Grinding is a process carried out with a grinding wheel made up of abrasive grains for removing very fine quantities of material from the w/p surface. This can be compared to a milling process with an infinite number of cutting edges.

It is used for - M/cing materials which are too hard for other m/cing processes such as tool and die steels and hardened steel materials

- Close dimensional accuracy 0.3 to 0.5 μm
- High degree of surface smoothness. R_a = 0.15 to 1.25 μm
- roughing & finishing.

Characteristics

Abrasive Types - They have the ability to fracture into smaller pieces when the force increases, which is called "friability". This property gives abrasives the necessary self-sharpening capability in use.

⇒ Aluminium Oxide (Al_2O_3)
- Natural abrasive
- Performance is inconsistent
- have impurities ← coz
- Manufactured from aluminium ore, bauxite.
- use for ~~softer and~~ steel and high-strength material

⇒ Silicon Carbide (SiC)
- Made from Silica sand & coke
- Small amount of common salt.
- use for non-ferrous, nonmetallic, hard and dense metals

⇒ Cubic Boron Nitride (CBN)
- Laboratory product.
- less reactive with materials like hardened steel, hard chill cast iron, & nickel base and cobalt-based super alloys.
- ~~use for hard & tough tools~~

- very expensive.
- very hard (knoop hardness ~ 4700 kg/mm²)

⇒ Dimond - Hard (knoop hardness ~ 8000 kg/mm²)

- used as a cutting-tool material
- very high chemical resistance
- low thermal expansion
- inert towards iron.
- use for die steel & tungsten carbide.

Grain Size — Size of a abrasive grain or grit, is identified by a number which is based on the sieve sized used.

- It is vary from 6 to 8 (coarse size), 500 to 600 (superfine)
- ~~Sive~~ Sieve number is spesified in terms of the number of openigs per square inch. Thus, larger the grain no., fine is the grain size.
- Surface finish depands upon the grain ~~si~~ size.

Grain Size	Surface finish, μm
46	0.8
54	0.6 to 0.8
60	0.4 to 0.6
80	0.2 to 0.4

Bond — keep the grains together under the action of the grinding forces

⇒ Vitrified - most commonly used.
- It is clay, mixed with fluxes such as feldspar, which is hardens to a glasslike substance on firing to a temp. of about 1250°C, and develops the strength.
- Strong Bond, rigid & porous
- not affected by fluids.
- Brittle & sensitive to impact.
- It is called ceramic bond.

⇒ Silicat - Sodium silicate (Na_2SiO_3) or water glass, ~~and~~ harden when heated.
- not strong as vitrified
- It is affected by dampness but less sensitive to shocks
- less in use.

⇒ Synthetic Resin or Resinoid - ~~It is those~~
- It is thermosetting resin such as phenol formaldehyde.
- good strength bond
- more elastic than vitrified
- this is not heat and chemical resistant
- used in rough grinding, parting off and high speed grinding (50 to 65 m/s)
- also use for fine finishing of roll grinding.

⇒ Rubber - Most flexible
- Made by natural or synthetic rubber
- Strength is developed by vulcanisation.
- high strength and less porous

- Bond affected by dampness and alkaline solutions
- use for cutting of wheels, regulating wheels in centreless grinding and for polishing wheels.

⇒ Shellac - use less as bond.
- use for very high finish
- applications are rolls, cutlery, camshaft finishing.

⇒ Metal - Manufacture of dimond and CBN wheels.
- very high thermal conductive metal such as copper alloy or aluminium alloy.
- strong bond.
- Powder metallurgy techniques are used to make the abrasive periphery.

Grade - Show the hardness of the wheel.

Soft - A to H
Medium - I to P
Hard - Q to Z

Structure - represent the grain spacing.

Dense - 1 to 8
open - 9 to X....

Specification of Grinding whee

150 X 10 X 12 XW A 36 L 5 V 23

- wheel dia = 150 mm
- thickness of whee = 10 mm

- Bore dia = 32mm
- W = Manufacturer's prefix to abrasive. It is optnl — nature of abrassive.
- A = Type of abrassive
- 36 = Grain size
- L = Grade
- 5 = Structure
- V = Bond
- 23 = Manufacturer's reference.