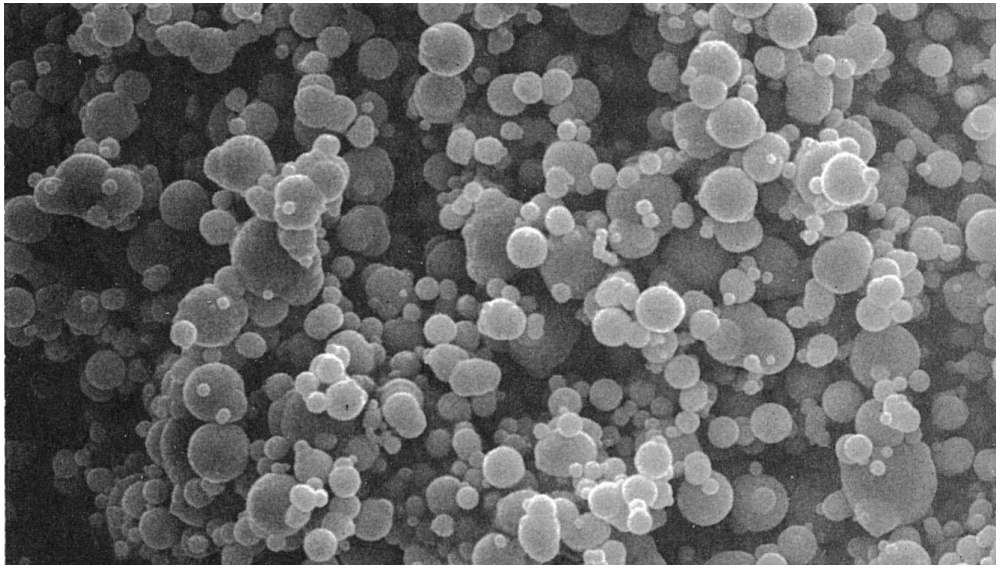
Benha University
Shoubra Faculty of Engineering
Mechanical Engineering Department

Lecture # 1

POWDER METALLURGY

متالورجيا المساحيق



Dr. Mohammed Gamil

توزيع الدرجات ومحتوى المادة طبقاً للائحة

الائحة : -

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية			توزيع الدرجات			اجمالى	ساعات امتحان تحريرى
			محاضرة	عملى / تمارين	اجمالى	أعمال سنة	عملى / شفوى	تحريرى		
4	تمج ××4	اختيارى تخصصى (1)	3	2	5	45	-	80	125	3

تمج 453 متالورجيا المساحيق (2+3)

المساحيق المعدنية وخصائصها – طرق الحصول على المساحيق – الخواص التكنولوجية للمساحيق – الخواص الطبيعية – الخواص الكيميائية – كبس المساحيق.

- **أعمال سنة ٤٥ درجة (إمتحان النصف – تقرير– تمارين – عرض - غياب)**
- **إمتحان نهاية العام ٨٠ درجة (تغطية لكل أجزاء المحتوى الدراسى)**

Definition of Powder Metallurgy

- Powder metallurgy may defined as, “the art and science of producing metal powders and utilizing them to make serviceable objects.”

OR

- It may also be defined as “material processing technique used to consolidate particulate matter i.e. powders both metal and/or non-metals.”

Powder Metallurgy

Metal

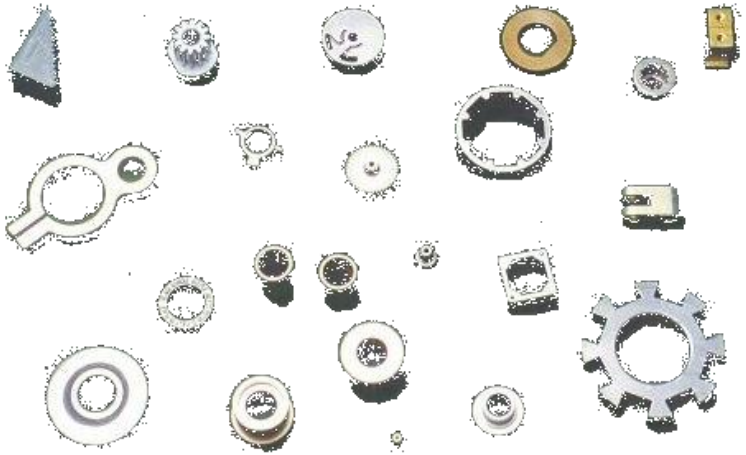
↓

Powder

↓

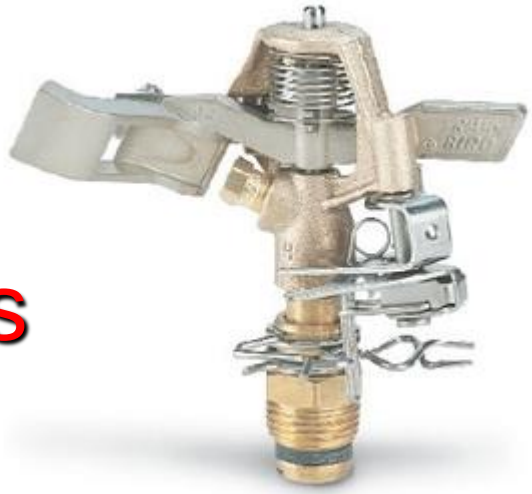
Metal Product

Example Parts



Examples of Powder Metal Products

1. Gears
2. Cams
3. Cranks
4. Bearings
5. Roller bearing cages
6. Housings
7. Light bulb filaments
8. Sprinkler mechanisms



Why Powder Metallurgy is Important

- PM parts can be mass produced to *net shape* or *near net shape*, eliminating or reducing the need for subsequent machining
- PM process wastes very little material - ~ 97% of starting powders are converted to product
- PM parts can be made with a specified level of porosity, to produce porous metal parts
  - Filters, oil-impregnated bearings and gears

Why Powder Metallurgy is Important

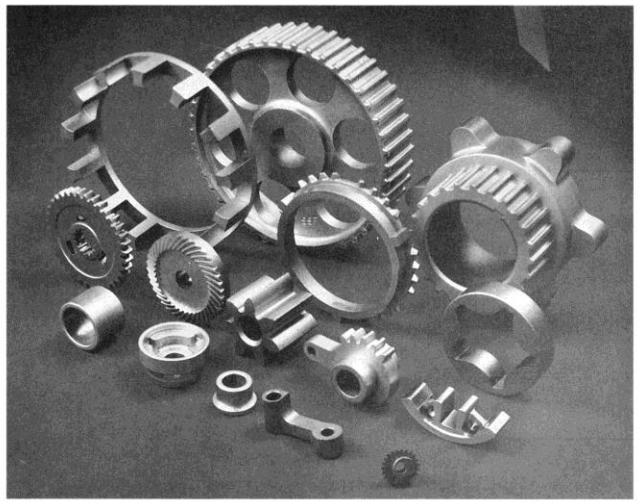
- Certain metals that are difficult to fabricate by other methods can be shaped by powder metallurgy
  - Tungsten filaments for incandescent lamp bulbs are made by PM
- Certain alloy combinations and cermets made by PM cannot be produced in other ways
- PM compares favorably to most casting processes in dimensional control
- PM production methods can be automated for economical production

Limitations and Disadvantages

- High tooling and equipment costs
- Metallic powders are expensive
- Problems in storing and handling metal powders
  - Degradation over time, fire hazards with certain metals
- Limitations on part geometry because metal powders do not readily flow laterally in the die during pressing
- Variations in density throughout part may be a problem, especially for complex geometries

PM Work Materials

- Largest tonnage of metals are alloys of iron, steel, and aluminum
- Other PM metals include copper, nickel, and refractory metals such as molybdenum and tungsten
- Metallic carbides such as tungsten carbide are often included within the scope of powder metallurgy



PM Work Materials

- Raw materials for PM are more expensive than for other metalworking because of the additional energy required to reduce the metal to powder form
- Accordingly, PM is competitive only in a certain range of applications
- What are the materials and products that seem most suited to powder metallurgy?

Thank you