A

Report on

Industrial In-Plant Training

At

“BHAGWATI ENGINEERING”

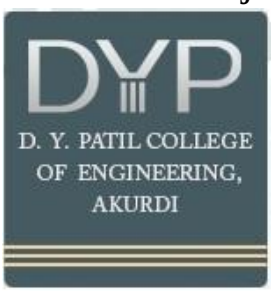
Third Year
Production Engineering (S/W)

by

Mr. Sagar Ravindra Gaikwad
Seat No - S190087515

Under the Guidance of

Mr. Nilesh Mahajan



DEPARTMENT OF PRODUCTION ENGINEERING
D.Y. PATIL COLLEGE OF ENGINEERING AKURDI, PUNE-44 ACADEMIC YEAR 2021-22

DEPARTMENT OF PRODUCTION ENGINEERING D.Y. PATIL COLLEGE OF ENGINEERING AKURDI, PUNE-44 ACADEMIC YEAR 2021-22

CERTIFICATE

This is to certify that the Project/ Assignments performed at "BHAGWATI ENGINEERING" has been completed in the academic year 2021-22 by Sagar Ravindra Gaikwad in partial fulfillment of the Bachelor's Degree in the Third Year Production (Sandwich) Engineering as prescribed by the Savitribai Phule Pune University.

Date: -

Mr. Dr. N. K. Kamble College
Guide Head of Department

External Examiner:

BHAGWATI ENGINEERING

Factory: 113,Heera Panna Industrial Estate, Off Aarey Road, Goregaon (East). Mumbai – 400063.

Date: 31.05.2023

TO WHOM SOEVER IT MAY CONCERN

This is to certify that SAGAR RAVINDRA GAIKWAD student of D.Y.Patil College of Engineering, Akurdi, PUNE studying in VIIIth Semester has Undergone Internship in our Organisation from 21th January 2023 to 31st May 2023.

During his Internship period, we found him regular and hard working.

His conduct and behaviour was also found good

FOR BHAGWATI ENGINEERING

R.G. Naik

PROPRIETOR

ACKNOWLEDGEMENT

I would like to express my sincere gratitude for the successful completion of my in-plant training at BHAGWATI ENGINEERING to all the employees of organization for offering their help and valuable guidance. I would especially like to thank Mr. Rajesh Naik (Owner of B.E.) for his contribution, co-operation and guidelines which made my training period knowledgeable and exciting.

I express my sincere thanks to my Guide Shri. Nilesh Mahajan (Lecturer - Production Engineering Department) for his continuous encouragement and guidance throughout my training period. I would like to express my sincere gratitude to Mr. N. K. Kamble (Head of Production Engineering Department) and Dr. Vijay M. Wadhai (Principal - Shri D.Y. Patil College of Engineering) for providing this wonderful opportunity and their valuable support for the successful completion of this endeavor.

Sagar Ravindra Gaikwad

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Bhagwati engineering was started in 1970, where the grinding the various machine parts. The company is located in Heera Panna Industrial Estate, Off Aarey Road Goregaon (East) Mumbai – 63.

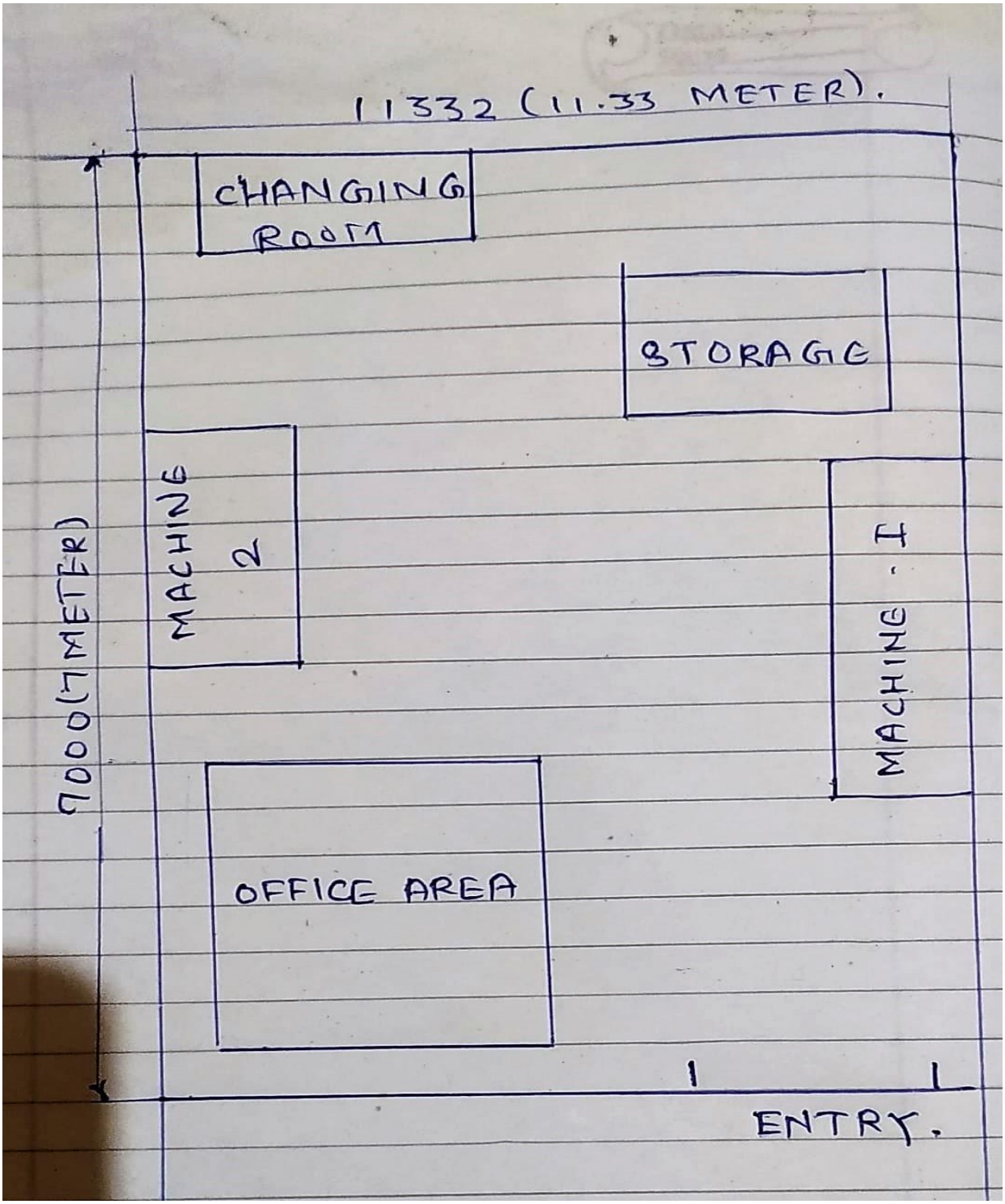
It is one of the small industries though it is named as small scale still the work done by them could be considered to that of medium and large-scale industries. The Company is a Manufacturing and Distribution Unit and generates components for Various types of Gears & distributes these manufactured parts.

Quality management system as per the ISO 9002-1994 adopts by company insures interface with customer quality management system adopted by them time to time, at contractually agreed.

Objective of Company:

Company's objective is to ensure customer's total satisfaction through continuous improvement in product, process and services and thereby achieve market leadership.

Factory layout



2. GRINDING MACHINE

Introduction

Grinding is a metal cutting operation like any other process of machining removing metal in comparatively smaller volume. The cutting tool used is an abrasive wheel having many numbers of cutting edges. The machine on which grinding the operation is performed is called a grinding machine.

Grinding is done to obtain very high dimensional accuracy and better appearance. The accuracy of grinding process is 0.000025mm. The amount of material removed from the work is very less.

3. Types of grinding machines

According to the accuracy of the work to be done on a grinding machine, they are classified as

1. Rough grinding machines
2. Precision grinding machines

Rough grinding machines

The rough grinding machines are used to remove stock with no reference to the accuracy of results. Excess metal present on the cast parts and welded joints are removed by rough grinders. The main types of rough grinders are:

1. Hand grinding machine
2. Bench grinding machine
3. Floor stands grinding machine
4. Flexible shaft grinding machine
5. Swing frame grinding machine
6. Abrasive belt grinding machine

Precision grinding machines

Precision grinders are used to finish parts to very accurate dimensions. The main types of precision grinders are:

1. Cylindrical grinding machines
2. Internal grinding machines
3. Surface grinding machines
4. Tool and cutter grinding machines
5. Special grinding machines

Cylindrical grinding machine

Cylindrical grinders are generally used to grind external surfaces like cylinders, taper cylinders, faces and shoulders of work. There are two types of cylindrical grinding machines and they are

1. External cylindrical grinding machines
2. Internal cylindrical grinding machines

Fig 1.1

Surface grinding machines

Surface grinding machines are employed to finish plain or flat surfaces horizontally, vertically or at any angle. There are four different types of surface grinders. They are:

1. Horizontal spindle and reciprocating table type

2. Horizontal spindle and rotary table type
3. Vertical spindle and reciprocating table type
4. Vertical spindle and rotary table type

Horizontal spindle surface grinding machine

The majority of surface grinders are of horizontal spindle type. In the horizontal type of the machine, grinding is performed by the abrasives on the periphery of the wheel. Though the area of contact between the wheel and the work is small, the speed is uniform over the grinding surface and the surface finish is good. The grinding wheel is mounted on a horizontal spindle and the table is reciprocated to perform grinding operation.

Vertical spindle surface grinding machine

The face or sides of the wheel are used for grinding in the vertical type surface grinders. The area of contact is large and stock can be removed quickly. But a crisscross pattern of grinding scratches is left on the work surface. Considering the quality of surface finish obtained, the horizontal spindle type machines are widely used.

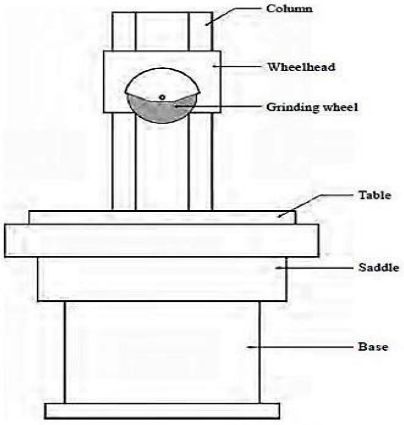


Fig 4.2 Horizontal spindle surface grinder

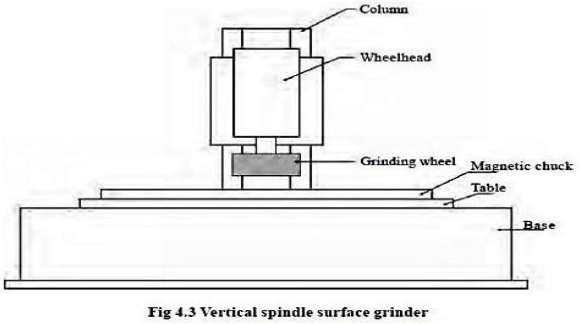


Fig 4.3 Vertical spindle surface grinder

Fig 1.2

Grinding machine operations

The process of grinding is the operation of removing excess material from metal parts by a grinding wheel made of hard abrasives. The following operations are generally performed in a grinding machine.

1. Cylindrical grinding
2. Taper grinding
3. Gear grinding
4. Thread grinding

Cylindrical grinding

Cylindrical grinding is performed by mounting and rotating the work between centres in a cylindrical grinding machine. The work is fed longitudinally against the rotating grinding wheel to perform grinding. The upper table of the grinding machine is set at 0° during the operation.

Taper grinding

Taper grinding on long workpieces can be done by swiveling the upper table. If the workpiece is short, the wheel head may be swiveled to the taper angle. Another method of grinding external taper is to true the face of the grinding wheel by a diamond tool dresser to the required angle. In this case, the table and the wheel head are not swiveled.

4. Benefits of Grinding

Providing grinding is a benefit to both the machine shop doing the grinding as well as its customers. The process saves time and money, and helps a shop create higher quality parts.

1. Offering a service to other shops, while also making grinding a profit center.

Although grinding as a service to others might have been more popular in 1994, Ripley Machine still has about 12 regional customers for which it grinds parts. But the company also specializes in CNC milling and turning, and recently bought its first Swisstype turning center a little more than a year ago. The company has 10 grinding machines to

perform internal, centerless barstock, through-feed centerless, in-feed centerless, and center grinding.

Grinding Machine can grind customer-supplied material or use one of its qualified vendors to purchase and supply the material. It has experience grinding various materials, including tool steel, stainless steel, aluminum, Hastelloy, brass, copper and more.

For centerless grinding, the shop is capable of grinding bars up to 1 inch diameter at lengths up to 14 feet long. For high production jobs for through-feed centerless grinding, the company uses automatic feeders and air gaging.

For internal grinding, the company is able to grind straight or taper bores and can grind parts with a bore diameter between 0.625 inch and 9 inches with a length up to 7 inches.

2. Faster access to precision ground barstock.

Grinding Machine's customers that take advantage of its in-house grinding capabilities save money buying ground stock from Ripley Machine because the shop can do the process cheaper and, therefore, charge less than a mill would. Also, instead of waiting one to two weeks for barstock to be ground and delivered from a mill, it typically takes Ripley only a couple days to precision grind stock in-house.

3. Production on the Swiss-type machine starts sooner.

Having in-house grinding also means having the ability to use the grinders more efficiently to get the ground barstock shipped out sooner. When ground barstock is purchased from a mill, customers normally must wait for the entire order to be ground and shipped. "We can get one bar ground, get it over to our Swiss setup guys and have our

Swiss team work on the initial parts and get the setup running smoothly," Reinwald says. "Simultaneously, the grinder is still running the rest of the material for the production order."

4. Improving size, tolerance and finish of barstock prior to machining.

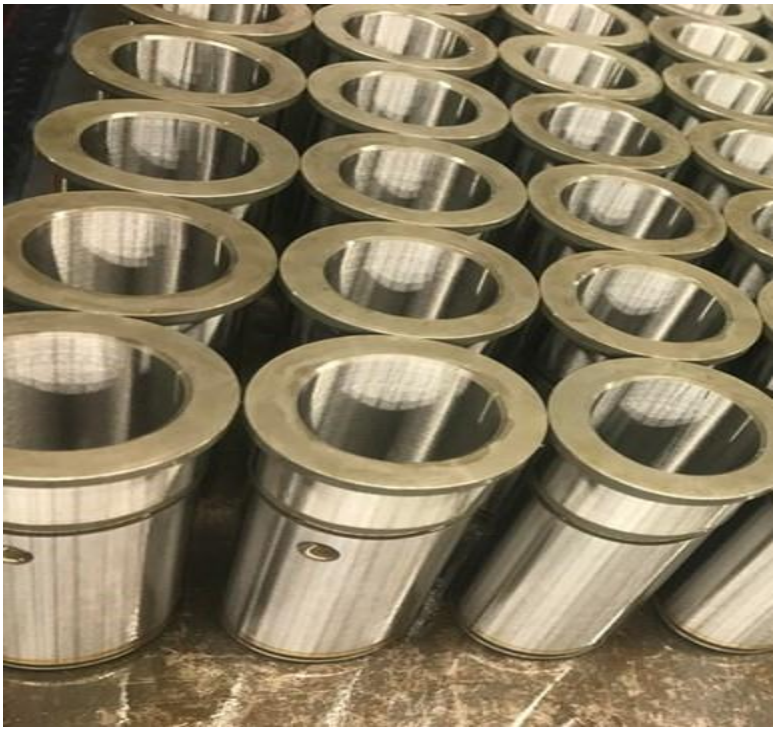
The quality of bar that is put into a Swiss-type machine is the same quality of part that will come out of it. Reinwald says sometimes stock material that has been purchased from the mill will not meet certain finish and size requirements for a job on a Swiss machine.

Therefore, having the ability to create ground bar to the size and finish necessary can be the only way to satisfy a customer.

“One shop we work with needed to have a bar a certain size, and they needed it ground down to fit into a collet rather than buying a guide bushing and at least one collet, maybe two,” Reinwald explains. “Their potential costs would have been at least a couple hundred bucks and whatever lead time. For us, though, it was a small bar that was less than a hundred dollars to grind.”

5. Creating better surface finishes than what is possible by turning alone.

When parts that have been machined on a lathe or Swiss or even on one of Ripley’s mills do not meet surface finish requirements or are perhaps marred from work holding, it is possible to grind the part after machining to meet finish requirements. Reinwald says the company might use one of its grinders to take off 5 tenths to a thousandth of an inch in total diameter on a part to ensure a good finish.



Advantages And Disadvantages Of Grinding Operation

Advantages Of Grinding Operation:

- This can produce a high surface finish with accurate can obtain.
- This can machine hard materials.
- This operation can be done with less pressure applied on work.
- It can obtain highly accurate dimensions.
- It can work at high temperature also.
- Speed of cutting can be done by this process.
- In grinding abrasive particles, they are self-sharpened action.
- This can operate for complex things also.
- Smooth surface can obtain.

Disadvantages Of Grinding Operations:

- Required tool is high cost.
- Process is also a costly one.
- It cannot remove the high amount of material; it only removes a little amount.
- For removing the required amount from work it consumes more time.
- You should work carefully, because imperfect contact may lead to damages.

5. Grinding wheel

A grinding wheel is a multi-tooth cutter made up of many hard particles known as abrasives having sharp edges. The abrasive grains are mixed with a suitable bond, which acts as a matrix to manufacture grinding wheels.

Materials used in Grinding Wheels

A grinding wheel consists of a composite material. This coarse particle presses and then bonds together by the cementing matrix called a bond.

This results in the formation of the sold circular shape of various types of the grinding wheel. Depending on the usage of the wheel, there are various profiles and cross sections of the precision grinding wheel available. Nowadays there are various types of material used for making of the grinding wheel. This depends on the usage of the grinding wheel. These are generally constructed out of sold steel and aluminum steel. The particle bonds with the help of the natural composite stones like that of millstones.

How is the grinding wheel produced?

In a grinding wheel, the function of the abrasive is the same as the teeth in the saw. The only difference is that the grinding wheel has millions of grains distributed throughout. These grains move against the workpiece. This results in removing tiny chips of unwanted material from the surface of the desired job.

There are various types of precision grinding wheels available. These depend on the end product it has to interact with and its usage. It includes:

A. Centerless Grinding Wheel
B. Cylindrical Grinding Wheel
C. Tool Room Grinding Wheel
D. Surface Grinding Wheel
E. Gear Grinding Wheel
F. Bench Grinder wheels
G. Grinding cup Wheel
H. Roll Grinding Wheel

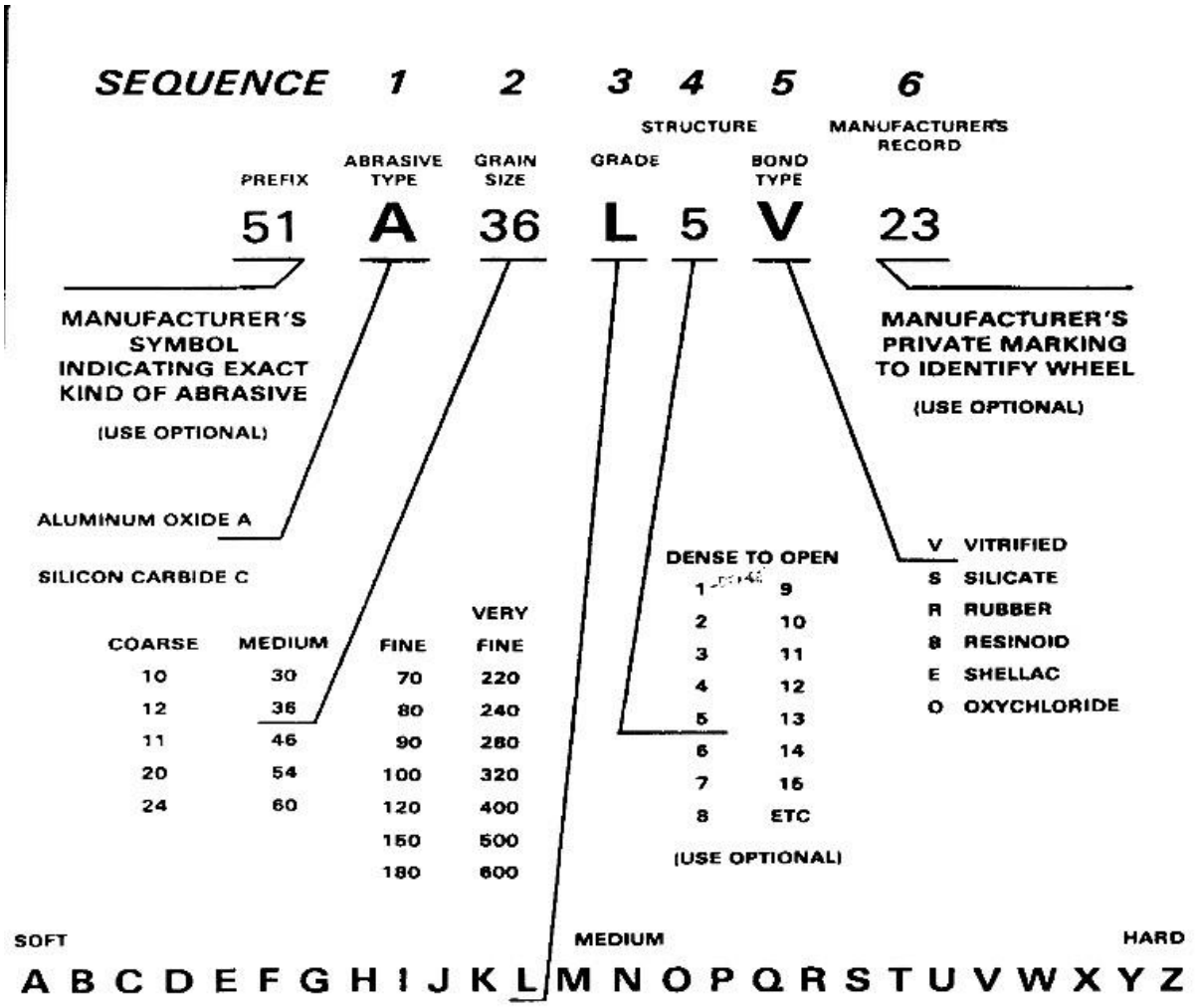


Fig 1.3

Characteristics of the Grinding Wheel

There are various important things taken into consideration for the grinding wheels. These include five characteristics, grain size, material, wheel grades, grain spacing, and the bond type. All these characteristics are indicated with the help of the color codes on the label of the wheel.

The abrasive grain:

The type of material used as the abrasive grain depends on the hardness of the material that it grinds. This includes aluminum oxide, silicon carbide, ceramic, diamond, and cubic boron nitride. The grinding wheel prepared by using diamond and cubic boron nitride referred to as super abrasives. Those constructed with aluminum oxide, silicon carbide, ceramic grains referred to as a conventional type of abrasives.

The grain size:
The type of grain size determines the average physical size of the abrasive grain. The larger the grain size the faster it will cut and create a poor finish. For ultra fine grain sizes, they result in forming finished products.

Wheel Grade
This determines the tightness of the bonds holding the abrasives. The wheel grade affects all the considerations of grinding. This includes wheel speed, coolant flow, feed rates, and grinding depth.

Grain Spacing
This depends on the spacing of the structure. It determines the ratio of the bond and the abrasive to the air space. A less dense wheel will cut and a large cut with creating an effect on the surface.

Wheel bond
This determines how the wheel holds the abrasive. It also affects considerations like finishing, coolant, least and greatest wheel speed.

Types of Grinding Wheels

Fig 1.4 Different size and type of grinding wheel

There are various types of grinding wheels available on different specifications. There are various application such as sharpen, polishing, cutting, & smoothing of metal.

These depend on the type of abrasive used, the size created and finished product. This includes:

Straight wheel: They find their usage in different types of tools like chisels. It can perform grinding of various types.
Cylinder or wheel ring: It finds its usage for the production of flat surfaces. The grinding happens with the end face of the wheel.
Tapered wheel: It finds its usage for grinding of thread and gear teeth.
Straight cup: It finds its usage for the cutting of tools and cutter grinders.
Dish cup: It finds its usage for cutter grinder and jig grinder.
Saucer wheel: It finds its usage for grinding of miller cutters and twist drills.
Diamond wheels: These finds its usage in the grinding wheels used to perfect industrial diamonds.

Cut off wheels: These find their usage in the construction of reinforcement bars. It also goes for anything that needs a quick removal and trimming.

Grinding Wheel Specifications

The grinding wheel specifications- The Grinding Wheel use in end-finishing of the product. It consists abrasive grains bonded together using

- Resins
- Epoxy
- Rubber
- Metal &
- Vitrified Glass Materials

They can be simple, flat disc shape without any recesses, flaring and cups shaped.

The type 1 wheels fall under this category and further designated to these types called “1A1”, “1A8”. Moreover, 1AI and 1A8 are known for the straight super abrasives wheels having straight face and no recess.

Which Grinding Wheel Should you Choose?

Selection of grinding wheels is challenging task for every manufacturer. That is why our abrasive experts summarized this this process in simple words to help you into making informed decision while selecting different types of grinding wheel based on material, & specifications.

The various choices for the following include:

Abrasive grains: –Talking about the choices for abrasive grains, it includes

- Aluminum Oxide,
- Ceramic,
- Silicon Carbide,
- Zirconia,
- Super Abrasive Diamond,
- Super Abrasive CBN And Tungsten Carbide.

The concentration of abrasive grain determines the finishing of the end product. The most industrial mineral is aluminum oxide.

Grit size

It applies on products using abrasive grains having “matrix” or “bonded” together to the surface (such as coated abrasives). It also includes MSL super abrasives, vitrified grinding wheels, dressing sticks, honing stones or the grit dressers.

The grit size is defined through the grading system standards. It specifies the upper and lower limits at the certain points in the size distribution. The various grit size systems are ANSIbonded, FEPA-F, JIS, and Micron Graded.

Applications

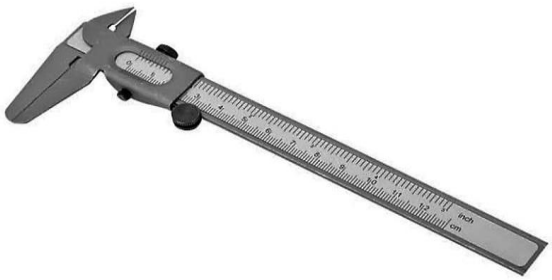
Grinding wheel specification depends on these aspects such as

- Material Removal,
- Intermediate Cut And Finish,
- Finishing Cutting,
- Corner Holding,
- Cleaning,
- Cylindrical, □ Dry Grinding,
- Form Grinding Etc.

Bond type

It is formed in between the abrasive grains and the grains of the metal substrate. It can be of resin/plastic, rubber, shellac, silicate, oxychloride, vitrified etc.

6. Measuring Instrument

	Vernier Caliper is a measuring and layout tool, typically used for measuring linear dimensions, it can measure the outer & inner dimension using the main job in a dimension using the smaller job and depth using steam.
	The micrometer screw gauge is used to measure even smaller dimensions than the Vernier Caliper also uses an auxiliary scale which is marked on rotary thimble.
	Dial indicator are one of the primary measuring tools used in precious engine building. They are used to measure the clearance, crankshaft thrust and straightness.

7. Conclusion:

- Capability to communicate effectively.

- Ability to be a multi skilled engineer with good technical knowledge and leadership.
- Capability for changing self-confidence.
- Through on working period we learn the habit of been more punctual on time.
- We learned how to communicate with different people in industry.
- We learned how to control the difficult situation and how to solve the problem.
- We got personal satisfaction of work we are doing as maintenance engineer.

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