Program for Design of Spur Gear, Problem 9.

Problem Statement: It is required to transmit 25 kW of power from a shaft running at 1000 rpm to a parallel shaft with speed reduction 2.5:1. The centre to centre distnace of the shaft is to be about 300 mm. THe material used for pinion is steel ( Sd =180 N/mm^2, BHN = 200). Considering class 2 gear with tooth profile 20 degrees full depth involute, design the spur gear and check for dynamic load and wear load.

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clc;

clear all;

intializing the given data:

alpha = 14.5

P = 25

N1 = 1000

i = 2.5

C = 300

S\_d1 = 200

S\_d2 = 180

BHN1 = 250

BHN2 = 200

Find the diameter of pinion and gear:

d1 = (2\*C)/3.5

d2 = i\*d1

Finding the number of teeth ing pinion and gear:

z1 = 20

z2 =i\*z1

Finding the lewis form factor:

[y1]=Lewis(z1)

[y2]=Lewis(z2)

Finding the strength factor to decide what the design is based on:

if S\_d1\*y1<S\_d2\*y2

disp("Design is based on pinion")

S\_d=S\_d1;

Y=pi\*y1;

z=z1;

else

disp("Design is based on gear")

S\_d=S\_d2;

Y=pi\*y2;

z=z2;

end

Finding the module and standardizing it:

N2 = N1/i

Mt = ((P\*1000\*60)/(2\*pi\*N2))\*10^3;

k = 10

Cv = 0.5

[m] = Eqn\_12\_5\_b(Mt,S\_d,Cv,k,Y,z)

[m] = Tb12\_2\_1a(m)

Finding the face width, velocity and Tangential Force :

b = 10\*m

v = (pi\*d2\*N2)/(1000\*60)

if v<=8

Cv1 = 3.05/(3.05+v);

elseif v>8 && v<=13

Cv1 = 4.58/(4.58+v);

elseif v>13 && v<=20

Cv1 = 6.1/(6.1+v);

elseif v>20

Cv1 = 5.55/(5.55+sqrt(v));

end

Ft = (2\*Mt)/(d2)

Verifying if the values found are satifactory:

S\_d22 = Ft/(pi\*Cv1\*b\*y2\*m\*10^3);

if S\_d22 >S\_d2

disp('Values are not satisfactory');

else

disp('Values are satisfactory');

end

Finding the dynamic load:

K3 = 20.67

e1 = Table\_12\_14(v)

k1 = 8.7;

C = 457.8

e = 0.04

C = (C\*e1)/e

[Fd] = Eqn\_12\_12(Ft,K3,v,C,b);

Fd = Fd\*10^-3

Find the endurance strength and verifying for a static load:

[Q] = Eqn\_12\_15\_c(z1,z2)

S\_es = 429;

K = 1.344

Fen = S\_es\*b\*Y\*m;

Fen = Fen\*10^-3;

if Fen>Fd

disp('Material is safe against static load');

else

disp('Not safe against load');

end

Finding the Wear and finding if the material is safe against wear:

[Fw] = Eqn\_12\_15\_a(K,Q,b,d1)

if Fw>Fd

disp('Material is Safe against wear');

else

disp('Material is not safe against wear');

end

As the material is not safe against wear the BHN number should be changed using table 12.16