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# Gear Cutting Arrangement On Lathe Machine

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***Abstract*: As gear cutting operation is mostly done on milling machine the cost of the milling machine is very high, which is not economical for the small scale industries. This gear cutting arrangement in lathe machine reduce the initial investment of small scale industries for milling which can use their lathe machine for gear cutting operations. This is also reducing the space covered the machines and the remaining space can be used for other productive work output. Still, it is facing some difficulties like machining of gear cutting on the shaft. To overcome this difficulty, it is necessary to design an attachment for the lathe. Which is able to overcome these difficulties and flexible to use it.**

***Keywords*: Design, Fabrication, Gear cutting, Lathe attachment.**

## 1. Introduction

In recent years, new fabrication techniques have been developed to satisfy the technological demands. Moreover, emphasis is stressed on attachments. Attachments are used in various fields and machines depending upon the needs to be fulfilled and mode of operation. An attachment eliminates the purchasing of a new unit which serves the same purpose. For example, a lathe occupies a place opposite to that of a gear cutting machine, the ten machines mainly used to produce cylindrical and plain surfaces respectively. By implementing an attachment to a unit, the capacity of the unit can be increased which is very economical.

Each general purpose conventional machine tool is designed and used for a set of specific machining work on jobs of limited range of shape and size. But often some unusual work also Need to be done in a specific machine tools, e.g. milling in a lathe, tapping in a drilling machine, gear teeth cutting in shaping machine and so on. Under such conditions, some special devices or systems are additionally used being mounted in the ordinary machine tools.

Such additional special devices, which augment the processing capability of any ordinary machine tool, are known as Attachments, Un like accessories, Attachments are not that inevitable and procured separately as and when required and obviously on extra payment. Taper cylindrical surface, which is a very common feature of several engineering components, is generally produced in lathes in a number of methods, depending upon length and angle of the tapered position of the job, such as offsetting tailstock, swiveling the compound slide using form tool and feed motions.

But jobs with wide ranges of length and angle of taper, are easily machined by using a simple attachment, called taper turning attachment schematically shows a taper turning attachment where the cross slide is delinked from the saddle and is moved crosswise by the guide block which moves along the guide bar preset at the desired taper angle.

Thus, the cutting tool, which is fitted on the cross slide through the tool post and the compound slide, also moves along with the guide black in the same direction resulting the desired taper turning. Gear cutting is the process of machining flat, curved, or irregular surfaces by feeding the work piece against a rotating cutter containing a number of cutting edges.

## 2. Literature Review

[1] Kumar et. al. “Design and Fabrication of Gear Cutting Attachment to Lathe for Manufacturing of Spur Gear” has concluded that gear up to 3 mm diameter and module 1 to 3 can be generated by Centre lathe by gear cutting attachment on lathe.

Manufacturing cost of gear may be reduced by this method which will be helpful for small and medium industries. This attachment to lathe can perform indexing mechanism like milling machine and carriage function to and fro movement and sliding on bed.

[2] Gadakh et al. “Gear Manufacturing by using Conventional Lathe Machine”, has concluded that gear manufacturing by milling machine is costly hence we have making a new attachment which make a gear. This setup is installed on lathe carriage.

This one is cheap device hence avoids dependency on costly milling machine for gear production. This attachment is really useful for small workshops and this is good alternative for milling machine.

From this arrangement we produce spur gear easily. This attachment having advantages is that having simple assembly, easily installed on lathe machine.

[3] Shinde et al. “Attachment on Lathe Machine to perform Gear Cutting Operation”, has concluded that gear cutting attachment on lathe reduce investment as well as space for small scale industry.

This attachment is mounted on carriage. Work piece is fixed and tool is rotating perpendicular to work piece. Mandrel is design to hold the tool. Manufacturing cost of gear can be reduced by this method also reduce the cost of milling machine.

[4] Parmar et al. "Review paper on Additional Attachment on Lathe for Manufacturing of Gear", has concluded that milling machine is very time consuming process so, we have use conventional lathe machine for manufacturing of gear by additional attachment on lathe machine.

So by this attachment cost of manufacturing of gear is reduced and gear is easily manufactured for small workshop and fabrication shop.

This is multipurpose tool for lathe machine. Time and cost for machining is reduce hence it increase the efficiency of lathe machine.

[5] Dalvi et al. "Lathe attachment for Gear Manufacturing" has concluded that Centre Lathe of standard power of 2.5 kW is capable of cutting spur gears.

## 3. Spur Gear Cutting Attachment for Lathe Machine

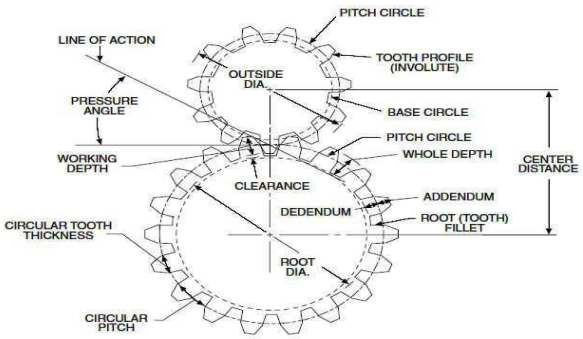


Fig. 1.

### A. Milling

Milling is a machining operation that will do machining by fixing work piece at a certain position and then doing operation by guiding cutting tool towards the work piece. That is a vertical milling operation there are different milling operation is available in now a days and most of them are operated by CNC machines to get much precision and reduce time in production.

### B. Machining

Machining covers a good style of actions that take a material and switch it into one thing else. It is outlined as a controlled method that takes the material and transforms it into a desired final form and size. This may embrace material removal as seen with such actions as cutting, drilling, boring, or material addition. Although machining is most ordinarily used with the metal product, machining can even be through with materials like wood, ceramic, plastic, and composite materials.

### C. Spur gear

Spur gears consist of parallel teeth to the axis and are utilized for transferring power between two parallel shafts. They are simple to manufacture and low cost. They need the most effective potency and smart accuracy rating. They are used in high speed and high load application altogether varieties of trains and an honest sort of velocity ratios. Hence, they perceive wide applications right from clocks, organization gadgets, motorcycles, vehicles, and railways to aircrafts.

### D. Welding

Welding is one of joining process that joint part together to be a product. In faculty laboratory there has two type of welding that is metal inert gas welding, MIG and arc welding. Arc welding uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes.

While MIG welding uses high deposition rate welding process, wire is continuously fed from a spool. MIG welding is therefore referred to as a semiautomatic welding process. Figure below show the MIG welding process. I plan to use this process to make a join between work piece.

## 4. Methodology

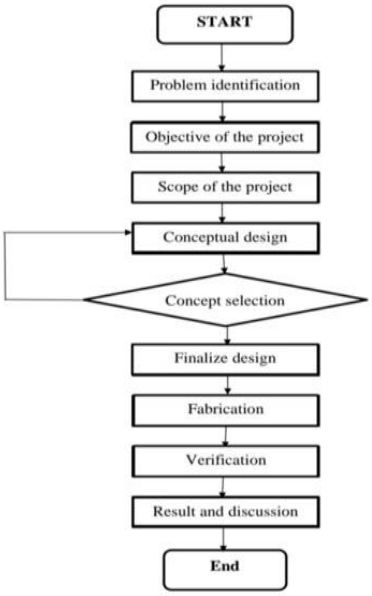


Fig. 2. Methodology

## 5. Model Development

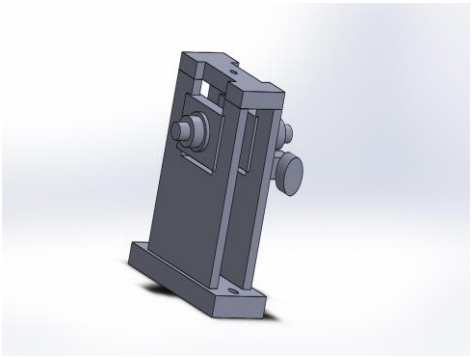

Fig. 3. Model development

## 6. Calculation

### A. Force calculation

- There are two forces related to the milling cutter. one

is cutting force and another is thrust.

- According to the machine specifications,

P = Power = 1 kw
N = Speed of rotation of the spindle = 560 rpm
D = Diameter of the cutter = approx. 50 mm

- Therefore, using the formulae for cutting force

V = πD N / 60
P = F.V
Therefore,
F = P / V

Putting the above values in this equation, we get cutting force F =680 N.

*B. Thrust calculation*

- To calculate the thrust force, following formula was used
- Thrust force (th) = K * D * f^0.7 N
- D =50mm
- f = 0.5mm/min
- N =560
- K = thrust force constant = 42.35
- Putting these values in the above equation, we get Thrust force (th)=1290N

## 7. Conclusion

We know that Country's GDP is largely affected by many small-scale industries. Also, we saw that in this fast moving world a micro industries are facing very tough competition from large scale industries and it's almost very difficult for them to survive and earn their share of bread and butter as they have an only choice of selecting one or two machine at a time due which there is a rise of a serious problem called as either sub contraction or renting of machines which further decreases the overall efficiency of whole machine and industry.

By selecting and incorporating such small but useful ideas a small-scale industrialist can save huge amount of time, energy, and money hence forth increasing the overall productivity of a firm and hence contributing more efficiently in countries GDP.

This model has been applied to both parallel-axis and cross-axis gear pairs. As the gear efficiency methodology proposed here is comprehensive and general, it has the potential to form a foundation for future modelling of efficiency of other types of gear drives.

The accuracy of the published friction coefficient formulae has been assessed by comparing them to the electro hydrodynamic lubrication-based friction values and the measured traction data. While friction values from the electro hydrodynamic lubrication analysis agreed well with the measured traction data, the published formulae failed to do so.

This provides clear insight that the friction formulae developed by others using lubricants, geometries, and surface characteristics and operating conditions reflecting an application other than gears might not provide accurate friction information to a gear efficiency model.

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