Program for Design of Belt Drive, Problem 1.

Problem Statement: The layout of a leather belt drive transmitting 15kW of power is shown in Figure 1. THe centre distance between the pulleys is twice the diameter of the bigger pulley. The belt should operate at a belcoity of 20 m/s approximately and the stresses in the belt should not exceed 2.25 N/mm^2. The desnity of leather is 0.95 g/cc and the coefficient of friction is 0.35. The thickness of the belt is 5 mm. Calculate:

i. The diameter of pulleys

ii. THe length and widht of the belt

iii. The belt tensions

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clc;

clear all;

Intializing the following values in the respective order: Power, velocity of the belt, stress in the belt, thickness of the belt, density of the leather, coefficient of friction and speed of rotation of smaller and larger pulley.

P = 15

v = 20

S = 2.25

t = 5

roh = 950

mu = 0.35

N2 = 480

N1 = 1440

Finding the diameter of the smaller pulley and standardization:

D2 = ((v\*60\*1000)/(pi\*N1))

D2 = Table\_14\_13\_b(D2)

Finding the diameter of the larger pulley and the center distance between the two pulleys.

D1 = ((D2\*N1)/(N2))

C = 2\*D1

Finding the total length using Equation 14.2(b). Also to find the actual velocity.

[L]=Eqn14\_2b(C,D1,D2)

V=(pi\*(D2+t)\*N1)/(60\*1000)

Using equation 14.1a and 14.5\_a\_b:

[tt\_s]=Eqn14\_1\_a(D1,D2,C)

g=9.81;

[b]=Eqn14\_5a\_b(P,S,t,V,roh,g,mu,tt\_s)

Standardizing table 14.9 (a)

b = Table\_14\_9\_a(b)

Solving the equation to find T1 and T2:

syms T1 T2

Tc=(roh\*b\*t\*(V^2))/(1e6);

eqns=[ (((T1-T2)\*V)/1000)==(P) , ((T1-Tc)/(T2-Tc))==exp(mu\*tt\_s)];

Solve=vpasolve(eqns);

Printing out the answers:

fprintf("The diameter of the smaller pulley = %f mm\n",D2)

fprintf("The diameter of the larger pulley = %f mm\n",D1)

fprintf("The Length of the belt = %f mm\n",L)

fprintf("The Width of the belt = %f mm\n",b)

fprintf("Tension on the Tight Side = %f N\n",Solve.T1)