

WORKSHOP TECHNOLOGY - III

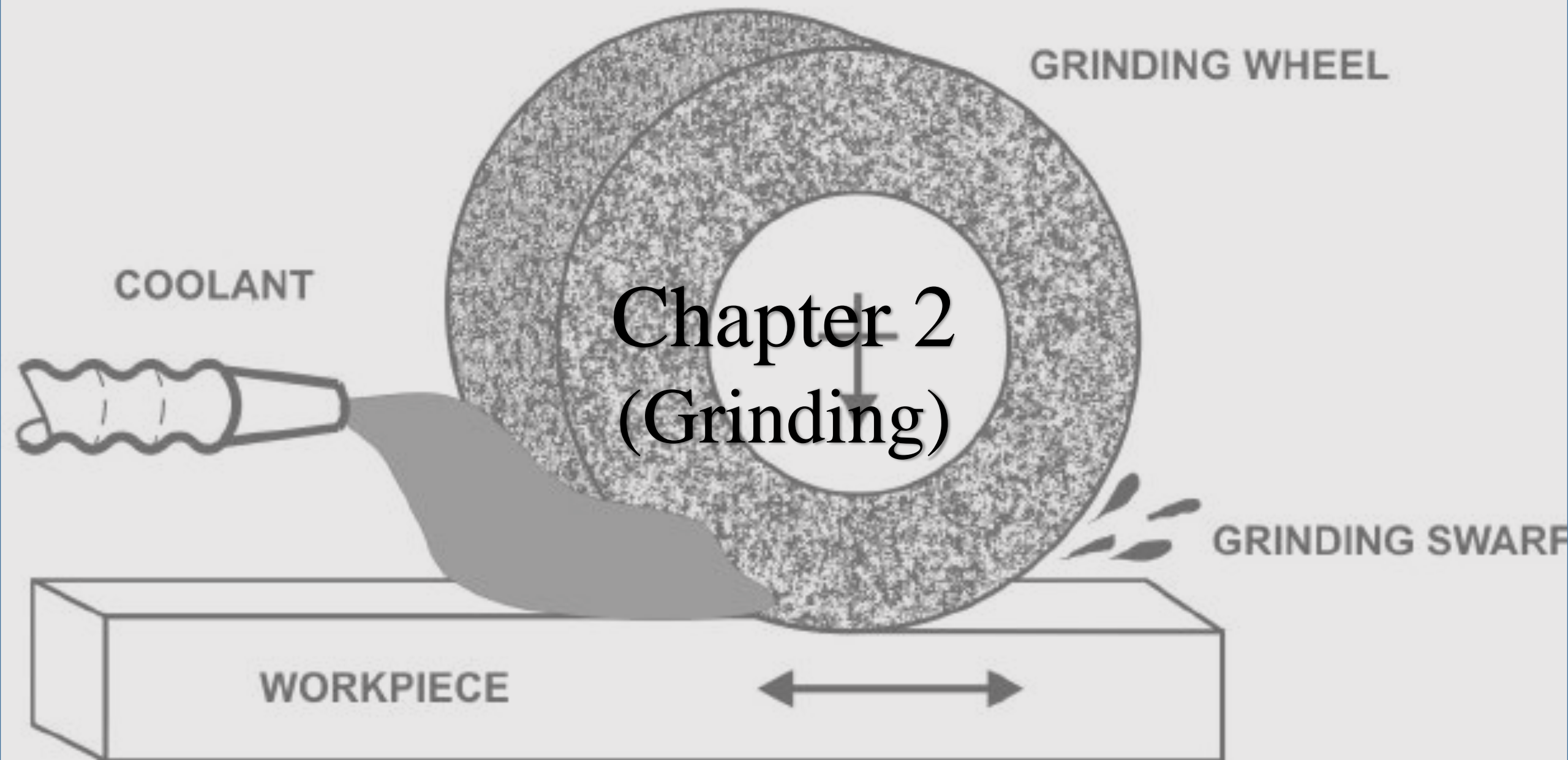


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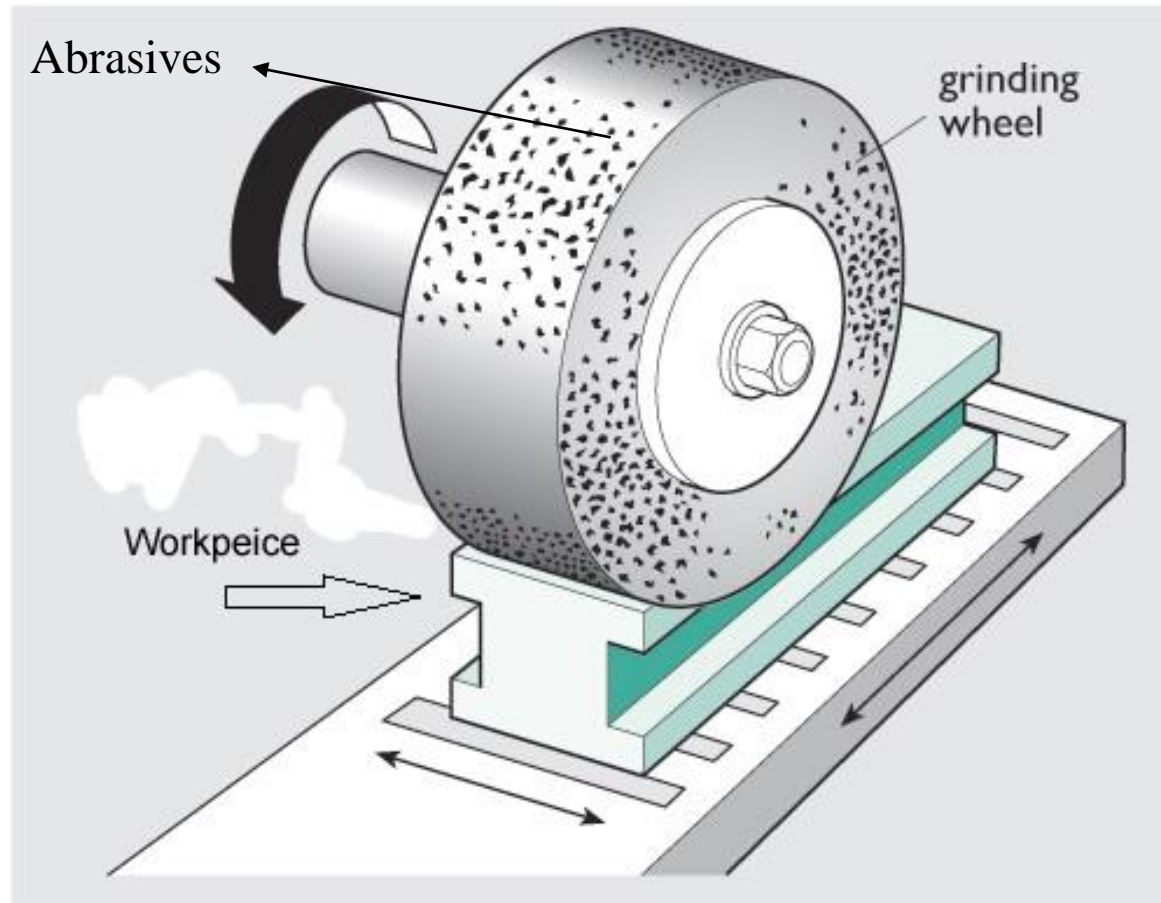
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Introduction

Grinding is a material removal process which is accomplished by abrasive particles that are bonded to a grinding wheel rotating at a very high speed.

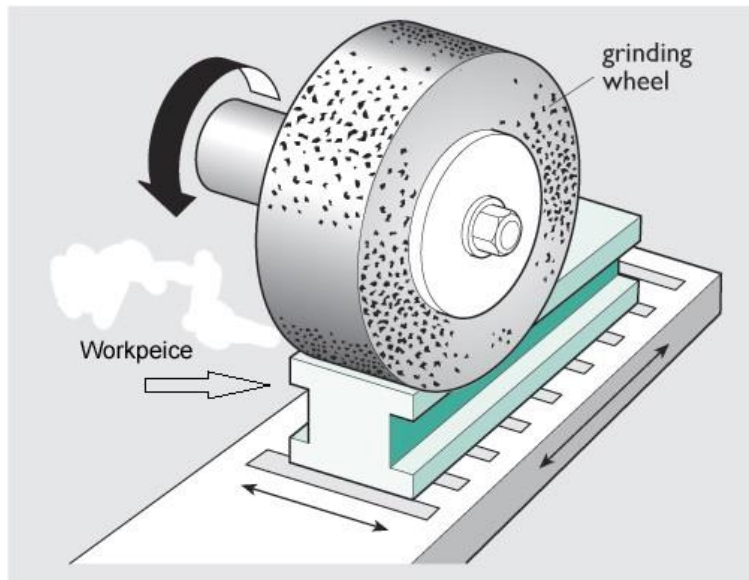
It is different from other machining process in a manner that it is finishing operation and very small material is removed (upto microns).



Type of grinding

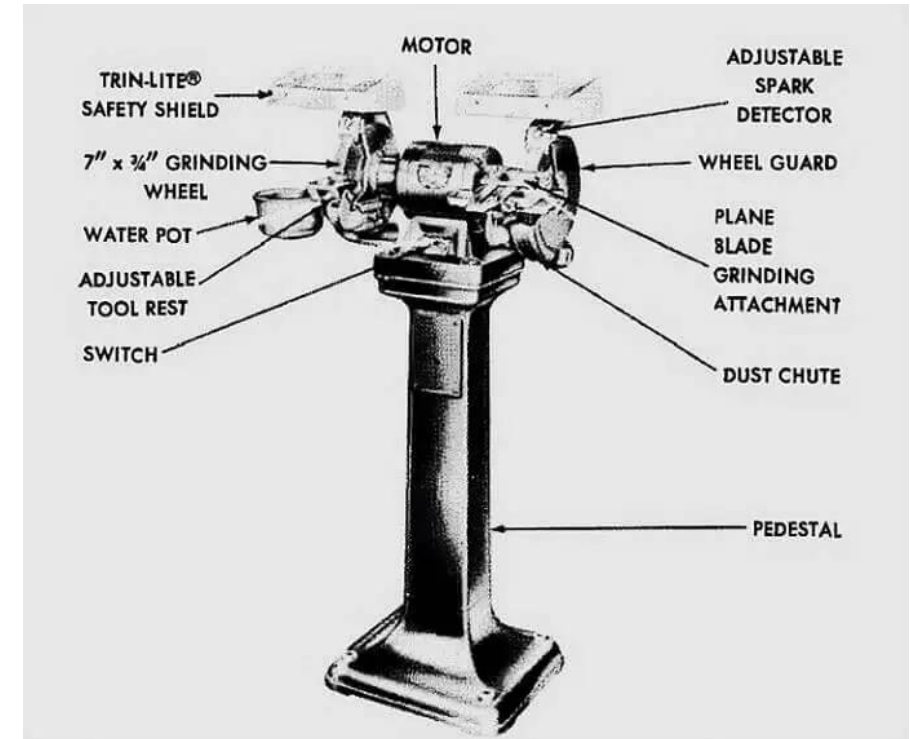
Precision grinding

- In this very hard material are machined.
- Used to achieve high surface finish and dimensional accuracy.



Non-Precision grinding

- Used to remove excess material.



Purpose of grinding

1. To machine material which are too hard for machining.
2. To sharpen cutting tools.
3. To produce surface of high degree of smoothness.
4. To grind threads in order to have close tolerance and better finish.
5. To produce close geometrical and dimensional accuracy.
6. To increase inside diameter.

Advantage

1. Only process that can be used for hardened steel or hardened alloy steel.
2. Only process that can produce extremely smooth finish for contact and bearing surfaces.
3. Grinding wheels have self sharpening properties.
4. Abrasive can sustain high temperature than conventional tool materials.

Elements of Grinding Wheel

Abrasive

Grain

Grade

Structure

Bond

Natural

Artificial

Sand Stone

Emery

Quartz

Diamond

Silicon Carbide

Aluminium Oxide

Diamonds

Coarse

Medium

Fine

Very Fine

Soft (A-H)

Medium (I-P)

Hard (Q-Z)

Dense (1-8)

Open (9 or up)

Vitrified Bond

Silicate Bond





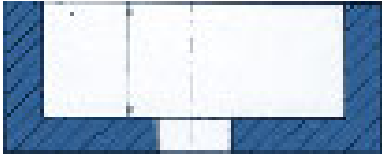
Oxychloride Bond

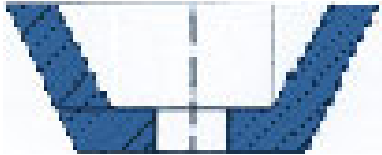



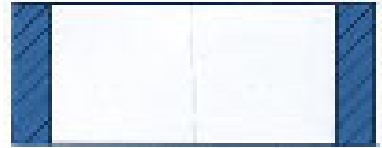
Resinoid Bond

Shellac Bond

Rubber bond

Common Wheel Shapes

disc grinding wheel	recessed one side grinding wheel	recessed both side grinding wheel	grinding wheel recessed and tapered	cup wheel
				

flaring cup	grinding wheel with blade	grinding wheel with double blade	dish wheel	cylinder-type grinding wheel
				

Type of Grinding Wheel

Built Up Wheel

Mounted Wheel

Diamond Wheel



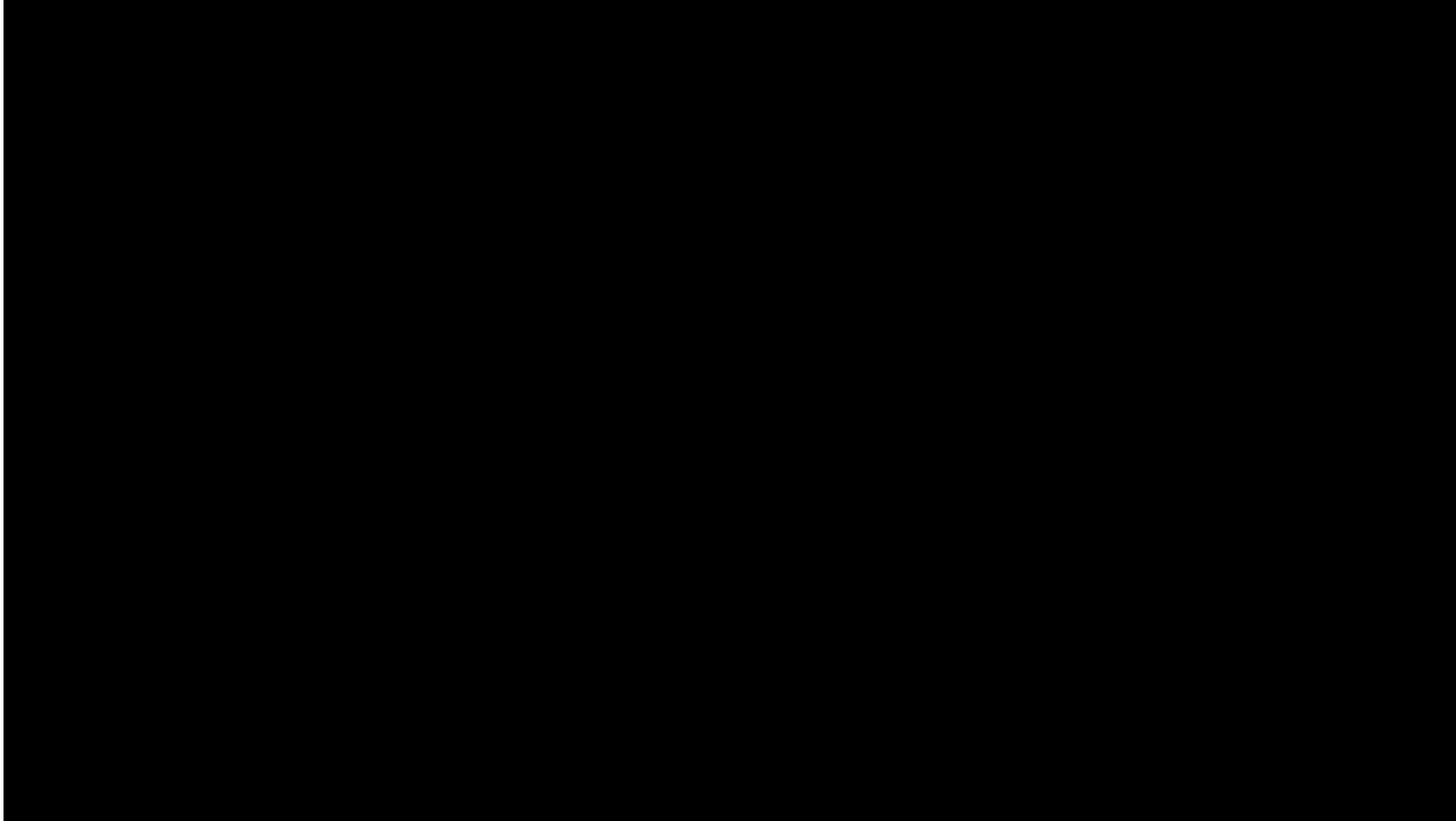
Specifications of grinding wheels as per BIS

Let say grinding wheel have the marking as: -



Truing, Dressing, Balancing and Mounting of Wheel

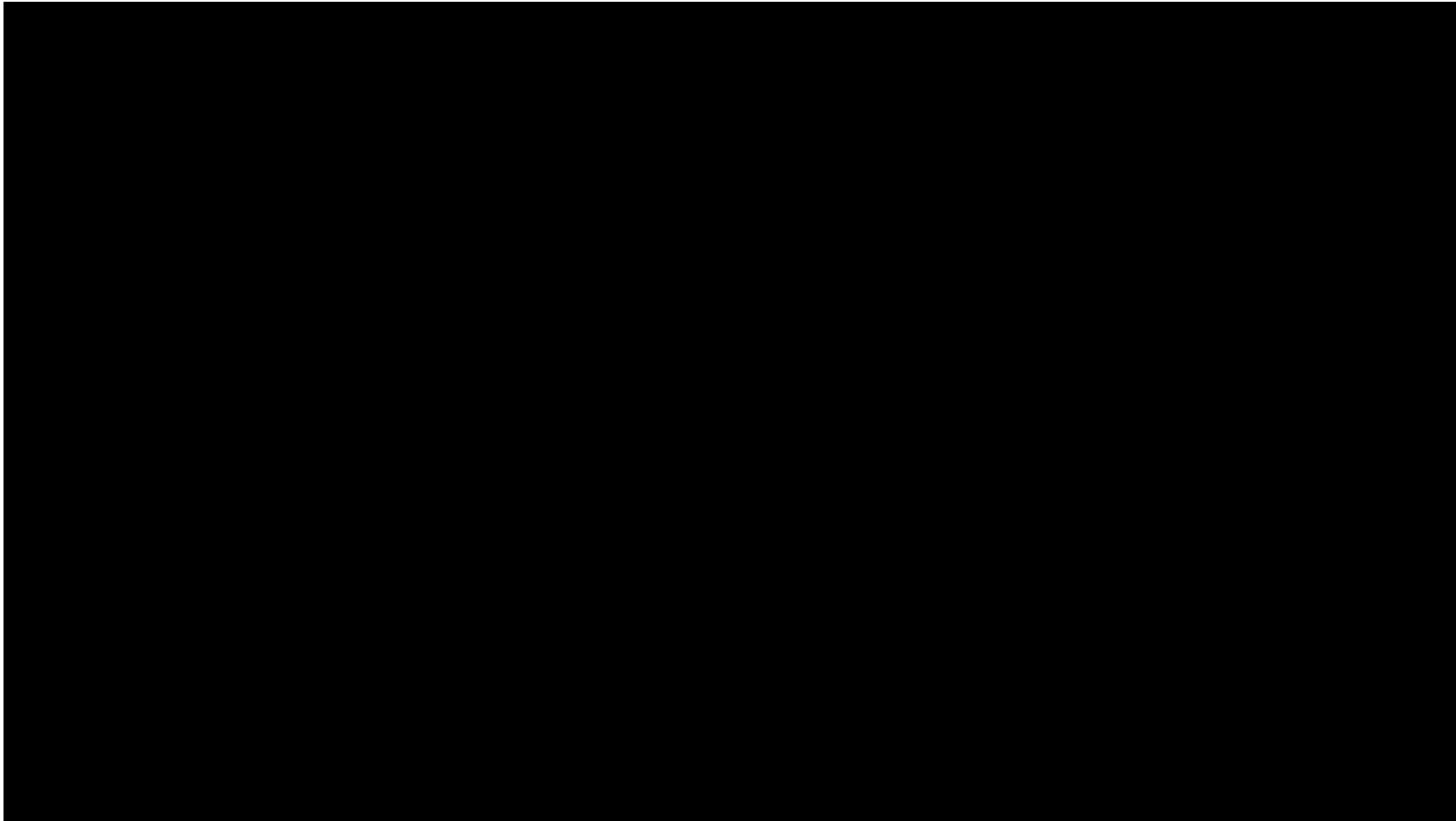
Truing: - It is the process of removing the abrasive material from the cutting face and side of the wheel so that it runs true with respect to the axis of rotation. Depth of 0.025 mm is given until wheel is round



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Truing, Dressing, Balancing and Mounting of Wheel

Dressing: - It is defined as the process of removing the worn out grains from the surface of the wheel, removing loaded material from the face of the wheel, restoring the original geometric shape.

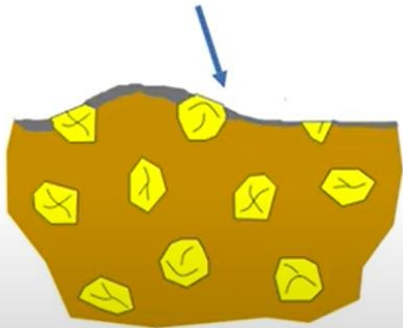


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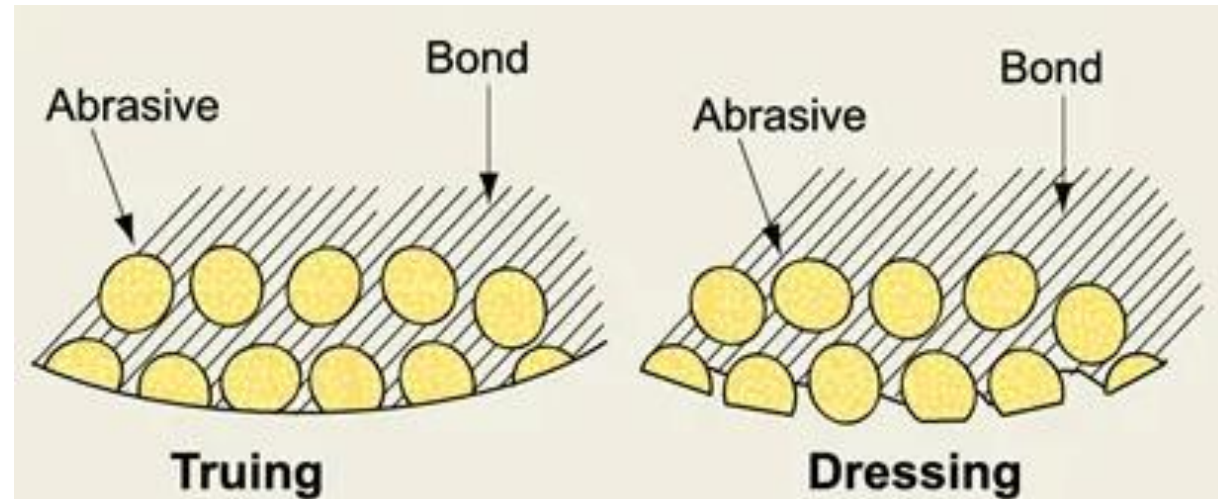
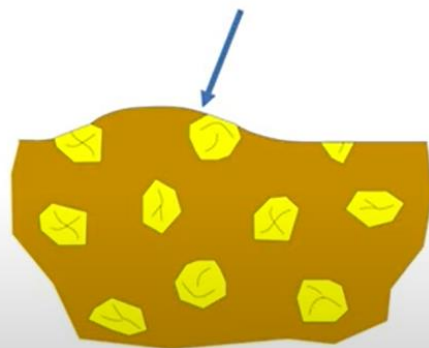
Truing, Dressing, Balancing and Mounting of Wheel



Loaded wheel before truing

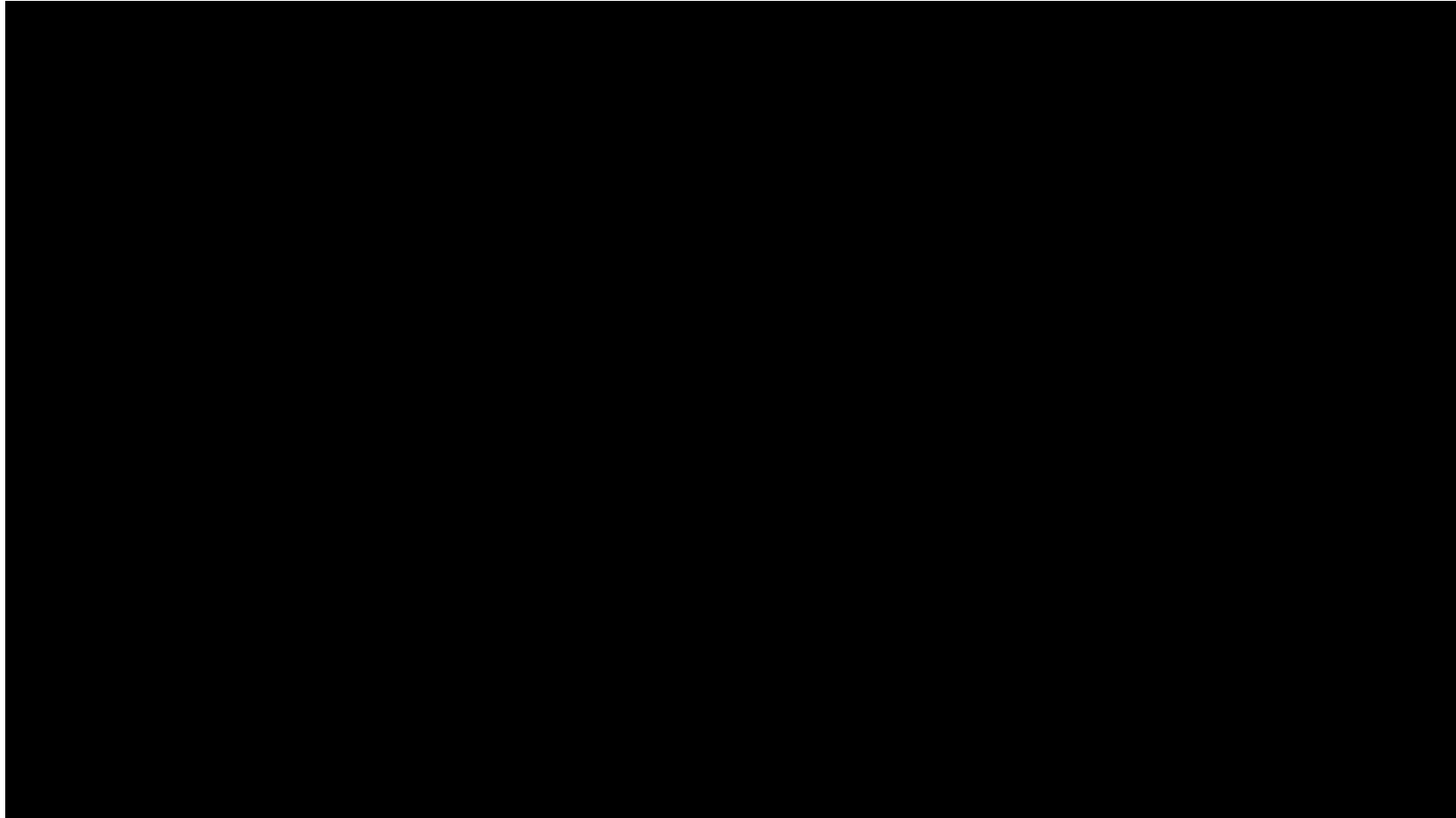


Trued wheel after truing



Truing, Dressing, Balancing and Mounting of Wheel

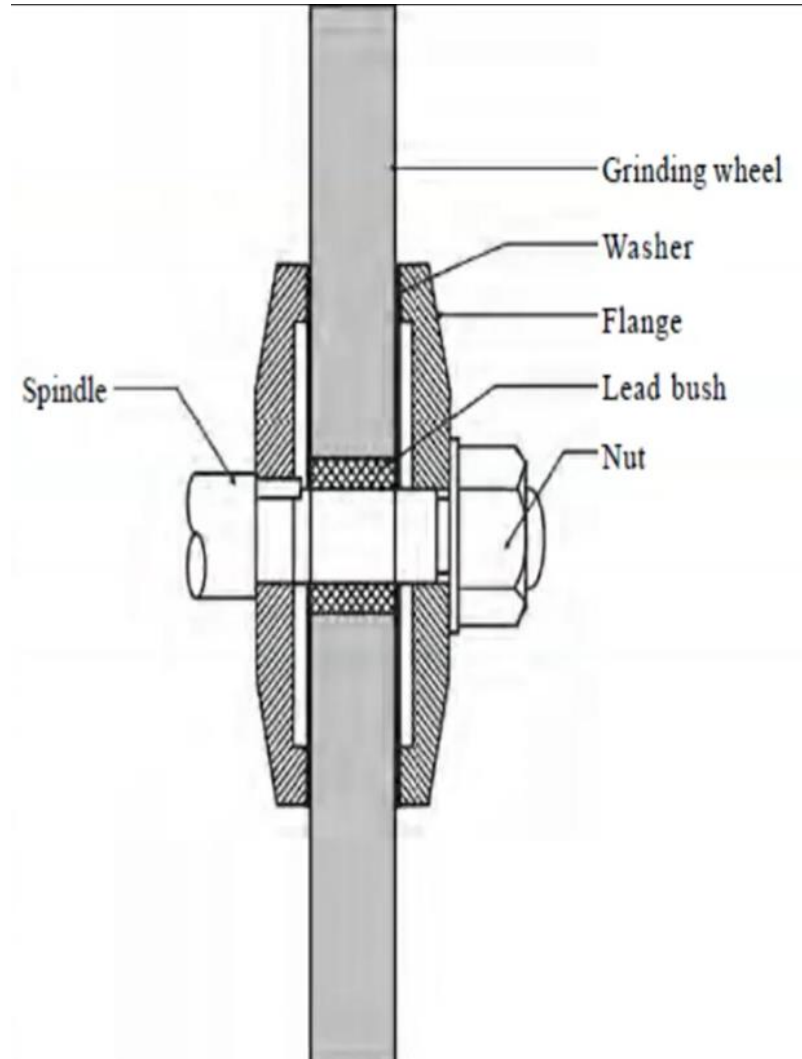
Balancing: - It is defined as the operation of ensuring uniform distribution of the mass of the wheel around the axis. So that no unbalanced forces act on it during rotation.



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Truing, Dressing, Balancing and Mounting of Wheel

Mounting: - It is essential that enough care is taken while mounting a grinding wheel on the machine spindle to avoid its chances of failure.



Type of Grinding Methods

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graph TD; A((Type of Grinding Methods)) --> B((Surface Grinding)); A --> C((Cylindrical Grinding)); A --> D((Centerless Grinding)); C --> E((External)); C --> F((Internal)); D --> G((External)); D --> H((Internal));
```

Surface Grinding

Cylindrical
Grinding

Centerless
Grinding

External

Internal

External

Internal

Grinding Methods

Surface Grinding

- i) It is a method of grinding horizontal surfaces
- ii) The wheel spindle can be horizontal or vertical
- iii) Used to grind precision V-blocks, piston rings snap gauges faces, precision washers etc.

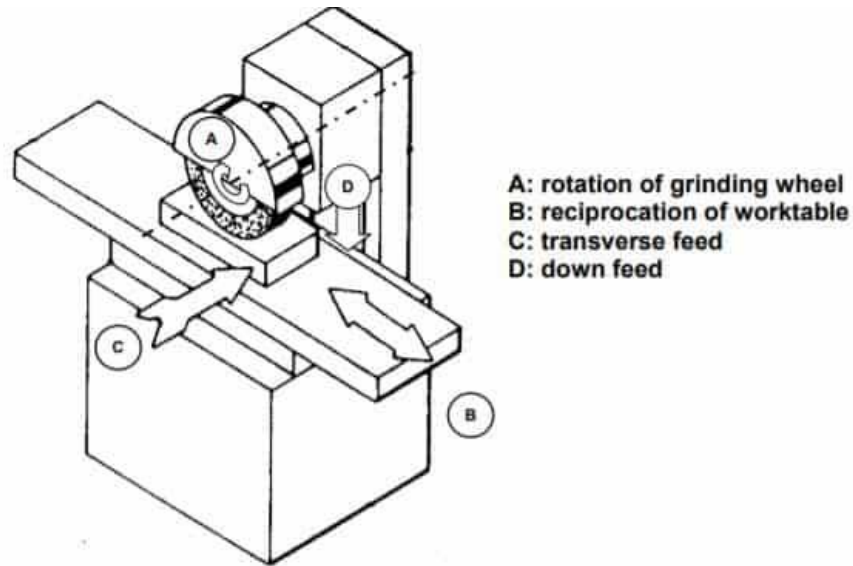


Fig.29.1: Horizontal spindle reciprocating table surface grinder

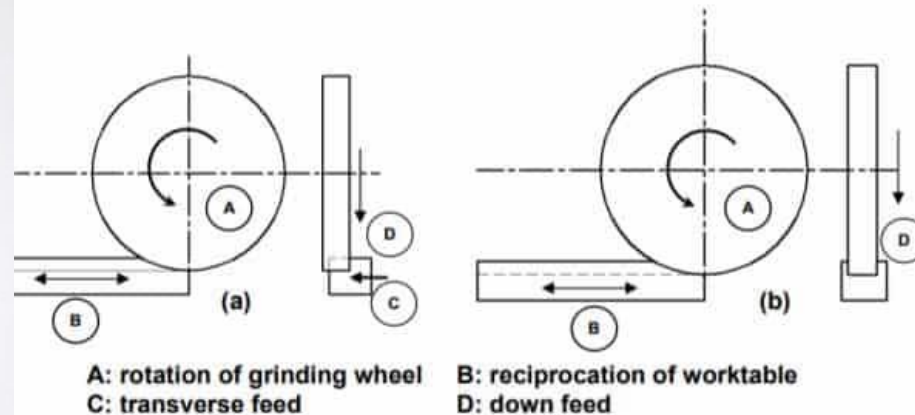


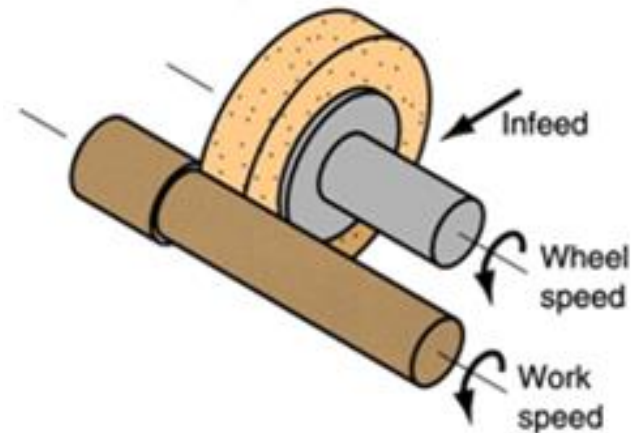
Fig. 29.2 Surface grinding (a) traverse grinding (b) plunge grinding



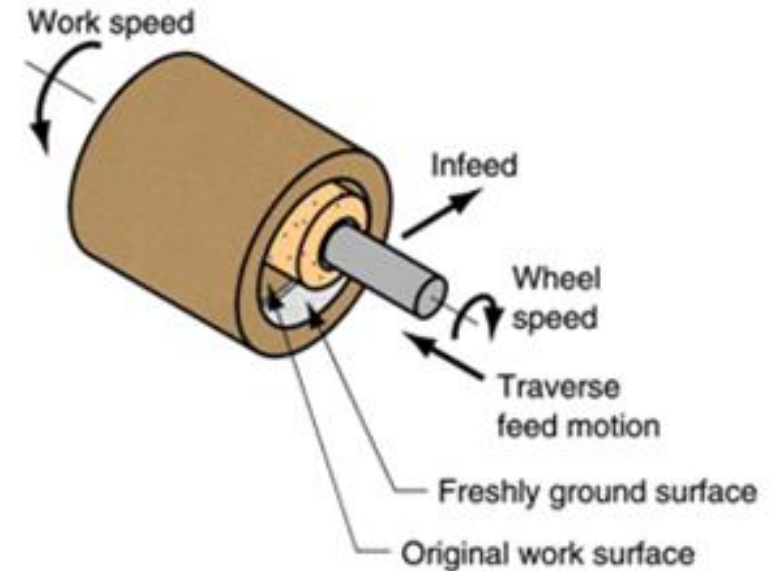
Grinding Methods

Cylindrical Grinding

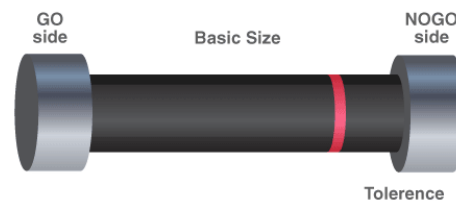
- i) It is a method of grinding the outside and inside internal surfaces of cylindrical workpiece.
- ii) The outside grinding is called external grinding, whereas inside grinding is called the internal grinding.
- iii) External cylindrical grinding is used to grind shaft journals, plug gauges and internal grinding is performed on bore of gear hubs, holes in dies etc.



(a)



(b)

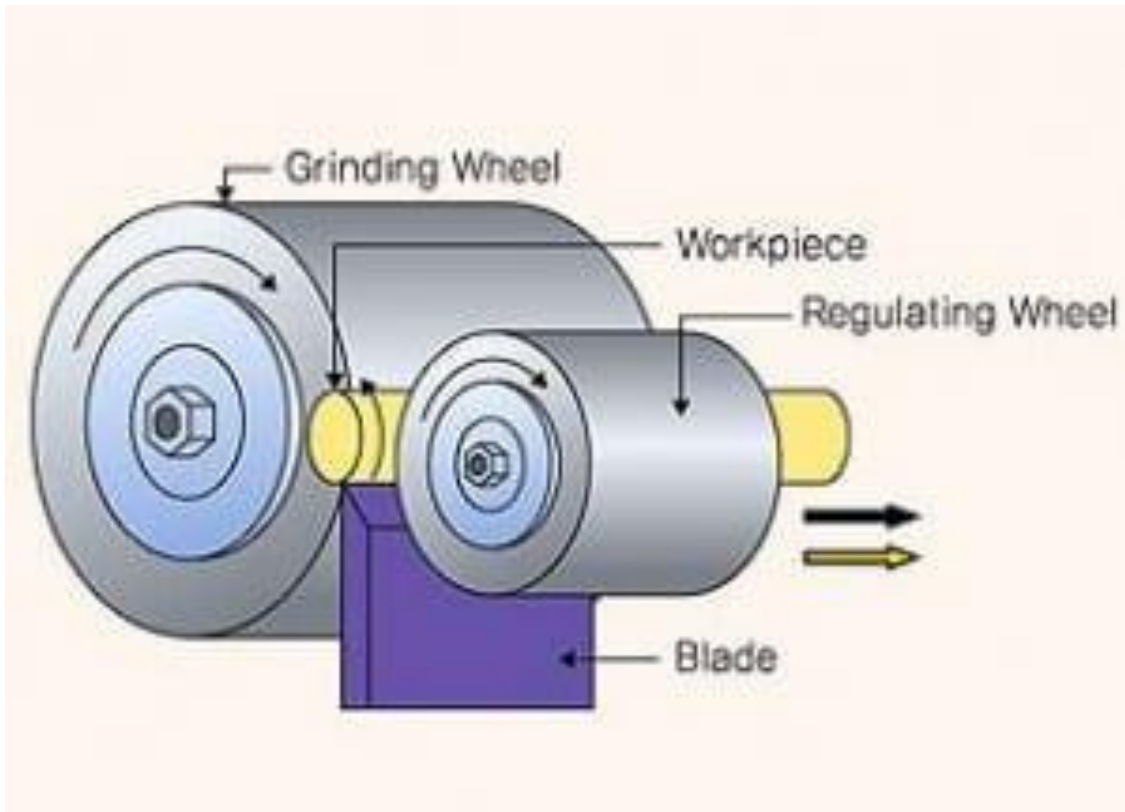


Plug Gauge

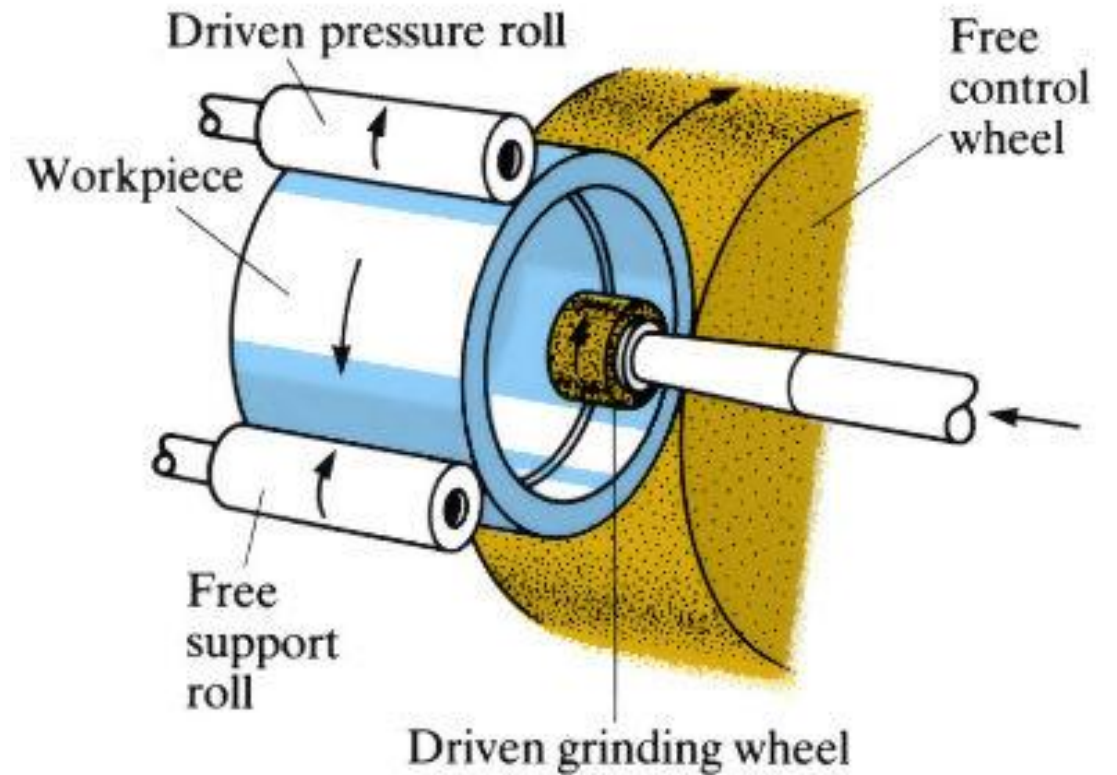
Grinding Methods

Centerless Grinding

- i) It is a method in which workpiece is not held/supported from center or chuck.
- ii) It is supported by a blade and is ground between two wheels.
- iii) Centerless grinding is used for cylindrical liners and various bushing etc.

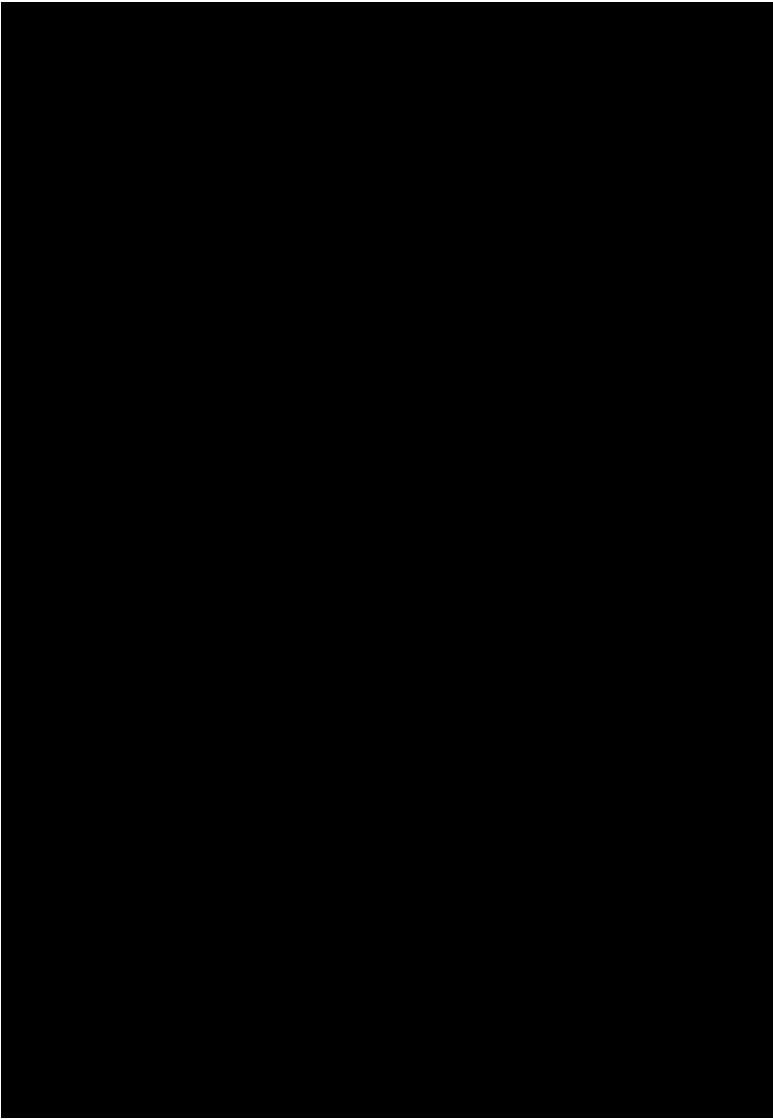


External Centerless grinding

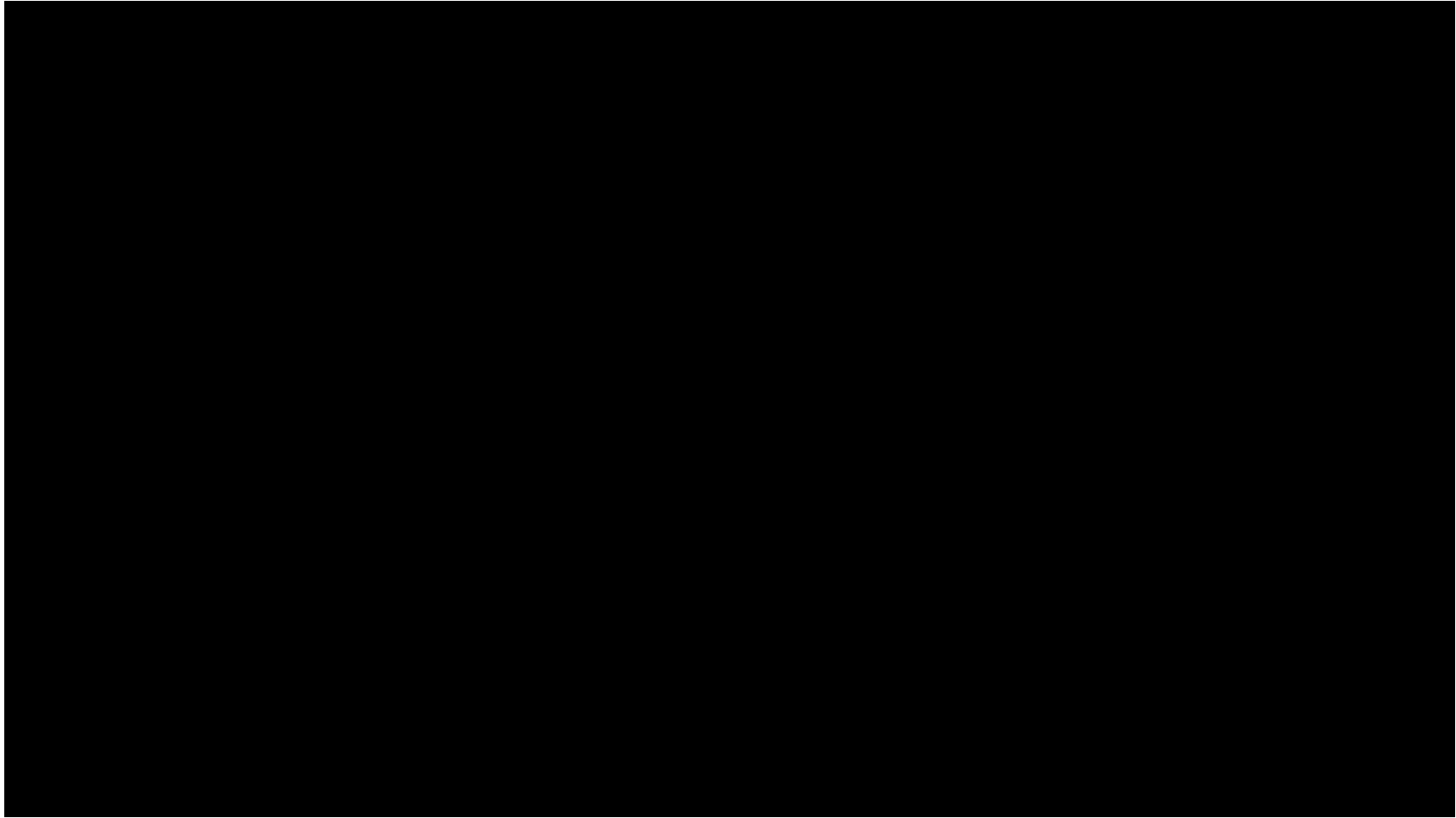


Internal Centerless grinding

Grinding Methods

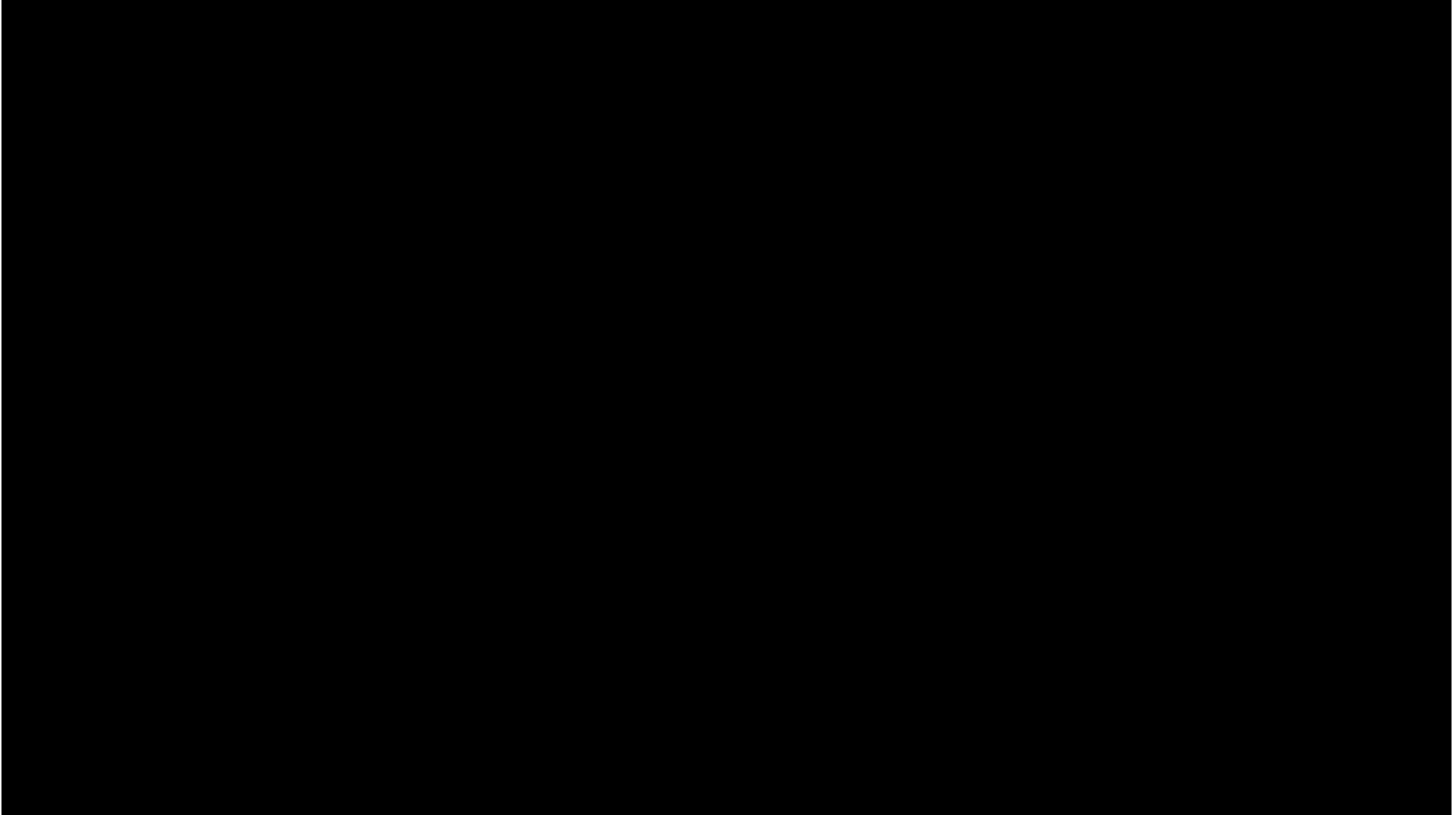


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Grinding Methods



<https://youtu.be/A0Oq2us-67A>

Selection of Grinding Wheel

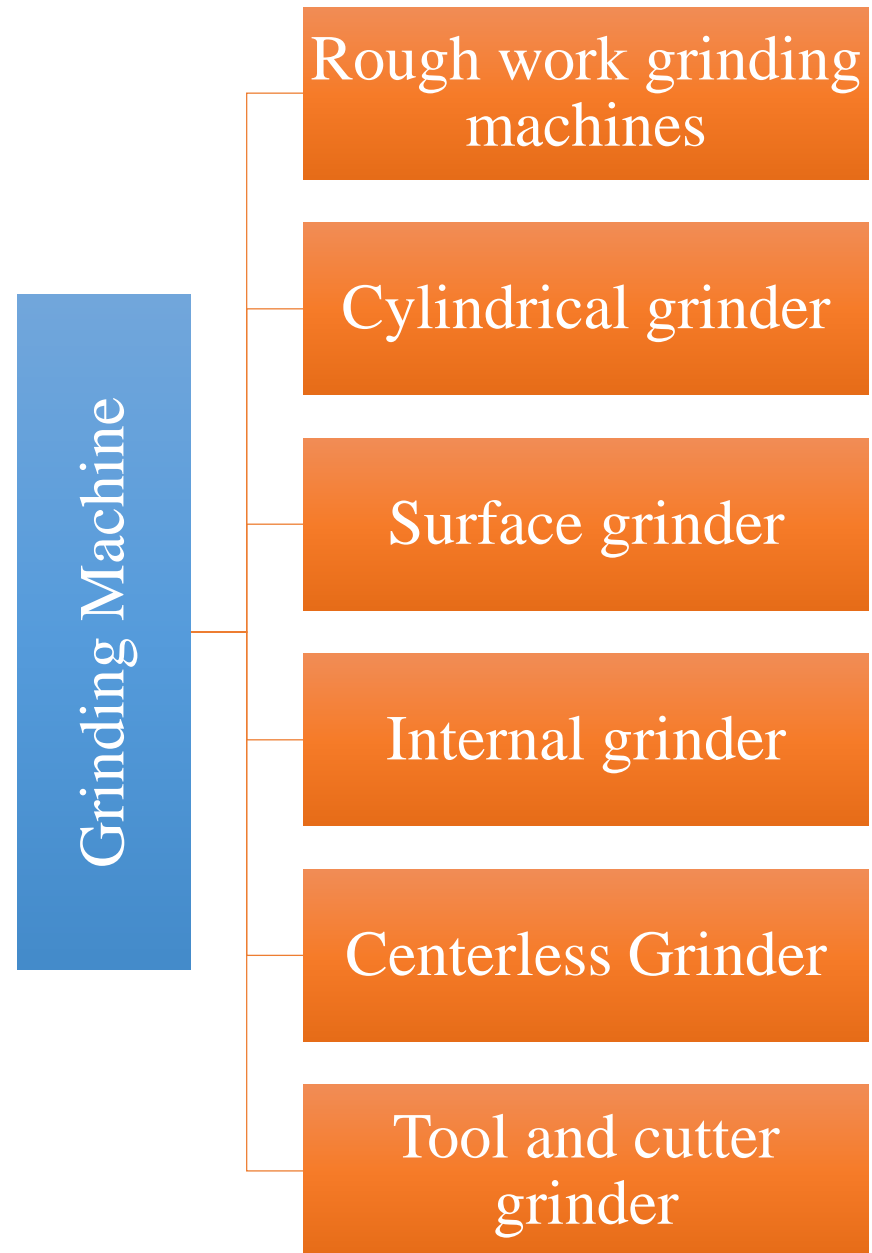


Constant Factor

- The material to be grounded
- Amount of stock to be removed
- Area of contact
- Type of grinding machine

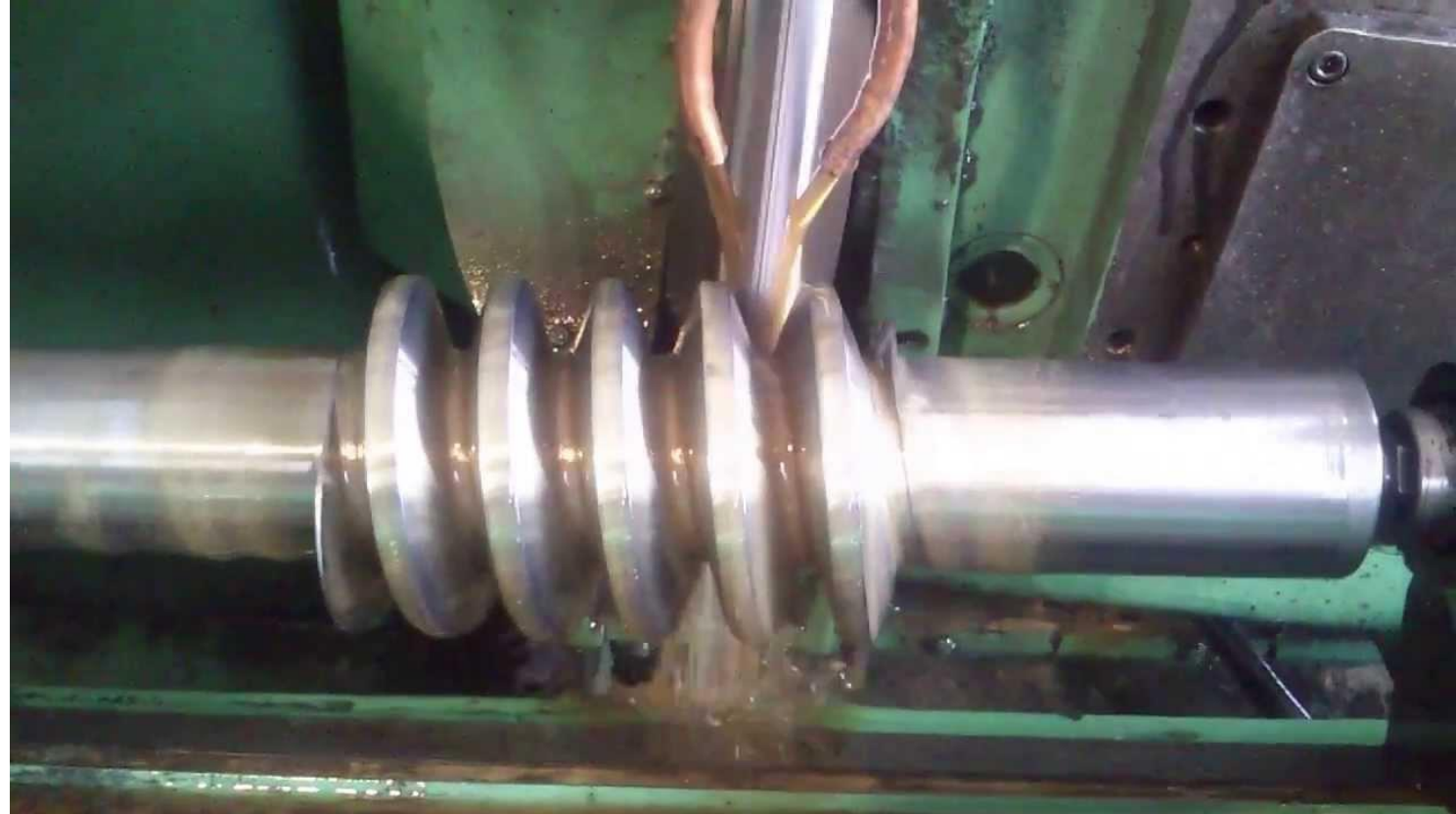
Variable Factor

- Wheel speed
- Work speed
- Condition of grinding machine
- Personal factor



Thread Grinding

- i) It is basically a generating process in which the desired profile is generated on a solid cylindrical object through grinding.
- ii) The machine used in this operates on the principle of cylindrical grinder.



Thank You