Program for Design of Spur Gear, Problem 4.

Problem Statement:Design a pair of spur gears to transmit 20 kW of power while operating for 8 to 10 hours per day sustaining medium shock, from a shaft rotating at 1000 rpm to a parallel shaft which is to rotate at 310 rpm. Assume the number of teeth on pinion to be 31 and 20 degree full depth involute tooth profile. The material of the pinion is C40 steel, untreated whose Su = 206.81 N/mm^2 and for gear is cast steel, 0.2% C untreated whose Su = 137.34 N/mm^2. Check the design for dynamic load if load fact C - 5.22.464 N/mm and also for wear load taking load stress factor K = 0.297 N/mm^2. Suggest suitable hardness.

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clc;

clear all;

Intializing the know values:

N1 = 1000

N2 = 310

alpha = 20

P = 20

z1 = 31

S\_d1 = 206.81

S\_d2 = 137.34

C = 522.464

K = 0.279

Finding the velocity ratio and the number of teeth on pinion and gear respectiely:

i = N1/N2

z1

z2 = z1\*i

Finding the lewis form factor:

[y1]=Lewis(z2)

[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:

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 PCD of pinion and gear respectively:

d1 = m\*z1

d2 = m\*z2

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

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

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

S\_es = 617.8;

K = (Fd\*1000)/(d1\*b\*Q);

[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 values of both should be increased or a different gear and pinion material need to be used.