LAPORAN PROJEK TAHUN AKHIR

KURSUS DIPLOMA LANJUTAN KEJURUTERAAN JENTERA

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SELANGOR.

TITLE:

DESIGN AND FABRICATION OF METALURGHICAL POLISHING WHEELS.

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Introduction

In this project,a polishing machine is to be designed and fabricated. On this machine,metallographic specimens are polished to remove surface irregularities in order to be able to observe them under the microscope for microstructure study and observation.

The most important mechanical element in the design is the rotating polishing wheel where the actual polishing process is undertaken. The wheel must rotate at a certain speed.A polishing compound is placed on the surface of the wheel and during the process,the operator must apply pressure on the wheel.The wheel must be rigidly mounted on a spindle which in turn is supported on bearings .These bearings also help to axially locate the spindle.

The power source is a motor rotating at a rated speed and power transmission is via a belt drive under a certain speed ratio.

Therefore,the project involves the design of many basic mechanical elements which can be listed as below:

(a) Power transmission shaft design.

(b) Belt drive design.

(c) Bearings.

(d) Associated transmission elements eg. keys,keyways,pulleys etc.

(e) Bearing housings and associated elements that locate bearings eg. end-plates,nuts,washers,distance-pieces etc. both radially and axially.

(f) Associated elements to rigidly mount the wheel to the spindle

(g) Appropriate support brackets for housings,motor etc.

(h) Appropriate sealing elements and lubrication for bearings.

Other important considerations pertinant to a particular element is stated in the appropriate chapters.

The predetermined design parameters that we have are the motor ratings and that that spindle must rotate at about 1000 rpm.The machine must be made as compact as possible to allow easy movement and occupy a small space.

Chapter 1 :

.1 Introduction : Belts

.2BELT DESIGN CALCULATIONS.(Design is in accordance with B.S.3790:1981)

Power rating of motor = 370W.

Motor shaft speed = 1400rpm.

Driven shaft speed = 1000rpm.

Service factor = 1.2 (Medium duty,soft start,hours of duty per day is 10h and under)

Design power rating = $\frac{370}{2} \times 1.2 = 222W$.

(Note: Half of the motor power rating is considered because single motor drives two separate driven shafts.)

Belt section selected is Z-type(from B.S.3790:1981 for endless wedge belt drives and endless V-belt drives) for V-belts.

This type is recommended for low power type of drives.

Speed ratio= $\frac{1400}{1000} = 1.4$

Standard sizes of pulleys selected are 80mm and 60mm pitch diameters for larger and smaller pulleys respectively.These pulleys give a speed ratio very near to 1.4.

Actual speed ratio = $\frac{80}{60} = 1.33$

Actual driven shaft speed = $\frac{1400}{1.33} = 1052rpm.$

To calculate belt pitch length.

Using the formula

$$L = 2c + 1.57(D+d) + \frac{(D-d)^2}{4c} \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

where L = Pitch length of belt.

D = Pitch diameter of larger pulley.

d = " " " smaller " .

c = Centre distance of drive.

Also,

$$c = A + \sqrt{A^2 - B} \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

where $A = \frac{L}{4} - \frac{\pi(D+d)}{8}$ and $B = \frac{(D-d)^2}{8}$