Program for Design of Worm Gear, Problem 9.

Problem Statement: Design a worm gear for a speed reducer to transmit 30 kW at a worm speed of 600 rpm. The required velocity ratio is 25:1. The worm is made of C30 heat treated steel and the worm wheel is made of phosphor bronze. The service conditions are intermittent operations with medium shock loads. Also calculate the heat dissipation through the drive.

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clc;

clear all;

Intializing the given data:

P = 30

ii = 25

N1 = 600

n1 = N1/60

alpha = 14.5

S\_d1 = 82.4

S\_d2 = 220.6

Finding n2 using equation 12.68(b)

[n2] = Eqn\_12\_68\_b\_n2(n1,ii)

Finding the centre distance using Equation 12.68(a):

[a] = Eqn\_12\_68\_a(P,ii)

The worm gear is assumed to be weaker than worm since it is subjected to sliding action, thereby resulting in over heating and leading to failures. The diameters d1 and d2 are found as per AGMA using equation 12.51(a):

[d1] = Eqn\_12\_51\_a(a)

[d2] = Eqn\_12\_47\_a(a,d1)

z1 = 1

Finding the permissible tooth load and Moment:

[Mt] = Eqn\_3\_3\_a(P,n2)

K = 1

[Ft] = Eqn\_12\_53\_d(K,d2,Mt)

Finding the pitch line velocity of the gear and the velocity factor:

[v] = Eqn\_12\_48\_b(d2,n2)

[Cv] = Eqn\_12\_53\_c(v)

Finding the face width using equation 12.64:

[b] = Eqn\_12\_64(a)

Finding the module m using equation 12.53(a):

y = 0.1

[m] = Eqn\_12\_53\_a\_m(Ft,S\_d1,Cv,b,y)

m = 15

Finding the lead angle using equation 12.64(e):

[gamma] = Eqn\_12\_46\_e(m,d1,z1)

Finding the dynmaci strength of gears:

Y = pi\*y

[Fs] = Eqn\_12\_54(S\_d1,b,Y,m)

Finding the wear tooth load:

K = 0.412

[Fw] = Eqn\_12\_62\_a(d2,b,K)

if Fw>Fs

disp("The material is safe against wear")

else

disp("The material is not safe against wear")

end

Finding vr using equation 12.60(b):

vr = ((pi\*d1\*n1)/(1000\*cosd(gamma)))

if vr > 2.75

mu = 0.025 + ((3.281\*vr)/(1000))

else

mu = ((0.0422)/(vr^(0.28)))

end

Finding the efficiency using equation 12.57( C):

[theta,eta] = Eqn\_12\_57\_c(alpha,gamma,mu)

Finding the normal force:

[Fn] = normal\_force(Ft,gamma,alpha)

Fing the heat generatd using equation 12.63 (a):

[Qg] = Eqn\_12\_63\_a(mu,Fn,vr,gamma)

Fing the heat dissipated using equation 12.63 (b):

[Qd] = Eqn\_12\_63\_b(P,eta)

if Qd>Qg

disp("Artificial cooling is not necessary");

else

disp("Artificial cooling is necessary");

end