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# A Study of Non-Conventional Grinding Machine Powered By Solar Energy

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## ABSTRACT

Nowadays every one focus on various pneumatic application in industrial areas because due to the continuous availability of compressed air in industry. It is possible to drive the number of applications using pneumatic circuit. So, by choosing the same way of study for improvement of Grinding Machine efficiency. The main objective is to reduce the power requirement to drive the grinding machine with the help of using pneumatic system. If solar panel is introduce in this system to reduce power consumption then as capacity of grinding machine increases the size of solar panel as increases, so to reduce size of solar panel ,there is another alternative option to choose pneumatic system to reduce power consumption of grinding ,so solar pneumatic system is essential for reducing power consumption and increases efficiency in sense of material removal rate(MRR). Grinding process is most important phenomenon to improve the surface finish in industrial purpose and it can easily handle the grinding tool So, this study will definitely do this kind of work. Further improvement in this work is to change the various tools and their size for number of application. The assembly of solar Pneumatic Grinding Machine is very simple and the working is so efficient.

**Keywords:** Grinding machine, Solar System , Pneumatic System , Efficiency, Power consumption, MRR

## I. INTRODUCTION

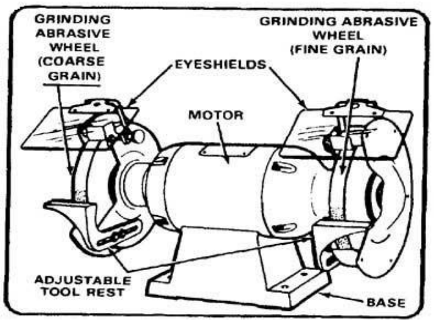


Fig:1.1 Grinding Machine

Grinding can also be considered as a machining process, i.e. process of removing metal, but comparatively in smaller volume. To grind means 'to abrade', to wear away by 'friction' or 'to sharpen'. In grinding, the material is removed by means of a rotating abrasive wheel. The action of grinding wheel is very similar to that of a milling cutter. The wheel is made up of a large number of cutting tools constituted by projected abrasive particles 1n the grinding wheel. Definite elongated metal chips varying in size from 0.4 to 0.8 mm can be seen by examining the material removed under the microscope. Nowadays, grinding is mainly used for the following purposes :

- To remove a very small amount of metal from the work piece to bring its dimensions within very close tolerances after all the rough finishing and heat treatment operations have been carried out. It is thus basically a finishing process employed for producing close dimensional and geometrical accuracies.
- It is sometimes used to obtain better finish on the surface.
- Sometimes it is used for machining those hard surfaces which are otherwise difficult to be

machined by the high speed steel tools or carbide cutters.

- ➢ It is also used for sharpening the cutting tools. (0) It is also used for grinding threads in order to have close tolerances and better Enish.
- ➢ Sometimes it is also applied for higher material removal rates (abrasive machining).
- ➢ Grinding is one of the extreme important processes in production work. It possesses certain advantages over other cutting processes.
- ➢ It is very suitable for cutting hardened steels etc. Parts requiring hard surfaces are first machined to shape in annealed condition, only a small amount being left for grinding

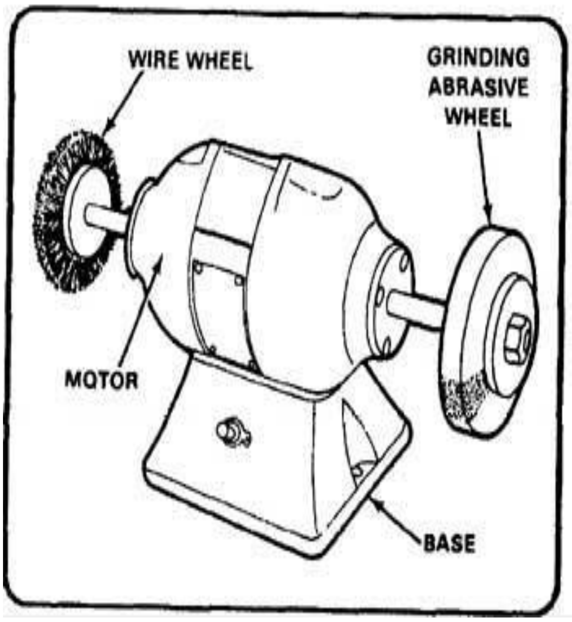


Fig:1.2 Grinding Machine

## APPLICATION

- ➢ surface finishing
- ➢ slitting and parting
- ➢ descaling , deburring
- ➢ stock removal (abrasive milling) finishing of flat as well as cylindrical surface
- ➢ grinding of tools and cutters and re-sharpening of the same.

## II. METHODS AND MATERIAL

Grinding is used in almost every industry that uses metal, including aerospace, automotive, construction, foundry, shipbuilding, rail, and many others. We are design prototype that works on solar principle.

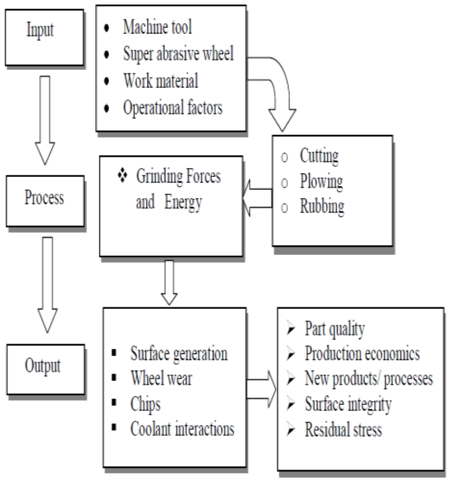


Fig :2.1 Working Principle of Grinding

## AIM AND OBJECTIVE

The main objective of this concept is to Experimental study of the model which is completely works on the Green Technology .Also to reduce power requirement for grinding.

The model interfaces.

1. Solar Module
2. Pneumatic Module

**Main Objectives are:**

- Design Machine which works on Solar
- Easy to controlling
- Easy to conveyance
- System is compact
- Running cost is less.
- Absence of linkage
- Self-lubricating and self-cooling properties

## LITERATURE REVIEW

Grinding Parameters

The success of any grinding operation depends on the proper selection of various grinding parameters, like wheel speed, work speed, transverse feed, and in-feed area of contact, grinding fluids, balancing of grinding wheels and dressing etc. Subramanian and Lindsay

(1992) have given the concept of grinding system approach that addresses four key inputs to the grinding process viz. machine tool, wheel selection, work material properties and operational factor. Inadequate attentions to details in any one of these systems input parameters can result in uncertain grinding results.

## SUMMARY OF THE LITERATURE SURVEY

Many investigations have been done so far to specify the
relationship between grinding conditions and their influences on the machining result. Optimization of machining processes is usually based on finding operating conditions, which minimize machining costs or maximize production rate. In order to perform such optimization analyses, a reliable relationship between tool life and machining parameters (e.g., Taylor equation) is generally required. Such optimization analyses can also be applied to precision grinding process. Snoeys et al (1974) have proposed an empirical tool life equation for plunge grinding assuming a power function relationship between the volume removed per wheel dressing and the equivalent chip thickness (removal rate per unit width divided by wheel speed).

A major drawback with this relationship is the need for separate evaluation of the constants in the tool life equation for each wheel -work piece combination, dressing procedure, wheel and work piece diameter and even wheel speed. Other tool life relationships developed by Malkin (1976) are based upon wear models of the grinding wheel up to burning, but these are too complex for practical use. By making a quantitative energy balance, Malkin (1975) showed that the total energy in grinding could be considered as the sum of chip formation, plowing and sliding energies. Plowing refers to work-piece deformation without removal and sliding energy is associated with rubbing between the wear flats and the work-piece surface. Both the plowing and sliding energy contributions become smaller at faster removal rates, so that the minimum specific energy approaches the specific energy for chip formation.
Mayne and Malkin (1976) have proposed an optimization approach for plunge grinding of steels, in order to maximize the metal removal rate subject to constraints on work piece burn and finish. In this approach, non-linear optimization techniques have been applied to a generalized grinding model and it was analytically demonstrated how the wheel dullness, as indicated by wear flat area, influences the allowable removal rate. Selection of optimal grinding conditions using this analysis is not practical because of the need for having a reliable estimate of wear flat areas.
YoremKoren (1980), have developed a computer program for practical off-line optimization of plunge grinding operation on steels based on the same strategy is described above with additional relationship taking the dressing parameter into account.

According to Verkerk (1977), it is sufficient to consider the cutting edges that belong to same grain as one cutting edge. When there are more cutting edges on one grain, there is no space for the chip between the cutting edges. Consequently, the cutting edges can no longer be active. As a result, the grain acts as one cutting edge. Verkerk gives a survey of the m Recent improvements in machining tolerances have exposeda new possibility for material-removal from brittle substances.It has been noted that plastically deformed chips are formedin the machining of brittle substances if the scale of the machiningoperation is small (less than 1 Lim depth ofcut) (TohMcPherson, 1986).ost important methods of measuring number of static and kinematic grains. However, neither the measured grain count nor the measured shape of the cutting edge tips can be used to draw direct conclusion on the characteristics of the grinding wheel topography. The topography models developed by the various researchers have the common feature that many measurements are required to determine the model parameters. Furthermore, the statistical geometrical distribution of the grains is not taken into consideration. All these conclude that the practical application of the topography models presented so far can be expected to be time consuming, due to the measuring efforts necessary

## III. CONCLUSION

From the above study it has been concluded that if solar system is use in combination with pneumatic system in grinding machine then power required is less and its can run at higher speed. In the

conventional grinding machine the speed of machine reaches upto 6000rpm while in the combine system of solar and pneumatics it reaches around 15000rpm and hence the material removal rate also increases.
Also the detail study has been carried out for the various parameters like material removal rate, speed, depth of cut, feed etc. from the literature survey.

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