

CHAPTER - 1 : TOOL MATERIAL

(1) Define manufacturing Engineering

Ans Manufacturing is a discipline of engineering dealing with different practices and includes the ~~research~~ research, design and development of system, process, mechanics, Tools and equipments.

* Manufacture engineer's primary focus is to turn raw materials into a new or update product in the economic, effective.

(2) Define Manufacturing

Ans The process of converting raw materials components or parts into finishing goods that meets a customer's expectations or specifications.

(3) What are the characteristics of tool materials?

Ans characteristics

(i) Higher hardness than that of the work piece material being machined.

(ii) Hot hardness which is the ability of the material to retain its hardness at elevated temperature in view of the high temp. existing in the cutting zone.

(iii) Wear Resistance

The chip-tool and chip-workpiece interface are exposed to such severe conditions that adhesive and abrasion wear is very common. The cutting tool material should, therefore, have high abrasion resistance to improve the effective life of the tool.

(iv) Toughness

The tool, even though is hard, should have enough toughness to withstand the impact loads that can come in the beginning of cut.

(v) Low friction

The coefficient of friction between chip and tool should be low, which should allow lower wear rate and better chip flow.

(vi) Better thermal characteristics

Since a lot of heat is generated at the cutting zone, it is necessary that the tool material should have higher thermal conductivity to dissipate this heat in the ~~shortness~~ shortest time.

(Q-4) write the composition, properties and uses of cutting tool material.

Ans These are different types of cutting tool material, such as

- (a) carbon steel
- (b) medium Alloy steel
- (c) High Speed Steel
- (d) ceramics
- (e) cemented carbides
- (f) Diamond
- (g) Stellite
- (h) Abrasives
- (i) CBN (cubic Boron Nitride)

carbon steel

composition

Carbon percentage between 0.6 to 1.6% and very small alloy addition such Mn, Si, Mo, Cr, W & V.

properties

- (i) Do not withstand High temperature
- (ii) They lose their required hardness at temp. from 200°C to 250°C .
- (iii) Low cutting speed about 0.15 m/sec.

Use

These type of steel used for making drills taps and Reamers.

High speed steel

composition

Alloy content 18% W, 5-5% Cr, 0.7% C and small amount of Mn, V, Si.

Properties

- (i) Cutting ability at 600°C
- (ii) Good Hardenability.
- (iii) High wear Resistance.

use

- (i) milling cutters
- (ii) Lathe cutting tool
- (iii) Taps
- (iv) Drill bit etc.

Diamond

composition

The diamond is known hardest material of carbon in crystalline form. It is artificial. It has large grain structure.

Depth of cut 0.125 mm.

- hardest known material
- Extremely wear resistant
- Excellent heat conductivity

Properties

- (i) Cutting speed about 50 time greater than H.S.S. and temp about 165°C .
- (ii) It has low co-efficient of friction.

Use

Diamonds are suitable for cutting very hard material such as glass, plastics, ceramics, etc.

ceramics

composition

Generally ceramics are made from composing Aluminium oxide (Al_2O_3) powder.

Other materials used to produce ceramics tools includes silicon carbide, boron carbide, titanium carbide.

Properties

- (i) These tools have very low heat conductivity
- (ii) They can stand with high temp. upto 1200°C .
- (iii) These are quite brittle.
- (iv) High compressive strength.

Use

It is used for single point tools.

cemented carbide

composition

cemented carbides are so named because they are composed of carbon mixed with other elements.

The basic ingredient of most cemented carbides is tungsten. One of the elements present in a mixture.

Carbide which is extremely hard. Tungsten powder is mixed under high heat at about 1500°C , with pure carbon (black) in the ratio of 94% and 6% by weight.

Properties

- (i) High Hardness
- (ii) High Heat resistance
- (iii) High wear resistance
- (iv) low specific Heat

Uses :-

These tool materials are used for machining cast iron, alloy steels.

Stellites

composition

Stellite is the trade name of a non-ferrous cast alloy composed of cobalt, Cr and W. The range of element

Cubic Boron Nitride (CBN)

This material, consisting atoms of boron and nitrogen is considered as the hardest tool material available next to diamond.
properties

- (i) High hardness
- (ii) High conductive
- (iii) High tensile strength

USE

used for cutting very hard materials.