Program for Design of Worm Gear, Problem 6.

Problem Statement:Design a suitable worm gearing with following details:

Power = 3.75 kW, Speed ratio = 72, pressure angle =14.5, centre distance = 180 mm, worm speed =1200 rpm.

The material for the worm is hardened steel with design stress as 45 MPA and that for worm wheel is phosphor bronze with a design stress of 52 MPa.

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clc;

clear all;

Intializing the given data:

P = 3.75

ii = 27

alpha = 14.5

a = 180

N1 = 1200

n1 = N1/60

S\_d1 = 45

S\_d2 = 52

Finding n2 using equation 12.68(b)

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

Kt = 1

[Ft] = Eqn\_12\_53\_d(Kt,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\_d2,Cv,b,y)

m = 8

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\_d2,b,Y,m)

Finding the wear tooth load:

K = 0.549

[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