"Grey Cast Iron" the best suitable material for lathe machine bed

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***Abstract*--**A lathe can be made from various materials for each component such as the lathe bed. When making a lathe, start by building the lathe bed. Choosing the right material to use is important for its stability and durability. The materials that use must be suitable for repeated use and durability. One of the primary considerations is damping. Working with a lathe causes vibrations that are caused by noise, mechanical oscillations or alternating currents. Damping reduces vibrations by dissipating the energy. Grey Cast Iron is made by remelting pig iron. It is an alloy of Carbon and Iron. Small amounts of Silicon, Phosphorus, Manganese and Sulfur are also present in it. The reasons behind its popularity are ability to make complex structures and low cost. In addition, the excellent properties of Grey Cast Iron have made it one of the most widely used alloys.

***Keywords*- -** *Grey cast iron, pig iron, Lathe & Lathe bed,*

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Introduction: -

Iron and its alloys are widely used in almost all industry and their products reach almost every household. Mixing iron with different elements is varying proportions results in alloys with different properties. Each element added to iron gives it some special characteristic. Grey cast iron, so-called because of its fracture face, has some unique properties due to its composition. The most widely used cast iron, it is brittle with low tensile strength and is used in the manufacturing of engine cylinder blocks, flywheels, gears and many machine-tool bases. [2] Lathe removes undesired material from a rotating work piece in the form of chips with the help of tool which is traversed across the work and can be fed deep in work piece. A lathe is used principally to produce cylindrical surfaces and plane surface, at right angles to the axis of rotation. A lathe basically consists of a bed to provide support, a head stock, a cross slide to traverse the tool, a tool post mounted on the cross slide. The carriage moves over the bed guide ways parallel to the work piece and the cross slide provides the transverse motion**[1]**.

A lathe bed is the area of the lathe that spans the distance from the headstock to the tailstock and is positioned underneath the workspace. Often referred to as the frame of the machine, the lathe bed is a very important component of the lathe and is responsible for keeping the tooling level and stable. Lathe bed is supported on broad sections columns. Its upper surface is either scrapped or ground and the guiding and sliding surfaces are provided. The bed consists of two heavy metal slides running lengthwise, with ways or V's formed upon them. Three major units mounted on bed are the head stock, the tailstock, and the carriage. Lathe bed material should have high vibration damping qualities as it is secured rigidly over cabinet leg and end leg and all other parts are fitted on it. Lathe bed being the main guiding member for accurate machining work, it should be sufficiently rigid to prevent deflection under cutting forces, should be massive with sufficient depth and width to absorb vibrations, should resist the twisting stresses set up due to resultant of two forces, should be seasoned naturally to relieve the stresses ser up during casting.

[3] Pig iron is a semi-finished metal produced from iron ore in blast furnace, containing 92 percent iron, high amounts of carbon (typically up to 3.5 percent), and balance largely manganese and silicone plus small amounts of phosphorus, sulfur, and other impurities. Pig iron is further refined in a furnace for conversion into steel. It gets its name from the shape of trough (resembling a pig) in which it used to be cast in the 19th century. Pig iron is a byproduct of the melting process to make pure iron. The iron ore is heated using high carbon fuel coke, which results in pig iron with a very high carbon content, usually around 4 percent. During the Industrial Revolution, pig iron was widely used. Pig iron is now normally forged into wrought iron, which is a more useful material.

Grey cast iron has following properties due to which it is best suitable for lathe machine bed.

[4] **High Compressive Strength**

This strength is defined by the endurance of any metal or alloy to withstand its compressive forces. Grey Cast Iron has a high compressive strength and that's why, it is widely used in posts and columns of buildings. In addition, their compressive strength can be as high as that of some Mild Steels.

Tensile Strength:

There are different varieties of Grey Cast Iron and their tensile strength varies accordingly. Some varieties show the tensile strength of 5 tons per square inch, some show 19, but on an average their strength is 7 tons per square inch. However, addition of vanadium can increase the strength of Grey Cast Iron.

Resistance to Deformation

Grey Cast Iron is highly resistant to deformation and provides a rigid frame.

Low Melting Point

Grey Cast Iron has low melting point – 1140 ºC to 1200 ºC.

Resistance to Oxidation

Grey Cast Iron is highly resistant to rust, which is formed by the reaction of oxygen and Iron. It is a perfect solution to avoid the problem of corrosion.

Uses of Grey Cast Iron:

- Class 300 Grey Iron: Can be used in producing heavy-duty machine tools, bed, presses, high pressure hydraulic parts, frame, gears, bushings, piston rings, cams, crankshaft, cylinder block, cylinder head, etc.
- Class 200 and class 250 Grey Iron: Can be used in producing gear, cylinder, base, bed, flywheel, cylinder liners, cylinder block, pistons, brake wheel, gear boxes, pressure valve, coupling plate, etc.
- Class 100 and class 150 Grey Iron: Suitable for producing cover body, protective cover, frame, hand wheels, hammer, floor, handle, box, frame, bed, bearing, pulleys, bench, pump body, pipe, valve, etc.

According to IS:210-1965, grey iron casting are designated by letter FG followed by ultimate strength in Kg /mm^2 e.g., FG 15, FG 20, FG 25, FG 30 , FG 40. The basic composition of grey cast iron is described in terms of carbon equivalent which is equal to total carbon % + 1/3 (silicon % + phosphorus %). This factor gives the relationship percentage of carbon and silicon in the iron to its capacity to produce graphite [2].

Conclusion

Generally lathe machine are subjected to regular unwanted vibrations. The lathe machine vibrations are dangerous to machining operations. It results in degraded quality on the machined parts, shorter tool life, and unpleasant noise, hence are to be necessarily damped out. The important characteristics of lathe machine bed for metal cutting are high damping and static stiffness. The unwanted vibrations must be arrested in order to ensure higher accuracy along with productivity.

Reference

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[2] Production technology by R. K Jain.
[3] www.businessdictionary.com/definition/pig-iron.html
[4] Flocast in Cast Iron Bar, Centrifugal Cast Iron, Continuous Casting, Continuous Cast Bronze bar, Grey Iron Casting.