Cutting Tool Materials

- While selecting cutting tool materials the type of service to which the tool will be subjected should be given primary considerations. No one materials is superior in all respect, but rather each has certain characteristics which limits its field of applications.

1. Carbon steels 2. Medium alloy steels 3. High speeds steels 4. Stellates 5. Cemented carbides 6. Ceramics 7. Diamonds 8. Abrasives.

- High speed steels:

High speed steels is the general purpose metal for low and medium cutting speeds operate at cutting speeds 2to 3 times higher than for carbon steels and retain their hardness.

It is used as popular operations of drilling, tapping, milling.

There are three general types of high speed steels, tungsten, molybdenum and cobalt.

Tungsten in HSS provides hot hardness and form stability. Molybdenum maintains tool sharpness of the cutting edge. Addition of cobalt improves hot hardness and makes the cutting tool more wear resistance.

- HSS (T-series)18-4-1: This steels contains 18%tungsten, 4% chromium & 1% vanadium is considered to be one of the best of all purpose tool steels.

- ❖ Molybdenum HSS(M-series)6-4-4: This steels contains 6% molybdenum, 4% tungsten, 4% chromium have excellent toughness & cutting ability.
- ❖ Cobalt HSS: Cobalt is added from 2 to 15% to increase hot hardness & wear resistance.

20% Tungsten, 4% chromium, 2% vanadium and 12% cobalt.

- Coated Carbide tools: For coated carbide tools a thin chemically stable, shock resistance refractory coating of Tic,Al2o3 and TiN are applied on the tungsten carbide inserts, using chemical vapor deposition method. In this coating first layer is of TiC, second layer is of Al2o3 and the top thin layer thin is of TiN. This process makes of hardness of few of the tool materials with temperatures.
- Ceramics : The latest development in the metal cutting tools uses aluminum oxides generally referred to as ceramics. Ceramics tools are made by composing aluminum oxide powder in a mold at about 280 kg/cm2 or more. The part is then sintered at 22000C. This is known as cold pressing. Other materials used to produce ceramic tools include carbide, boron nitride, titanium carbide and titanium boride.

Properties of cutting fluids

Cutting fluids some times referred to as lubricants or coolants' are liquids and gases applied to the tool and work piece to assist in the cutting operations.

Purpose of cutting fluids

1.To cool the tool 2. To cool the work piece 3. To lubricate and reduce friction

4. To improve surface finish 5. To protect the finished surface from corrosion

6. To cause chips breakup in to small parts. 7. To wash the chips away from the tool.

Types of cutting fluids:

1. Water 2. Soluble oil 3. Mixed oil 4. Chemical additive oil 5. Solid lubricants

Properties of cutting fluids

1. High heat absorption for readily absorbing heat developed
2. Good lubricating qualities to produce low- coefficient of friction
3. High flash point so as to eliminate the hazard of fire
4. Stability so as not to oxide in the air
5. Neutral so as not to react chemically
6. Odorless so as to not to produce any bad smell even when heated.
7. Harmless to bearings
8. Harmless to the skin of the operators
9. Non-corrosive to the work or the machine
10. Transparency so that the cutting action of the tool may be observed.
11. Low viscosity to permit free flow of the liquid
12. Low priced to minimize production cost.

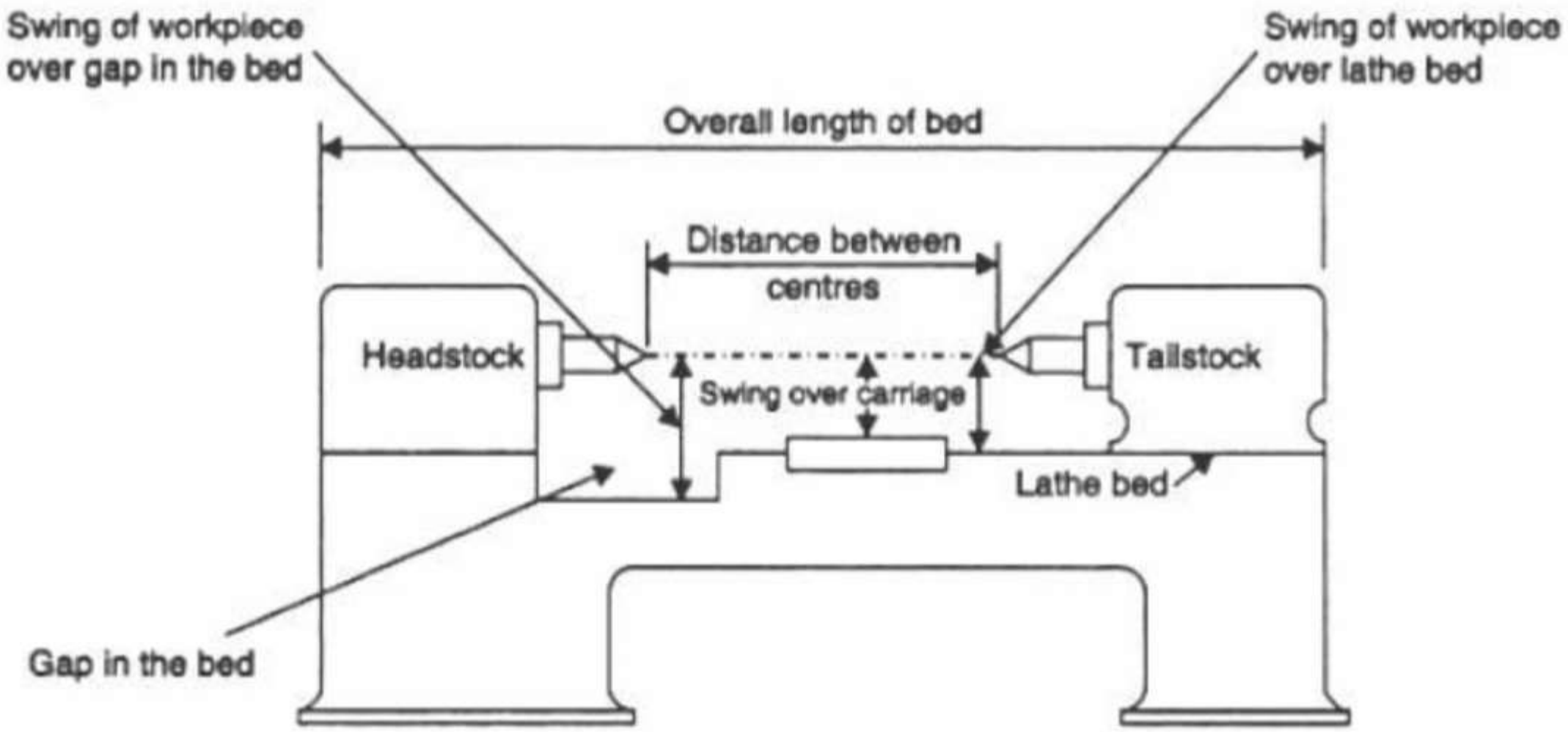
Production Lathe

- Lathe is one of the oldest machine tools. It machines the give work piece in to required product by employing turning effect. In a lathe the work piece revolves along with the chuck to which the motor is connected by various gears and shafts.

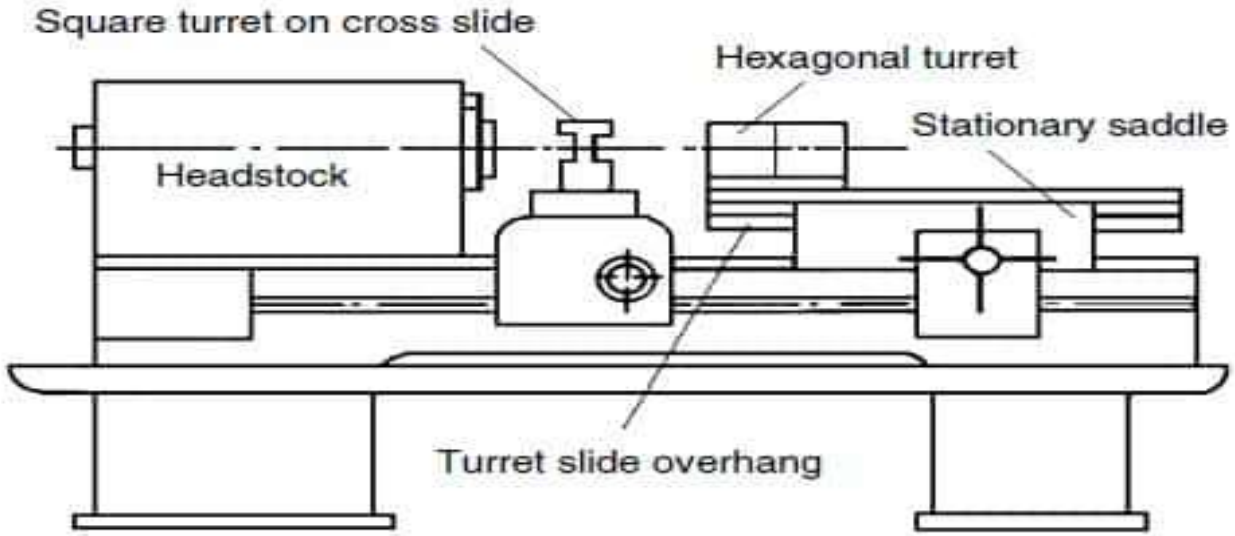
Working Principle

The lathe is machine tool which holds the work piece between two rigid and strong supports called centers or in a chuck or face plate which revolves. The cutting tool is rigidly held and supported in a tool post which is fed against the revolving work. The normal cutting operations are performed with the cutting tool fed either parallel or at right angles to the axis of the work. The cutting tool may also be fed at an angle relative to the axis of the work for machining tapers and angles.

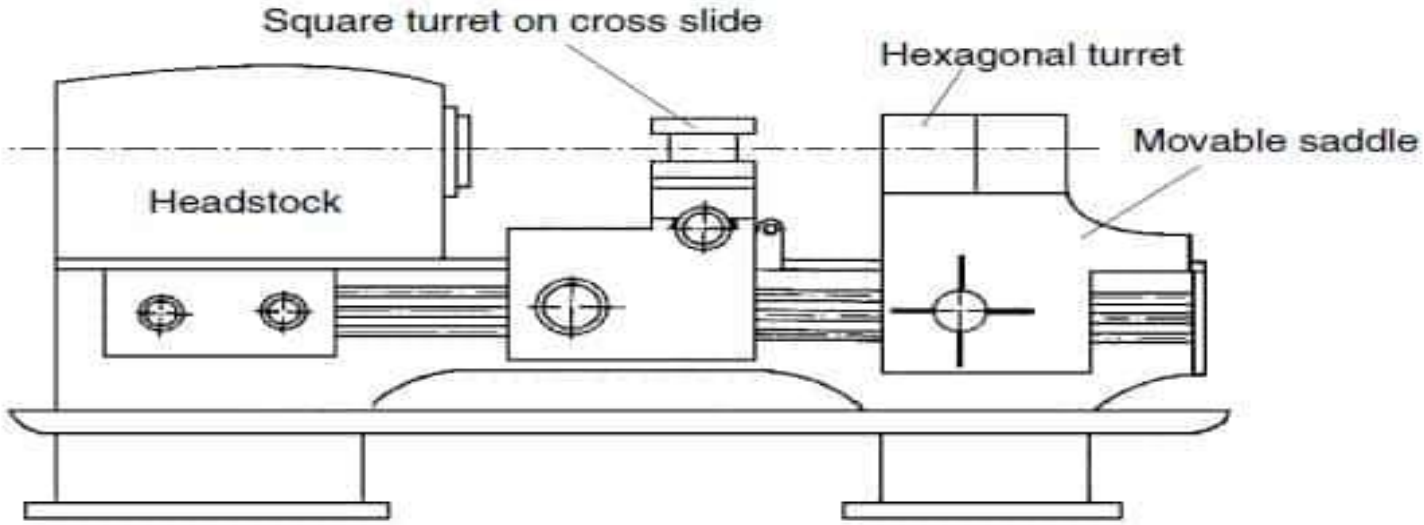
Lathe Specifications



Capstan & Turret Lathe



(a) Capstan



(b) Turret

Capstan and Turret Lathe: A capstan and turret lathe is a production lathe. It is used to manufacture any number of identical pieces in the minimum time. In semi-automatic lathes machining operations are done automatically.

Functions other than machining like loading and unloading of a job, the positioning of tools coolant operations are done manually.

The turret head is mounted on the ram fitted with turret slides longitudinally on the saddle. Turret head has a hexagonal block having six faces with a bore for mounting six or more than six tools at a time. The threaded hole on these faces is used to hold the tools.

In the case of a Capstan Lathe, the hexagonal turret is mounted on a short slide or ram which again fitted with a saddle. The saddle can be move accordingly throughout the bed ways and can be fixed to the bed if necessary.

It is specially used for bar type jobs. But in the case of Turret Lathe, the hexagonal turret directly mounted on the saddle. The saddle can be move through the bed ways. Turret lathe is generally used for chucking type work.

- Chucks : 1.Three jaw chuck 2. Four jaw chuck 3. Combination chuck
  4. Magnetic chuck 5. Air or Hydraulic chuck 6. Collet chuck
- Face plate chuck
- Rest