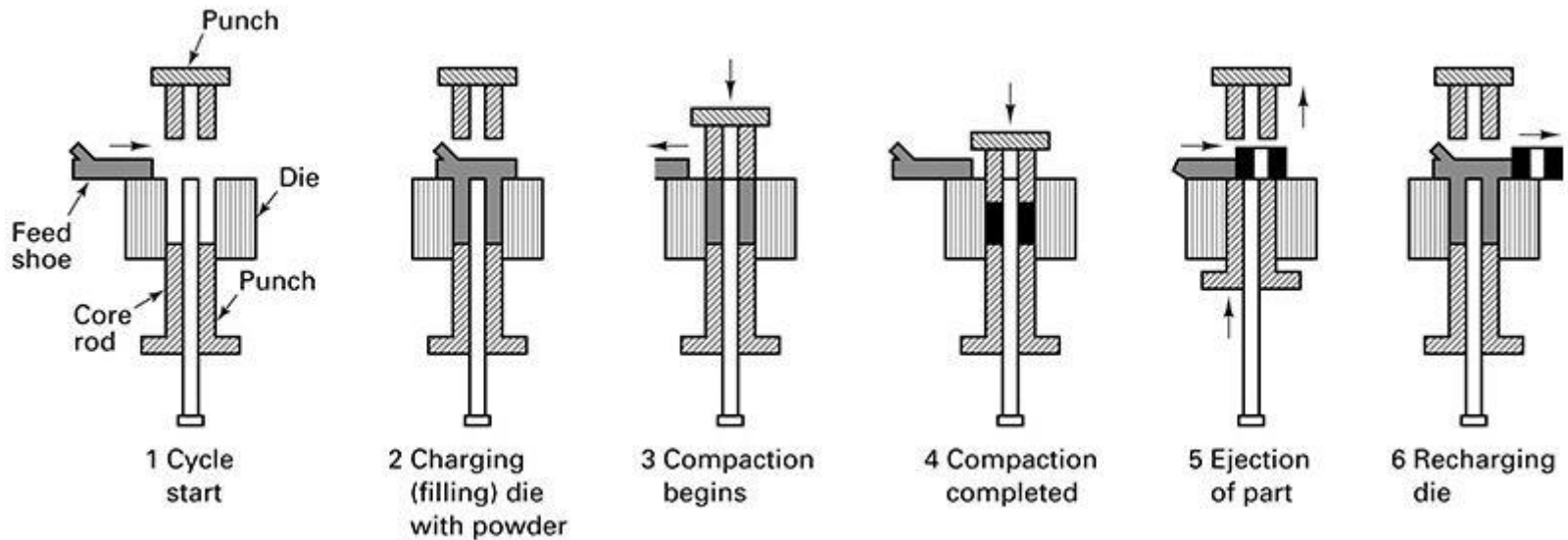
POWDER METAL PARTS PRODUCTION

[Watch Video Here](#)

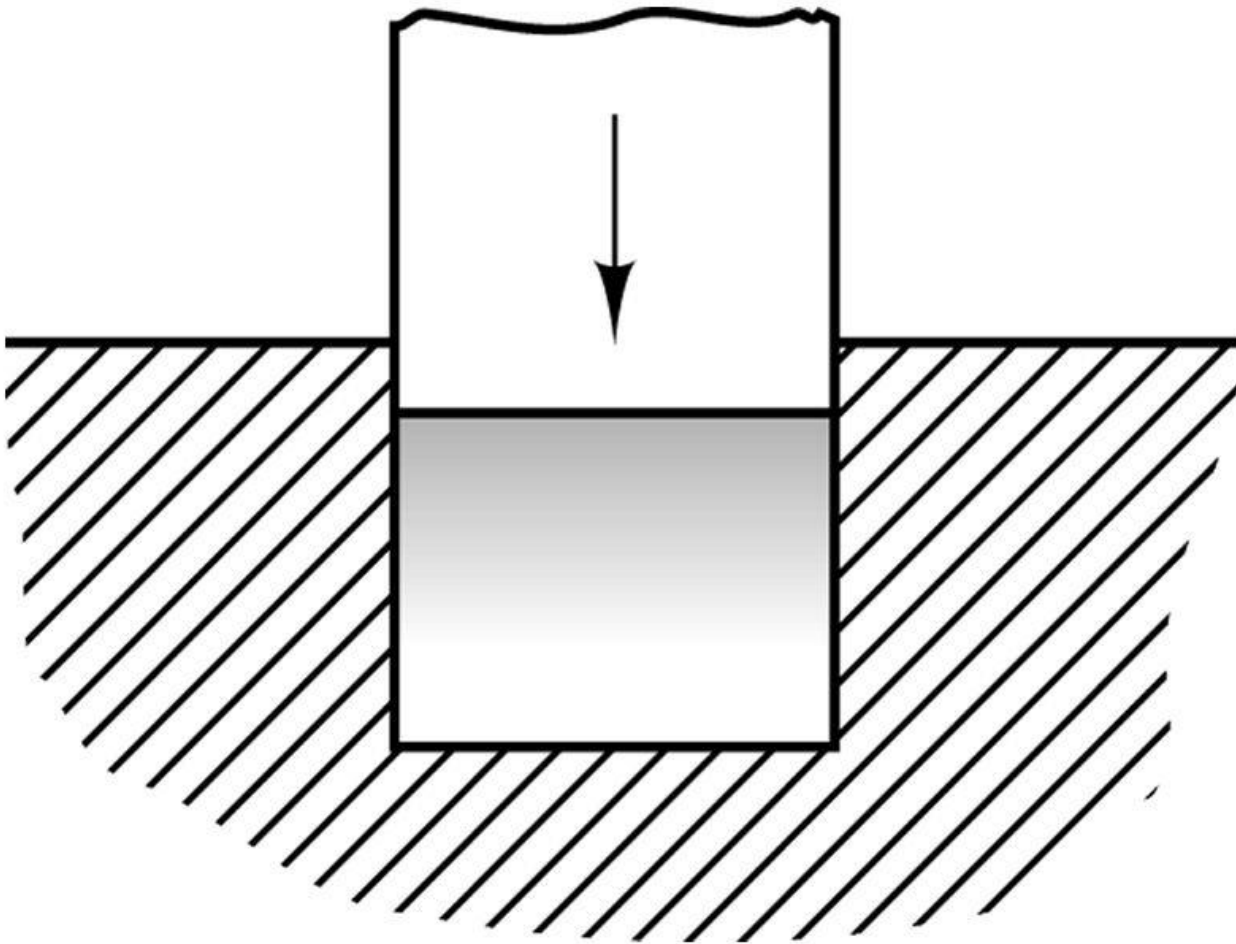
Press for compacting metal powders



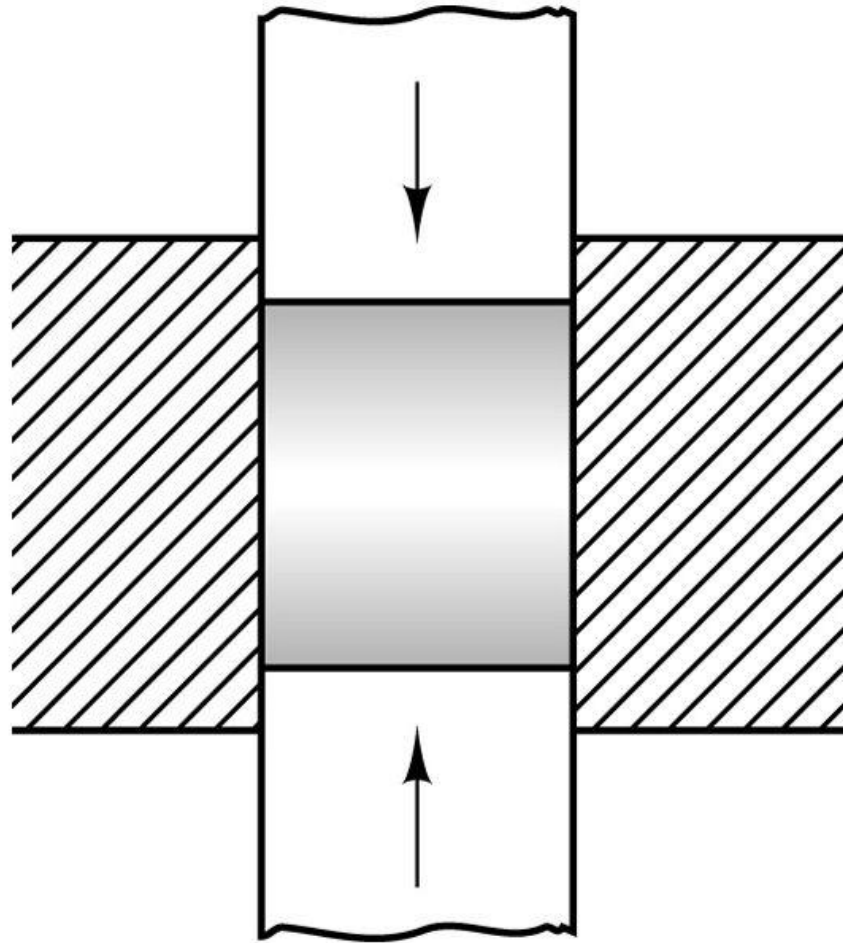
Compaction sequence



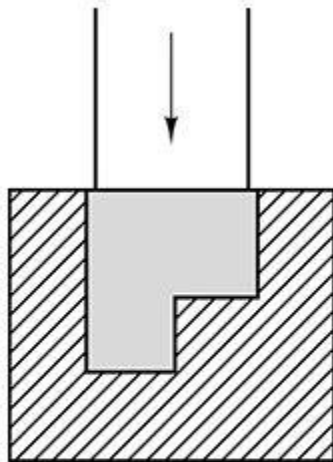
Single-punch compaction



Double-punch compaction

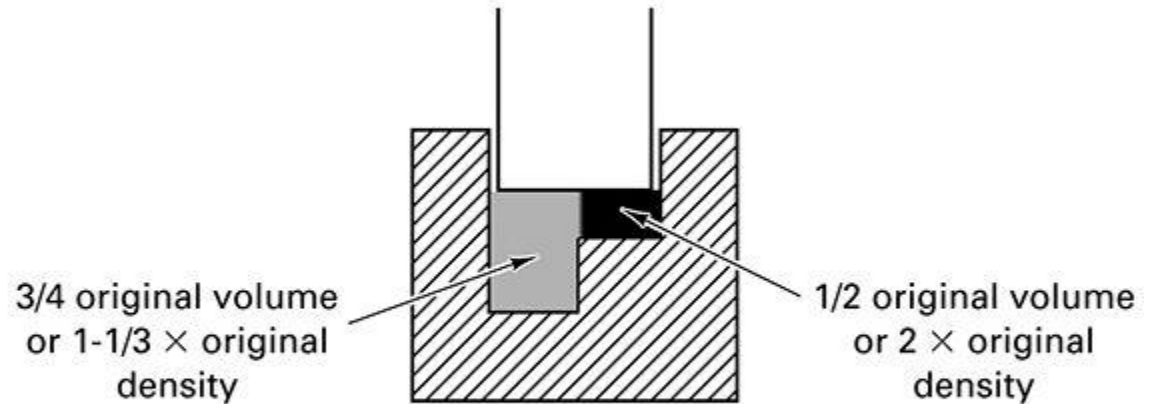


Non-uniform compaction



Initial conditions

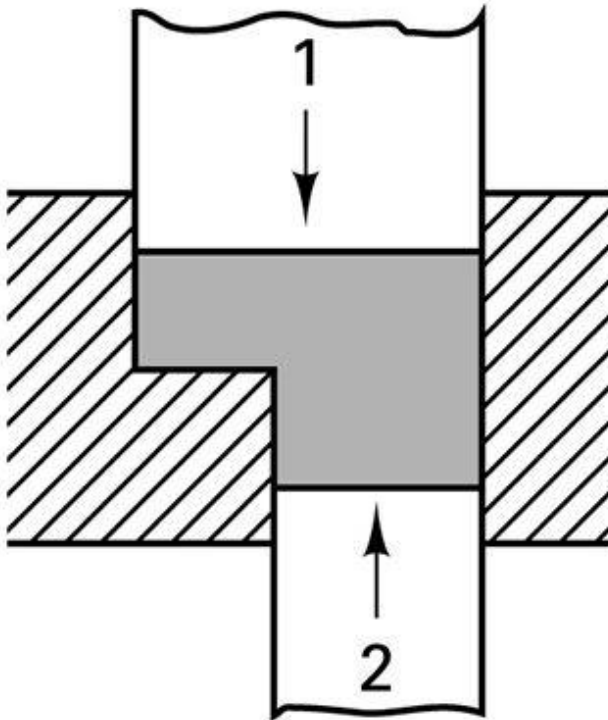
(a)



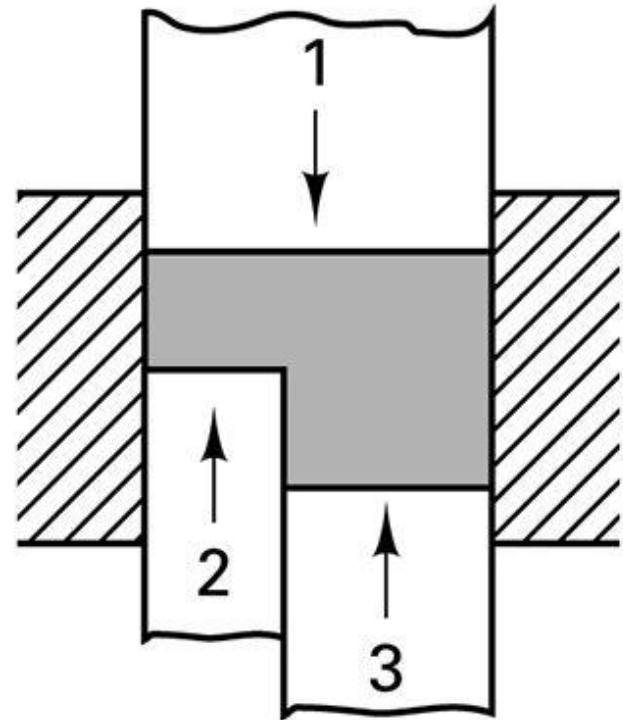
After compaction

(b)

Uniform compaction

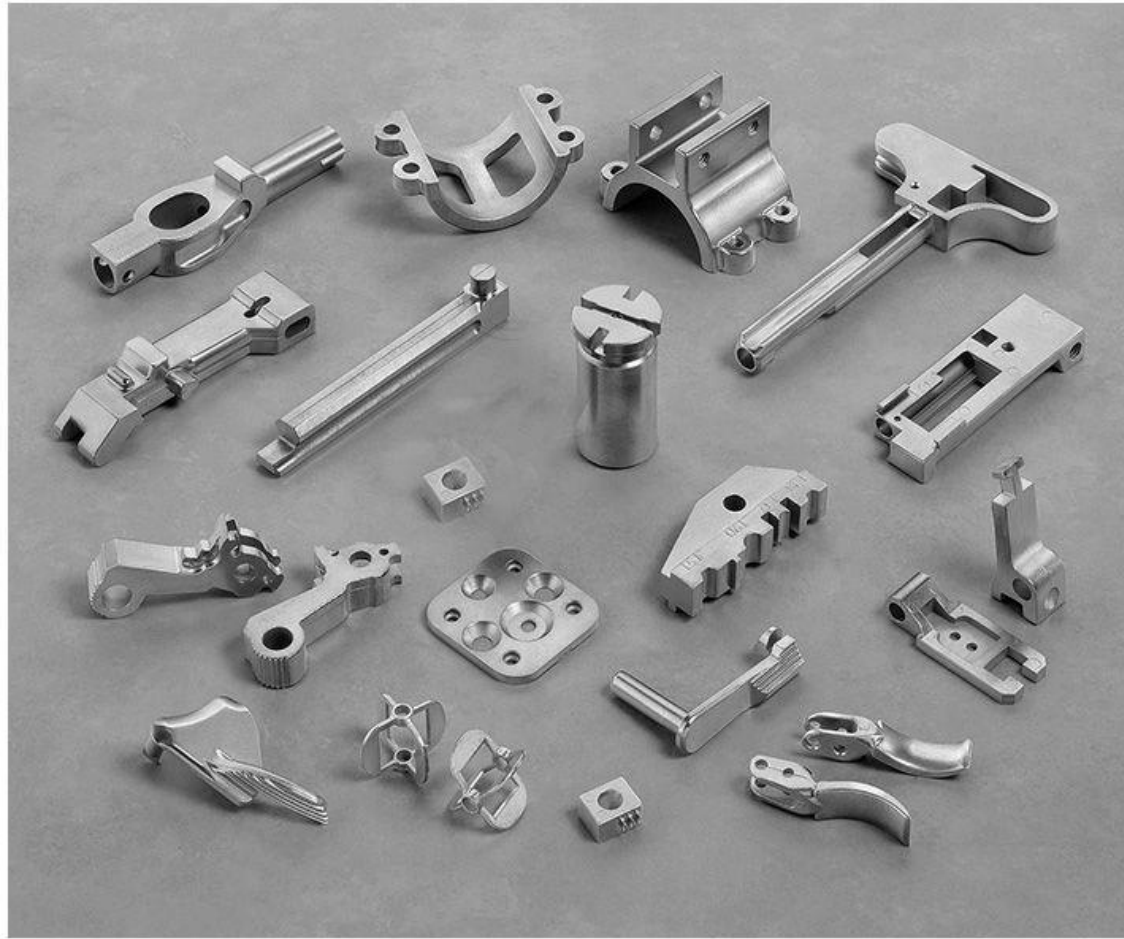


Single lower punch



Double lower punch

Metal Injection/Powder Injection Parts



High Quality Parts from MIM/PIM Processes

- High final density – 95-99% of wrought
- Uniform density
- Close tolerances (0.3-0.5%)
- Excellent surface finish

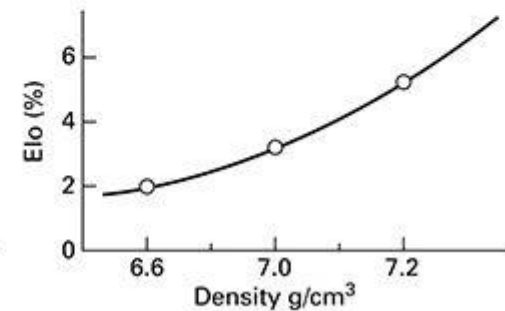
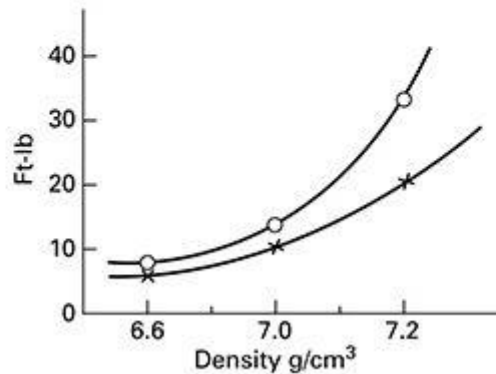
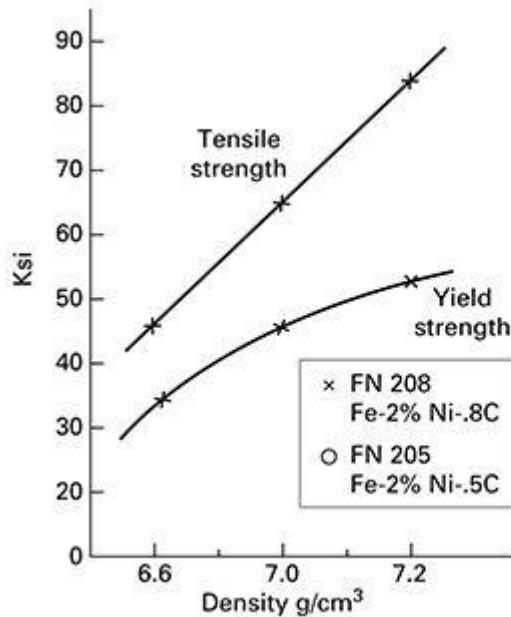
Conventional vs. PM Mfg. Gear Blanks



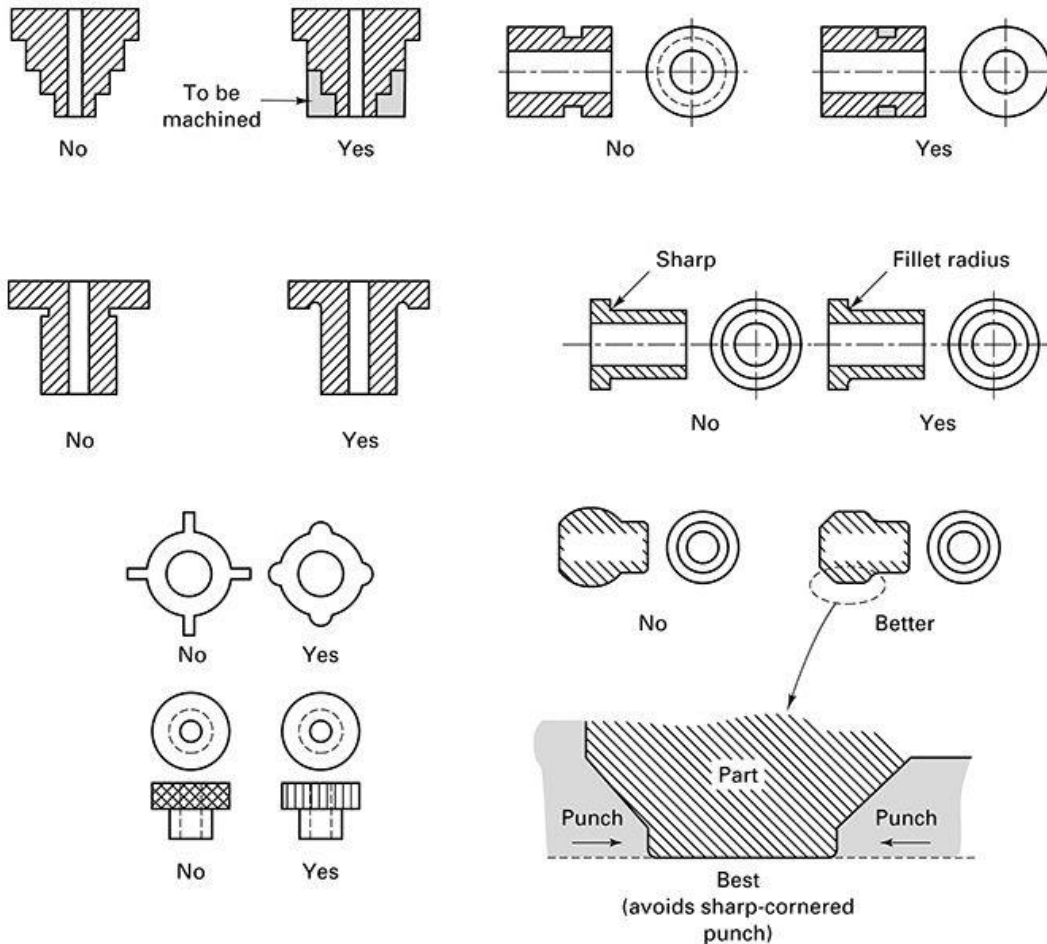
PM Preform and connecting rod



Mechanical Properties PM Parts



Poor and Good PM Design Features



Typical PM Parts

