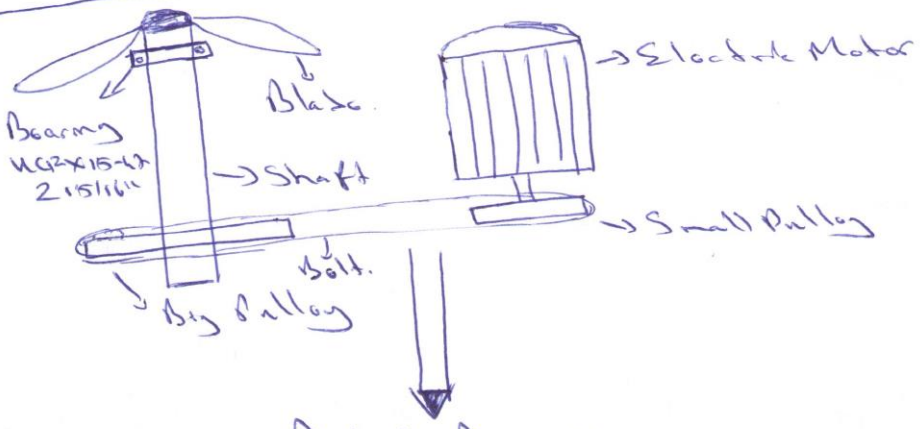
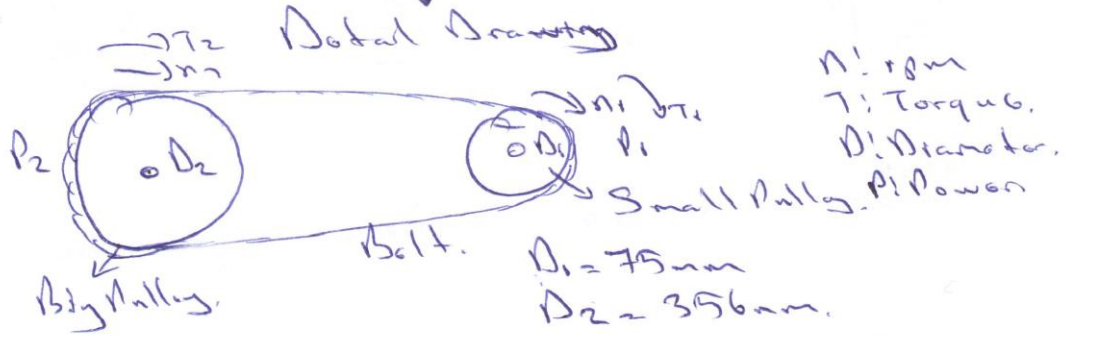
The calculations of Fan Bearing





n: rpm
T: Torque.
D: Diameter.

$D_1 = 75\,mm$

$D_2 = 356\,mm.$

$n_1 \times D_1 = n_2 \times D_2 \Rightarrow 1000 \times 75 = 356 \times n_2$

$n_2 = 200\,rpm$

Electric Motor (Technical Informations)

- 18.5kW
- 50Hz
- 1000 rpm

$\Rightarrow$ The rpm of Fan shaft = 200 rpm

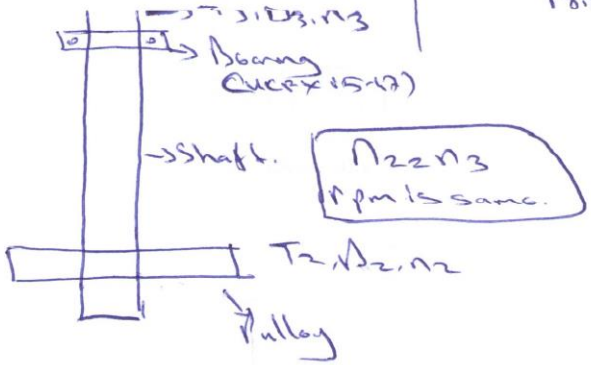
$P_2 = P_1 \cdot \eta$ (Coefficiency) for V Belt

$18.5 \times 0.94 = 17.4\,kW$ η (Coefficiency) = 0.9

$P_2 = \frac{T_2 \times n_2}{9550}$

$17.4_2 = \frac{T_2 \times 200}{9550}$

$T_2 = 832\,Nm$



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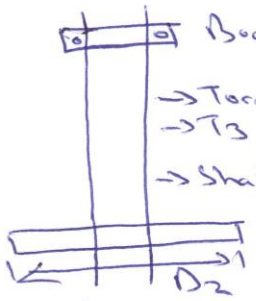


$T_2 = 832\ Nm$

$n_2 = n_3$

$D_2 \neq D_3$

$\frac{T_2}{D_2} = \frac{T_3}{D_3}$

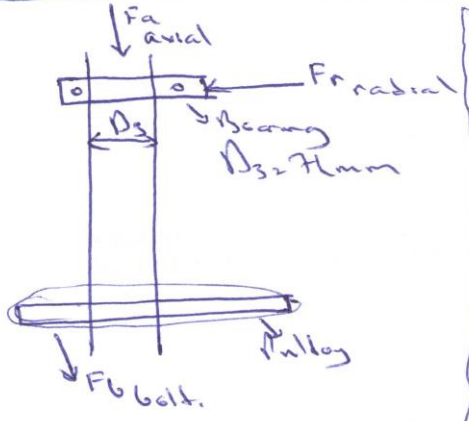
$\frac{832}{356} = \frac{T_3}{74}$

$D_2 = 356\ mm$

The shaft of fan Diameter (D_3) 74mm

T_3 (Shaft Torque) $= 173\ Nm$ →

The Forces on Shaft of Fan.



$T_3 = F_r \cdot (D_3/2)$

$173\ Nm = F_r \times (0.037\ m)$

$F_r = 4675\ N.$

Our Bearing:

UCFX 15-47 2 15/16"

Basic Load Ratings

$C_r = 72.7\ kN$ (Basic dynamic load)

$C_{or} = 53.0\ kN$ (Basic Static radial load)

$f_o = 14.6$

P_{or} = Static equivalent radial load

f_s = Safety factor

$f_s = \frac{C_{or}}{P_{or}} \quad 2 = \frac{53000}{P_{or}}$

$P_{or} = 26500\ N.$

(Selected the value of high rotating for Fan)

$f_s = 2$

$P_{or} = 0.6 F_{r\ radial} + 0.6 F_{a\ axial}$

$F_{belt} = \frac{19.1 \times 10^6 \times W(Power)}{D_p \times n} \times f_w \times f_b$

W(Power) = 17.4 kW

n (rpm) = 200 rpm.

D_p = Pitch circle diameter of Pulley

= 356 mm

f_w = Load factor f_b = belt factor

Electra machine $f_w = 1.2$ | V belt $f_b = 2$

$F_{belt} = \frac{19.1 \times 10^6 \times 17.4}{356 \times 200} \times 1.2 \times 2$

$= 11200\ N.$

$= 11kN$

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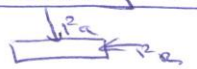
$P_{or} = 0.6 P_r + 0.5 P_a$.

The Bearing Forces.



$26500 = 0.6 \times 4675 + 0.5 \times P_a$.

$P_{a\,axial} = 47390\ N \cong 47\ kN$.

Calculation of dynamic equivalent load.

$P_r = X.P_r + Y.P_a$.

Based on Radial load factor (X) and Axial load factor (Y)

- look from the X, Y factor Table
- Selected from X.Y Table.
- Read the following values.

$\frac{F_o \times P_a}{C_{or}}$	X	Y
13	0.56	0.50

$P_r = 47390 \times 0.50 + 4675 \times 0.56$

$= 26313\ N$.

The Calculations of Bearing Life Hour (LH)

Speed factor $f_n = (0.03 \times n)^{(-1/3)} = 0.55$

Life factor $f_h = f_n \cdot \frac{C_r}{P_r} = 0.55 \times \frac{72700}{26313} = 1.52$.

L_{10h} (Life hour) $= 500 \times f_h^3 = 500 \times 1.52^3$

$= 1756,299$

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