RV College of Engineering

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DESIGN OF MACHINE ELEMENTS-1(18ME54)

DESIGN AND ANALYSIS OF DRIVE SHAFTS USING C AND MATLAB

PRESENTED BY

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INTRODUCTION

- A shaft is a rotating member usually of circular cross-section (solid or hollow), which transmits power and rotational motion.
  Machine elements such as gears, pulleys (sheaves), flywheels, clutches, and sprockets are mounted on the shaft and are used to transmit power from the driving device (motor or engine) through a machine.
- Press fit, keys, dowel, pins and splines are used to attach these machine elements on the shaft.
- The shaft rotates on rolling contact bearings or bush bearings.
- Various types of retaining rings, thrust bearings, grooves and steps in the shaft are used to take up axial loads and locate the rotating elements.
- Couplings are used to transmit power from drive shaft (e.g., motor) to the driven shaft (e.g. gearbox, wheels).

TYPES OF SHAFTS

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1. Axle: The term ‘axle’ is used for a shaft that supports rotating elements like wheels, hoisting drums or rope sheaves and which is fitted to the housing by means of bearings. In general, an axle is subjected to bending moment due to transverse loads like bearing reactions and does not transmit any useful torque, e.g., rear axle of a railway wagon.

2. Spindle: A spindle is a short rotating shaft. The term ‘spindle’ originates from the round tapering stick on a spinning wheel, on which the thread is twisted.
3. Countershaft: It is a secondary shaft, which is driven by the main shaft and from which the power is supplied to a machine component.
4. Jackshaft: It is an auxiliary or intermediate shaft between two shafts that are used in transmission of power.
5. Line shaft: A line shaft consists of a number of shafts, which are connected in axial direction by means of couplings.

LITERATURE SURVEY

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1. Gopichand Gllaka, Prasad Raju Kalidindi and S Koteswara Rao: `Design of Solid Shafts using MATLAB', Int J Mech Engg Technol (IJMET), 3(3), pp 645–653, 2012.

2. S.M Tamjid Hossain and Abdullah Al-Faruk: `Analysis of Simple and Cantilever Beams Using MATLAB Graphical User Interface',Proceedings of the

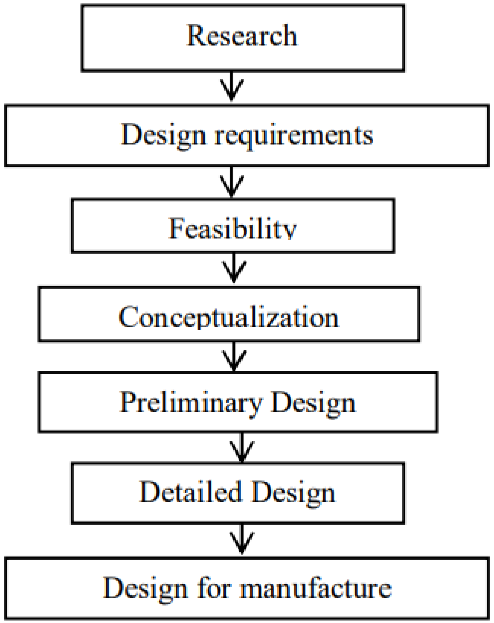
International Conference on Mechanical Engineering and Renewable Energy

2017 (ICMERE2017)

3. Ketan D. Saradava, Piyush J. Mandaliya, Pratik P. Parsania, "Design of Machine Shaft in Fatigue Loading by Using C++ Programming Language" in Trends in Machine Design ISSN: 2455-3352 (online), Volume 3, Issue 1.

SHAFT DESIGN

- Material Selection
- Geometric Layout (fit power transmission equipment, gears, pulleys)
- Failure strength
- Static strength
- Fatigue strength
- Shaft deflection
- Bending deflection
- Torsional deflection
- Slope at bearings and shaft-supported elements
- Shear deflection due to transverse loading of short shafts
- Critical speeds at natural frequencies



PROBLEM DEFINITION

- This project deals with design of drive shafts using a C programming code. In most practical applications, gears and pulleys are mounted in large number on shafts.
- Thereby, the process of determining suitable diameter of shaft by traditional methods becomes tedious and time consuming.
- A program code is written which determines diameter by considering the length of the shaft, power transmitted, rpm of the shaft, diameter of pulleys and gears, tension ratios of pulleys, pressure angles of gear and position of gears and pulleys on shaft

PARAMETER USED

M - Maximum bending moment

τ – Maximum allowable shear stress

σ – Maximum allowable normal stress

Cm – Shock factor

Ct – Fatigue factor

T - Torque (Twisting moment)

d-Diameter of shaft

P-Power (in kW)

N-speed in rpm

rg-radius of gear

rp-radius of pulley

T1,T2-Tensions on tight and slack

L-Length of shaft (mm)

G-Rigidity Modulus

IMPLEMENTATION OF CODE IN C AND MATLAB

```
#include<stdio.h>
 #include<math.h>
int main()
{
char ch;
int i,j,m,n,Z,load,q, cho ;
FILE *fptr;
char driver, driven, pos;
double T,Cm,Ct,N,ss,Lt,d,P,PI,pa,RH1,RH2,RV1,RV2, MH1, MH2, MV1, MV2, Mtmax, Meq, H, B, C, D, k[10], p[10], rp[10], rg[10],lp[10], lg[10], t[10],ang[
PI=3.14159265; //input parameters
do
{
printf("This is a program to design transmission shafts and plot bending moment diagrams\n");
printf("1. To determine shaft parameters\n");
printf("2. To plot bending moment diagram for various loading cases\n");
printf("Enter the choice (1 or 2)\n");
scanf("%d", &cho );
switch(cho )
{
    case 1:
        {
            printf("power in kw= ");
scanf("%lf",&P);
printf("Allowable shear stress(MPa)= ");
scanf("%lf",&ss);
printf("speed in rpm= ");
scanf("%lf",&N);
printf("type of load\n");
printf("1-steady loads\n");
printf("2-minor shock loads\n");
printf("3-heavy shock loads\n");
scanf("%d",&load);
if(load==1)
{
Cm=1.5;
Ct=1.0;
}
```

IMPLEMENTATION OF CODE IN C AND MATLAB

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```c
else if(load==2)
{
Cm=1.75;
Ct=1.25;
}
else
{
Cm=2.5;
Ct=2.25;
}
printf("Cm=%f\n",Cm);
printf("Ct=%f\n",Ct);
printf("total length of shaft(mm)= ");
scanf("%lf",&Lt);
printf("total number of pulleys= ");
scanf("%d",&n);
printf("total number of gears= ");
scanf("%d",&m);
T=(9.55e+06*P)/N;
printf("Torque transmitted T = %f N-mm\n\n",T);    //torque
for(i=1;i<=n;i=i+1)   // input parameters for pulleys
{
printf("\n pulley %d\n",i);
printf("-----------------\n");
printf("radius of pulley(mm)= ");
scanf("%lf",&rp[i]);
printf("power given by pulley %d= ",i);
scanf("%lf",&p[i]);
printf("angle made by pulley %d with horizontal= ",i);
scanf("%lf",&ang[i]);
ang[i]=(PI/180)*ang[i];
printf("tension ratio of pulley= ");
scanf("%lf",&k[i]);
printf("point of application of load= ");
scanf("%lf",&lp[i]);
t[i]=(9.55e+06*p[i])/N;    //torque
t1[i]=(t[i]/rp[i]/(k[i]-1));
```

```c
for(j=1;j<=m;j=j+1)    // input parameters for pulleys
{
printf("\n gear %d\n",j);
printf("-----------------\n");
printf("radius of gear(mm)= ");
scanf("%lf",&rg[j]);
printf("power given to gear %d= ", j);
scanf("%lf",&p[j]);
printf("pressure angle of gear= ");
scanf("%lf",&pa);
pa=(PI/180)*pa;
printf("point of application of load(mm)= ");
scanf("%lf",&lg[j]);
t[j]=(9.55e+06*p[j])/N;    //torque
ft[j]=(t[j]/rg[j]);
fr[j]=ft[j]*tan(pa);
RHg[j]=0;
RVg[j]=0;
RHg[j]=fr[j];
RVg[j]=ft[j];
if (RHg[i]<0.1)
RHg[i]=0.0;
if (RVg[i]<0.1)
RVg[i]=0.0;
printf("-----------------------------------\n");
}
```

IMPLEMENTATION OF CODE IN C AND MATLAB


```
// reaction forces at bearing
RH1=0;
RH2=0;
RV1=0;
RV2=0;
for(i=1;i<=n;i=i+1)
{
RH1=RH1+((RHp[i]*(Lt-lp[i]))/Lt);
RH2=RH2+((RHp[i]*lp[i])/Lt);
RV1=RV1+((RVp[i]*(Lt-lp[i]))/Lt);
RV2=RV2+((RVp[i]*lp[i])/Lt);
}
for(i=1;i<=m;i=i+1)
{
RH1=RH1+((RHg[i]*(Lt-lg[i]))/Lt);
RH2=RH2+((RHg[i]*lg[i])/Lt);
RV1=RV1+((RVg[i]*(Lt-lg[i]))/Lt);
RV2=RV2+((RVg[i]*lg[i])/Lt);
}
printf("The reaction forces of left bearing RH1=%f N and RV1=%f N\n",RH1,RV1);
printf("The reaction forces of right bearing RH2=%f N and RV2=%f N\n",RH2,RV2);
MV[1]=0;
MV[m+n]=0;
MH[1]=0;
MH[m+n]=0;
if(lp[1]>lg[1])
{
MH[1]=RH1*lg[1];
MV[1]=RV1*lg[1];
}
else
{
MH[1]=RH1*lp[1];
MV[1]=RV1*lp[1];
}
```

```
    break;
    case 2:
        {
            float length, load_app, load_loc, uload_app, uload_len, udlci;
            int load_type,cs;
            printf("Simply supported beam\n");
            printf("Length of the beam in m");
            scanf("%f", &length);
            printf("Enter load case:\n");
            printf("1. Point load\n");
            printf("2. UDL\n");
            scanf("%d",&load_type);
            cs=load_type;
            fptr = fopen("C:\\Users\\Rithwik Shankar Raj\\Documents\\LOCAL FILES\\5th Sem\\DME-1\\file0.txt", "w");
            if(fptr == NULL)
{
    /* File not created hence exit */
    printf("Unable to create file.\n");
    break;
}
    fprintf(fptr, "%d\n", load_type);
    fclose(fptr);

            if(cs == 1)
            {


            printf("Load applied in kN \n");
            scanf("%f",&load_app);
            printf("Location of Load from left end of the beam in m\n");
            scanf("%f",&load_loc);
            fptr = fopen("C:\\Users\\Rithwik Shankar Raj\\Documents\\LOCAL FILES\\5th Sem\\DME-1\\file1.txt", "w");
            if(fptr == NULL)
{
    /* File not created hence exit */
    printf("Unable to create file.\n");
```

IMPLEMENTATION OF CODE IN C AND MATLAB

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```
clc; clear; close all
disp('Simply Supported Beam');
fileID=fopen('C:\Users\Rithwik Shankar Raj\Documents\LOCAL FILES\5th Sem\DME-1\file1.txt', 'r');
formatSpec='%f';
A=fscanf(fileID,formatSpec);
fileID=fopen('C:\Users\Rithwik Shankar Raj\Documents\LOCAL FILES\5th Sem\DME-1\file2.txt', 'r');
formatSpec='%f';
B=fscanf(fileID,formatSpec);
fileID=fopen('C:\Users\Rithwik Shankar Raj\Documents\LOCAL FILES\5th Sem\DME-1\file0.txt', 'r');
formatSpec='%f';
T=fscanf(fileID,formatSpec);

A
B
T
L = A(1,1);

Type = T(1,1);

if Type == 1

W = A(2,1);

a = A(3,1);
c = L-a;

R1 = W*(L-a)/L; % Left Support Reaction.
R2 = W*a/L; % Right Support Reaction.

else

W = B(1,1);

b = B(2,1);
```

```
cg = B(3,1);
a = (cg-b/2);
c = L-a-b;

R1 = W*b*(b+2*c)/(2*L); % Left Support Reaction.
R2 = W*b*(b+2*a)/(2*L); % Right Support Reaction.
end

% Discretization of x axis.
n = 1000; % Number of discretization of x axis.
delta_x = L/n; % Increment for discretization of x axis.
x = (0:delta_x:L)'; % Generate column array for x-axis.

V = zeros(size(x, 1), 1); % Shear force function of x.
M = zeros(size(x, 1), 1); % Bending moment function of x.

% Data processing section
if Type == 1
for ii = 1:n+1
% First portion of the beam, 0 < x < b
V(ii) = R1;
M(ii) = R1*x(ii);

% Second portion of the beam, b < x < L
if x(ii) >= a
V(ii) = R1-W;
M(ii) = R1*x(ii)-W*(x(ii)-a);
end
end
x1 = a;
Mmax = W*a*(L-a)/L;
else
for ii = 1:n+1
% First portion of the beam, 0 < x < a
if x(ii) < a
```

IMPLEMENTATION OF CODE IN C AND MATLAB

```
if x(ii) < a
V(ii) = R1;
M(ii) = R1*x(ii);
elseif a <= x(ii) && x(ii)< a+b
% Second portion of the beam, a < x < a+b
V(ii) = R1-W*(x(ii)-a);
M(ii) = R1*x(ii)-W*((x(ii)-a)^2)/2;
elseif x(ii) >= (a+b)
% Second portion of the beam, a+b < x < L
V(ii) = -R2;
M(ii) = R2*(L-x(ii));
end
end
x1 = a+b*(b+2*c)/(2*L);
Mmax = W*b*(b+2*c)*(4*a*L+2*b*c+b^2)/(8*L^2);
end

disp(' ');disp (['Left support Reaction' ' = ' num2str(R1) ' ' 'kN'])
disp(' ');disp (['Left support Reaction' ' = ' num2str(R2) ' ' 'kN'])
disp(' ');disp (['Maximum bending moment' ' = ' num2str(Mmax) ' ' 'kNm'])

figure
subplot(2,1,1);
plot(x, V, 'r','linewidth',1.5);
grid
line([x(1) x(end)],[0 0],'Color','k');
line([0 0],[0 V(1)],'Color','r','linewidth',1.5);
line([x(end) x(end)],[0 V(end)],'Color','r','linewidth',1.5);
title('Shear Force Diagram','fontsize',16)
text(a/2,V(1),num2str(V(1)),'HorizontalAlignment','center','FontWeight','bold','fontsize',16)
text((L-c/2),V(end),num2str(V(end)),'HorizontalAlignment','center','FontWeight','bold','fontsize',16)
axis off

subplot(2,1,2);
```

```
% Second portion of the beam, a+b < x < L
V(ii) = -R2;
M(ii) = R2*(L-x(ii));
end
end
x1 = a+b*(b+2*c)/(2*L);
Mmax = W*b*(b+2*c)*(4*a*L+2*b*c+b^2)/(8*L^2);
end

disp(' ');disp (['Left support Reaction' ' = ' num2str(R1) ' ' 'kN'])
disp(' ');disp (['Left support Reaction' ' = ' num2str(R2) ' ' 'kN'])
disp(' ');disp (['Maximum bending moment' ' = ' num2str(Mmax) ' ' 'kNm'])

figure
subplot(2,1,1);
plot(x, V, 'r','linewidth',1.5);
grid
line([x(1) x(end)],[0 0],'Color','k');
line([0 0],[0 V(1)],'Color','r','linewidth',1.5);
line([x(end) x(end)],[0 V(end)],'Color','r','linewidth',1.5);
title('Shear Force Diagram','fontsize',16)
text(a/2,V(1),num2str(V(1)),'HorizontalAlignment','center','FontWeight','bold','fontsize',16)
text((L-c/2),V(end),num2str(V(end)),'HorizontalAlignment','center','FontWeight','bold','fontsize',16)
axis off

subplot(2,1,2);
plot(x, M, 'r','linewidth',1.5);
grid
line([x(1) x(end)],[0 0],'Color','k');
line([x1 x1],[0 Mmax],'LineStyle','--','Color','b');
title('Bending Moment Diagram','fontsize',16)
text(x1+1/L,Mmax/2,num2str(roundn(Mmax,-2)),'HorizontalAlignment','center','FontWeight','bold','fontsize'
text(x1,0,[num2str(roundn(x1,-2)) ' m'],'HorizontalAlignment','center','FontWeight','bold','fontsize',16
axis off
```

DESIGN AND ANALYSIS

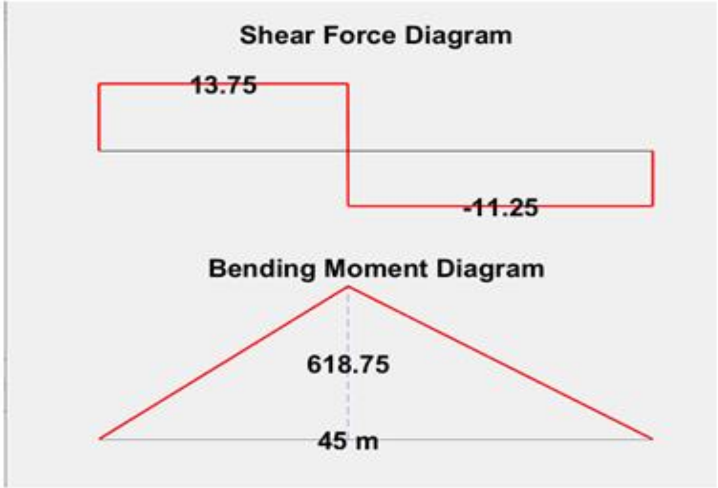
```
This is a program to design transmission shafts and plot bending moment diagrams
1. To determine shaft parameters
2. To plot bending moment diagram for various loading cases
Enter the choice (1 or 2)
1
power in kw= 45
Allowable shear stress(MPa)= 40
speed in rpm= 330
type of load
1-steady loads
2-minor shock loads
3-heavy shock loads
1
Cm=1.500000
Ct=1.000000
total length of shaft(mm)= 1500
total number of pulleys= 1
total number of gears= 1
Torque transmitted T = 1302272.727273 N-mm


 pulley 1
----------------
radius of pulley(mm)= 300
power given by pulley 1= 45
angle made by pulley 1 with horizontal= 0
tension ratio of pulley= 3
point of application of load= 600

 gear 1
----------------
radius of gear(mm)= 87.5
power given to gear 1= 45
pressure angle of gear= 20
point of application of load(mm)= 1100
-----------------------------------
The reaction forces of left bearing RH1=6653.627318 N and RV1=3968.831169 N
The reaction forces of right bearing RH2=7445.202396 N and RV2=10914.285714 N
maximum bending moment MTmax=5284735.321608 N-mm
the standard diameter of shaft d=105.713592 mm
```

```
This is a program to design transmission shafts and plot bending moment diagrams
1. To determine shaft parameters
2. To plot bending moment diagram for various loading cases
Enter the choice (1 or 2)
1
power in kw= 20
Allowable shear stress(MPa)= 42
speed in rpm= 300
type of load
1-steady loads
2-minor shock loads
3-heavy shock loads
2
Cm=1.750000
Ct=1.250000
total length of shaft(mm)= 2000
total number of pulleys= 2
total number of gears= 1
Torque transmitted T = 636666.666667 N-mm


 pulley 1
-----------------
radius of pulley(mm)= 250
power given by pulley 1= 20
angle made by pulley 1 with horizontal= 90
tension ratio of pulley= 2.5
point of application of load= 500

 pulley 2
-----------------
radius of pulley(mm)= 200
power given by pulley 2= 8
angle made by pulley 2 with horizontal= 45
tension ratio of pulley= 2.5
point of application of load= 1600

 gear 1
-----------------
radius of gear(mm)= 200
```

```
 gear 1
-----------------
radius of gear(mm)= 200
power given to gear 1= 12
pressure angle of gear= 20
point of application of load(mm)= 900
-----------------------------------
The reaction forces of left bearing RH1=802.529294 N and RV1=5927.345229 N
The reaction forces of right bearing RH2=1993.546669 N and RV2=4025.769806 N
maximum bending moment MTmax=3044634.870639 N-mm
the standard diameter of shaft d=92.480906 mm
End of program
---------------------------------------------

Do you want to continue? (Yes(Y) or No(N)))
```

```
This is a program to design transmission shafts and plot bending moment diagrams
1. To determine shaft parameters
2. To plot bending moment diagram for various loading cases
Enter the choice (1 or 2)

2
Simply supported beam
Length of the beam in m100
Enter load case:
1. Point load
2. UDL
1
Load applied in kN
25
Location of Load from left end of the beam in m
45
Do you want to continue? (Yes(Y) or No(N)))
```

```
Command Window
Simply Supported Beam

A =

   100
    25
    45


B =

    2.0000
   40.0000
   26.6000


T =

     1


Left support Reaction = 13.75 kN

Left support Reaction = 11.25 kN

fx Maximum bending moment = 618.75 kNm
```

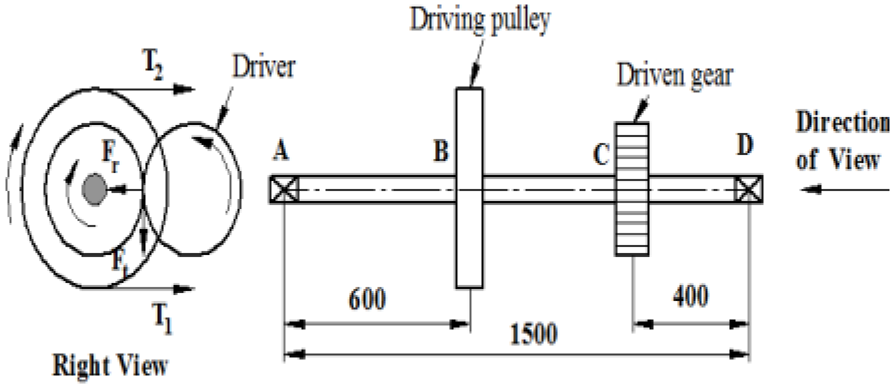


ii) UNIFORMLY DISTRIBUTED LOAD

```
This is a program to design transmission shafts and plot bending moment diagrams
1. To determine shaft parameters
2. To plot bending moment diagram for various loading cases
Enter the choice (1 or 2)
2
Simply supported beam
Length of the beam in m100
Enter load case:
1. Point load
2. UDL
2
Uniformly distributed load in kN/m
2
Length of udl in meter
40
C.G of udl from left end of the beam in meter
26.6
Do you want to continue? (Yes(Y) or No(N)))
```

CASE 1: ANALYTICAL

Data: P= 45kW; N=330rpm; C_m= 1.0; C_t= 1.5; G=80GPa; L=1500mm; Pressure angle $\alpha = 20^0$; $\tau_{max} = 40MPa$;
r_p = 300mm, r_g = 87.5mm, $\frac{T_1}{T_2} = 3$



The torque transmitted by the shaft

$$T = \frac{9.55\times10^6 P}{N} N-mm => T=1.302 10^6 N-mm$$

R_{DV} = 10912N and R_{BV}= 3968 N

Determination of maximum bending moment

$$M = \sqrt{{M_H}^2 + {M_V}^2}$$

$M_A = M_D = 0$

$M_B = 3.283\times10^6$ N-mm

$M_C = 4.37\times10^6$ N-mm

$$d = \left[\frac{16\sqrt{(C_m M)^2 + (C_t T)^2}}{\pi \tau_{max}}\right]^{1/3}$$

$$d = 94.8mm$$

Maximum bending moment is at C

Therefore, M= 4.37×10^6 N-mm

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CASE 1: OUTPUT

```
This is a program to design transmission shafts and plot bending moment diagram
1. To determine shaft parameters
2. To plot bending moment diagram for various loading cases
Enter the choice (1 or 2)
1
power in kw= 45
Allowable shear stress(MPa)= 40
speed in rpm= 330
type of load
1-steady loads
2-minor shock loads
3-heavy shock loads
1
Cm=1.500000
Ct=1.000000
total length of shaft(mm)= 1500
total number of pulleys= 1
total number of gears= 1
Torque transmitted T = 1302272.727273 N-mm


 pulley 1
-----------------
radius of pulley(mm)= 300
power given by pulley 1= 45
angle made by pulley 1 with horizontal= 0
tension ratio of pulley= 3
point of application of load= 600

 gear 1
-----------------
radius of gear(mm)= 87.5
power given to gear 1= 45
pressure angle of gear= 20
point of application of load(mm)= 1100
-----------------------------------
The reaction forces of left bearing RH1=6653.627318 N and RV1=3968.831169 N
The reaction forces of right bearing RH2=7445.202396 N and RV2=10914.285714 N
maximum bending moment MTmax=5284735.321608 N-mm
the diameter of shaft d=96.213592 mm
End of program
```

CASE 2: DRIVE SHAFTS

Go, change the world

P=327.3 kW
N=2500 rpm
T=1250 N-mm
L=1650 mm (Length of drive)

```
This is a program to design transmission shafts and plot bending moment diagrams
1. To determine shaft parameters
2. To plot bending moment diagram for various loading cases
Enter the choice (1 or 2)
1
power in kw= 327.3
Allowable shear stress(MPa)= 108
speed in rpm= 2500
type of load
1-steady loads
2-minor shock loads
3-heavy shock loads
1
Cm=1.500000
Ct=1.000000
total length of shaft(mm)= 1650
total number of pulleys= 0
total number of gears= 0
Torque transmitted T = 1250286.000000 N-mm

The reaction forces of left bearing RH1=0.000000 N and RV1=0.000000 N
The reaction forces of right bearing RH2=0.000000 N and RV2=0.000000 N
maximum bending moment MTmax=0.000000 N-mm
the diameter of shaft d=37.521776 mm
End of program
```

```
power in kw= 327.3
Allowable shear stress(MPa)= 108
speed in rpm= 2500
type of load
1-steady loads
2-minor shock loads
3-heavy shock loads
2
Cm=1.750000
Ct=1.250000
total length of shaft(mm)= 1650
total number of pulleys= 0
total number of gears= 0
Torque transmitted T = 1250286.000000 N-mm

The reaction forces of left bearing RH1=0.000000 N and RV1=0.000000 N
The reaction forces of right bearing RH2=0.000000 N and RV2=0.000000 N
maximum bending moment MTmax=0.000000 N-mm
the diameter of shaft d=40.389055 mm
End of program
```

```
power in kw= 327.3
Allowable shear stress(MPa)= 108
speed in rpm= 2500
type of load
1-steady loads
2-minor shock loads
3-heavy shock loads
3
Cm=2.500000
Ct=2.250000
total length of shaft(mm)= 1650
total number of pulleys= 0
total number of gears= 0
Torque transmitted T = 1250286.000000 N-mm

The reaction forces of left bearing RH1=0.000000 N and RV1=0.000000 N
The reaction forces of right bearing RH2=0.000000 N and RV2=0.000000 N
maximum bending moment MTmax=0.000000 N-mm
the diameter of shaft d=49.034711 mm
End of program
-------------------------------------------

Do you want to continue? (Yes(Y) or No(N)))
```

CASE 2: DRIVE SHAFTS

- MATERIAL: STAINLESS STEEL
- MAXIMUM SHEAR STRESS: 108 MPa

A drive shaft or Cardan shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them

Here we have run the calculations for
1. Steady Conditions
2. Minor Shock loads
3. Heavy Shock loads

CASE 2: DRIVE SHAFTS

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- Here we have obtained shaft diameter
- 1. Steady Conditions: d=38 mm
- 2.Minor Shock loads:d=40 mm
- 3.Heavy Shock loads:d=50 mm

- The author of the paper had obtained a shaft diameter of 60mm
- This is because fatigue failure was also considered.

CONCLUSION

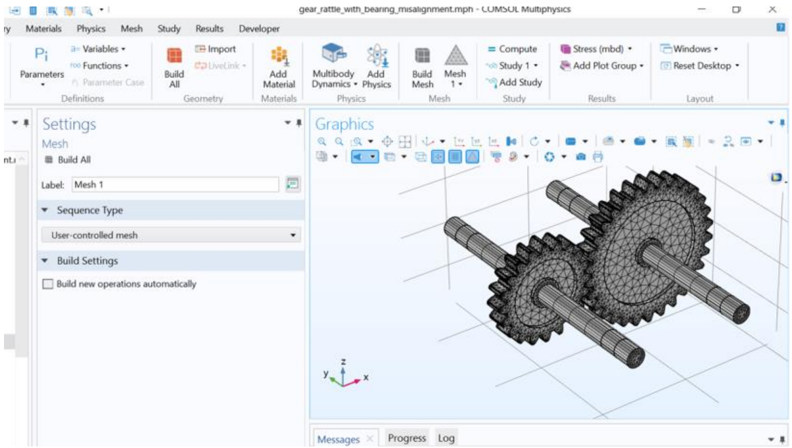
1. A generalised C program code has been written for computing shaft diameter for simply supported shafts on bearings with any number of gears and pulleys.
2. The code has been compared to the results obtained analytically.
3. This eliminates human error, makes the process less tedious and faster.
4. MATLAB code has been developed to take the output values of the C code (in the form of binary text files), read these values and use them to plot the bending and shear force diagrams of various load configurations.
5. A sample simulation using LiveLink for COMSOL and MATLAB can be conducted or shaft-pulley system.

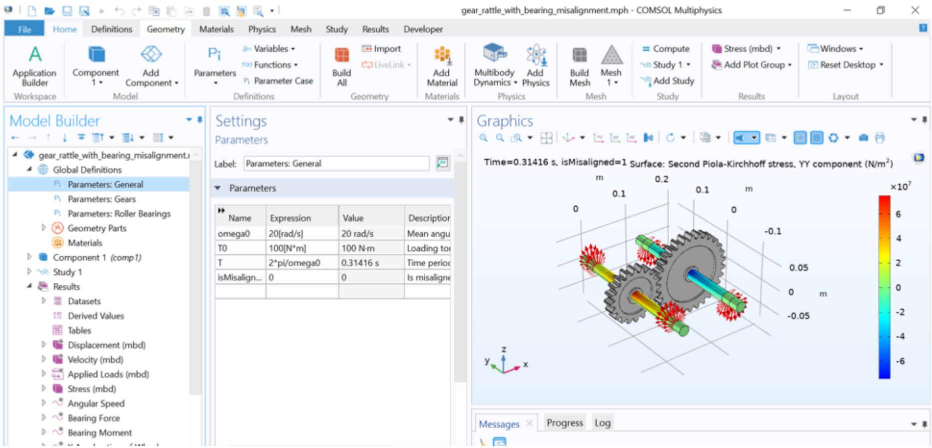
FUTURE SCOPE

- The current C project code creates a text file containing the values entered by the user. The required values are then extracted into a column vector in MATLAB which are to be used for the plotting of shear force and bending moment diagrams. This necessitates manual execution of the MATLAB code which needs to be automated.
- This process can be made faster and efficient by incorporating the codes into SIMULINK to form a console application with integrated graphics (GUI), thereby making it easier for any user to access and analyze shaft specifications.
- The generated outputs can also be linked with Solidworks software to create a sample design of the shaft based on the input parameters along with stress-strain analysis of the shaft design to display its working under normal conditions. This makes this application compatible on an industrial level.
- The data from the C and MATLAB program can be used as an input for COMSOL for FEA analysis to give deeper insight into shaft design.

FUTURE SCOPE

- The data from the C and MATLAB program can be used as an input for COMSOL for FEA analysis to give deeper insight into shaft design.
- The LiveLink feature of COMSOL can be implemented for this purpose.





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THANK YOU!