MAE 598

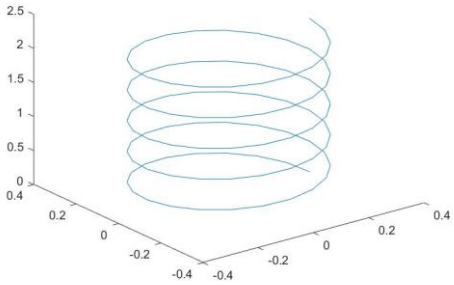
Applied Computational Fluid Dynamics

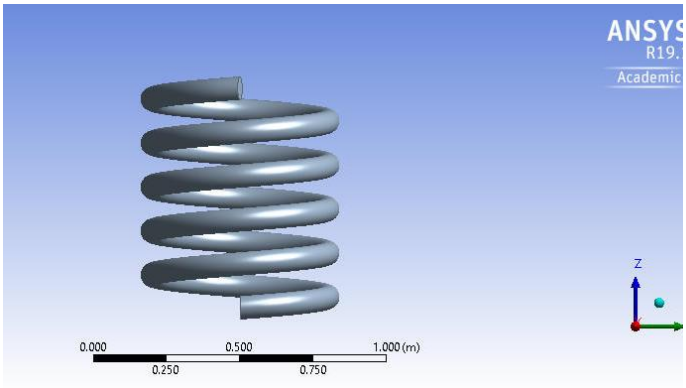
SAURABH SHIRISH PRABHU

Project 2

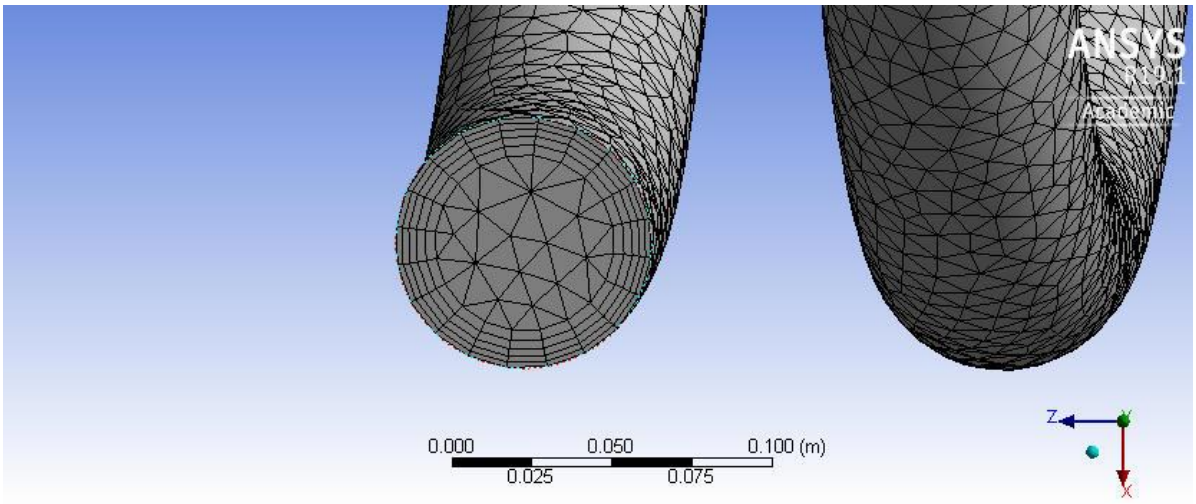
Saurabh Shirish Prabhu

Comment on collaboration: **NO COLLABORATION**



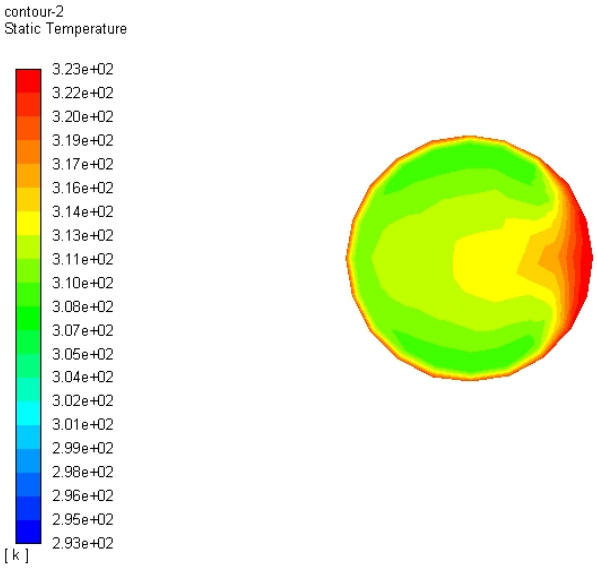


Task1 (1) : plot of the mesh on the surface of the outlet.

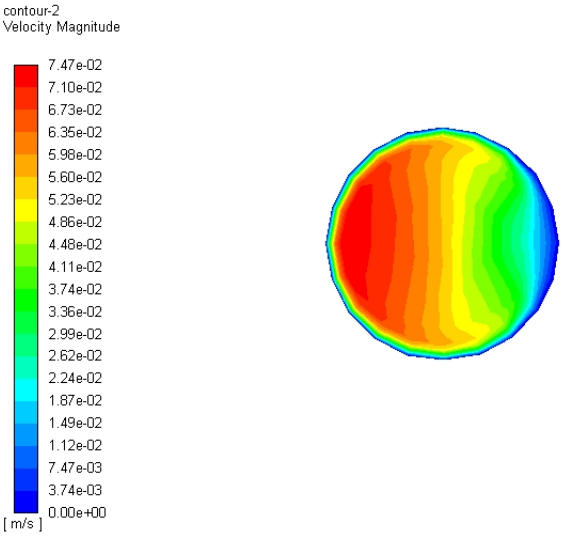


Task1 (2) Contour plots of *temperature* and *velocity magnitude* on the surface of outlet.

temperature contour

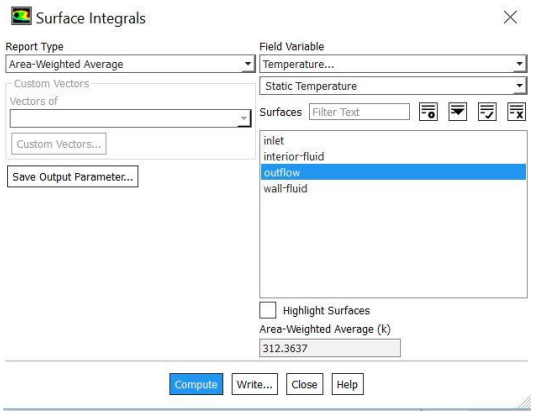


velocity magnitude



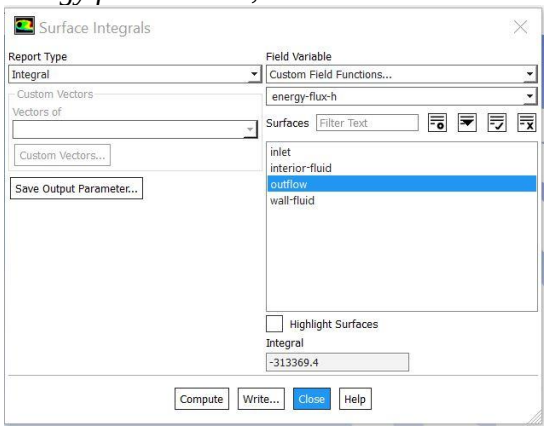
Task1 (3) values of the averaged outlet temperature, T_{out}, and the energy flux at outlet, *H*

averaged outlet temperature, Tout



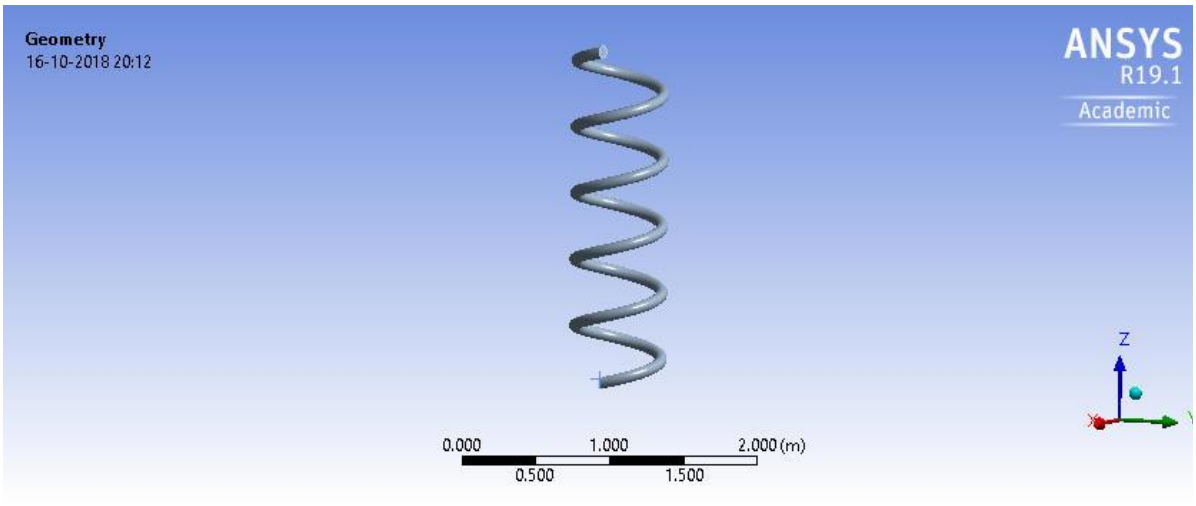
T_{out} = 312.3637 K

energy flux at outlet, H



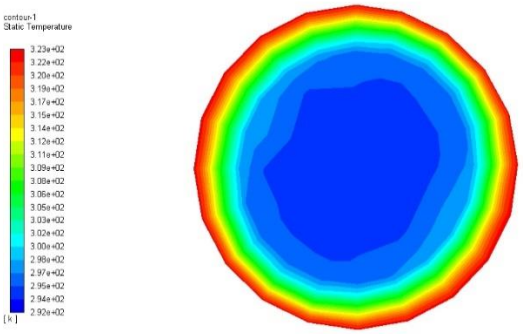
H_{out} = 313369.4 W

Task2 (1) : geometry of the stretched helical pipe

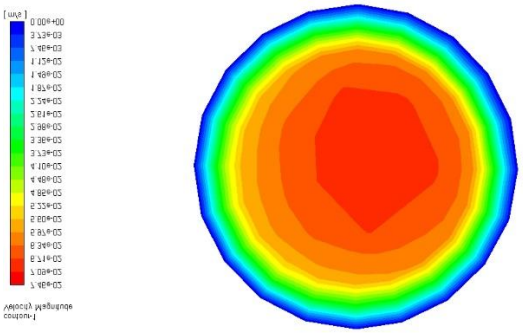


Task2 (2) contour plots of *temperature* and *velocity magnitude* on the surface of outlet

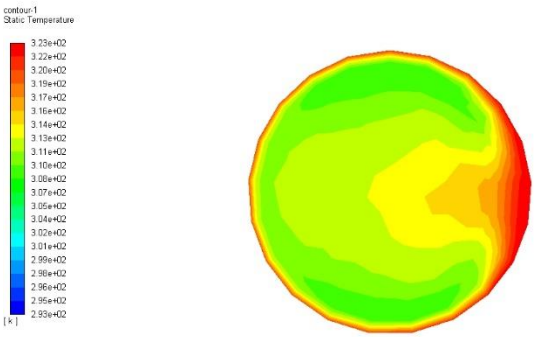
Temperature contour (straight pipe)



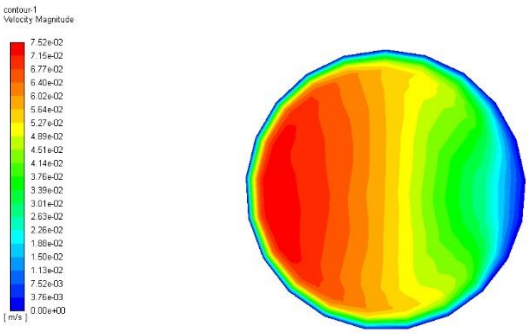
Velocity contour (straight pipe)



Temperature contour (stretched pipe)

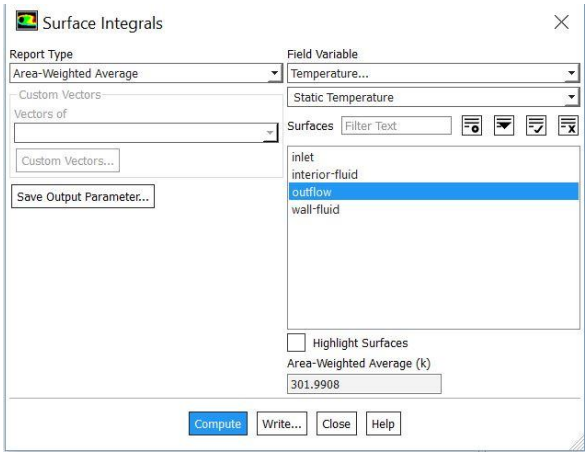


Velocity contour (stretched pipe)



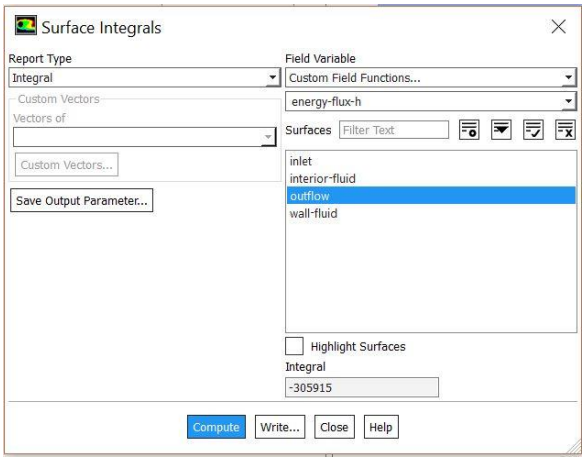
Task2 (3) values of the averaged outlet temperature, T_{out}, and the energy flux at outlet, H

averaged outlet temperature (straight pipe)



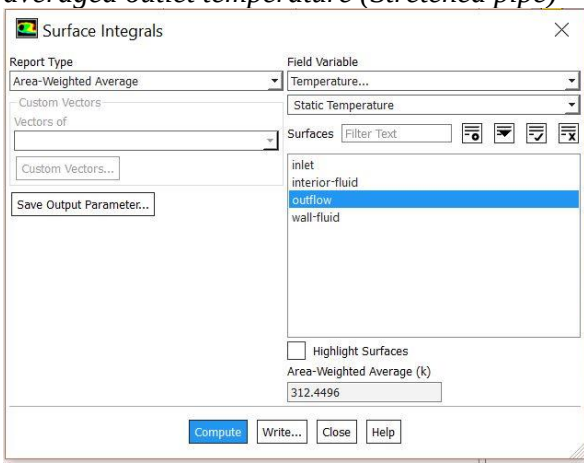
T_{out}= 301.9908 K

energy flux (straight pipe)



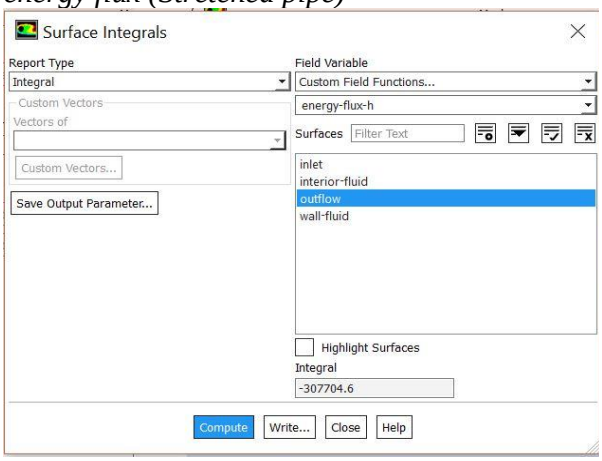
H_{out}= 305915 W

averaged outlet temperature (Stretched pipe)



T_{out}=312.4496 K

energy flux (Stretched pipe)



H_{out}= 307704.6W

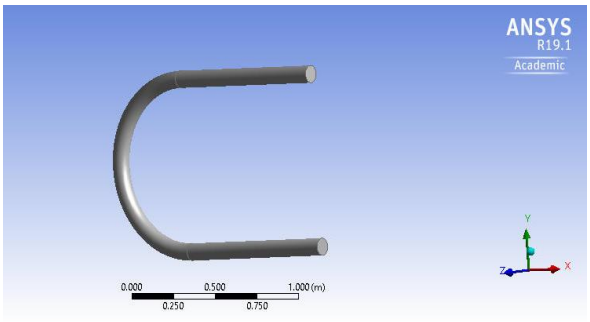
Comparison

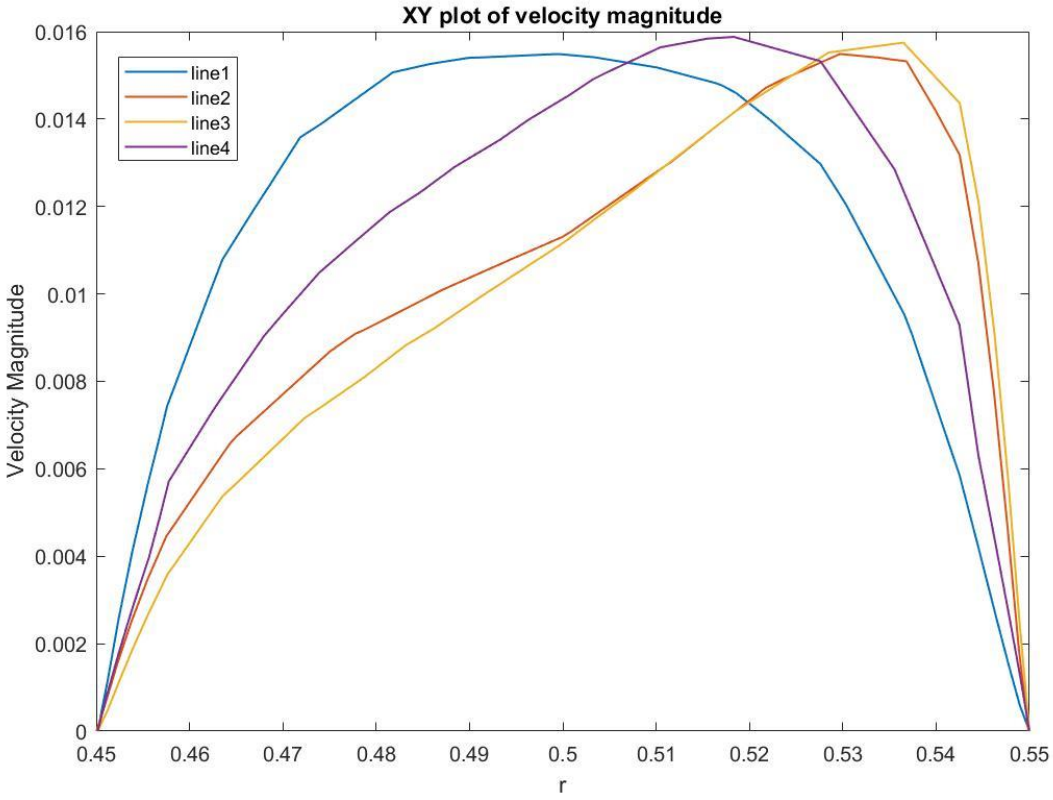
Case		**T_{out} (K)**	**H_{out} (W)**
1.	**original pipe**	312.3637	313369.4
2 (1).	**Straight pipe**	301.9908	305915
2 (2).	**Stretched pipe**	312.4496	307704.6

- It can be observed that the H_{out} decreases as the pipe tends to become straight.
- H_{out}(original) > H_{out}(Stretched) > H_{out} (Straight)
- T_{out}(original) is approximately equal to T_{out}(Stretched) but T_{out} (Straight) is the lowest.

Task 3: Line plots of *velocity magnitude* along four line segments in the plane of symmetry

This simulation was run on a full pipe





Appendix:

CODE For Task1

```
clc
clear all

a = (10*pi)/100;
t = [0:a:(10*pi)];
R = 0.2923; %0.3;
C = 0.15/(2*pi);
X = R*cos(t);
Y = R*sin(t);
Z = 3*C*t;
plot3(X,Y,Z)
fid = fopen('project2task2.txt','w');
id1=1;

%r=sqrt((R^2)+(C^2))*t;
for id2=1:length(t)
   fprintf(fid,'%3i %3i %7.4f %7.4f %7.4f \n',id1,id2,X(id2),Y(id2),Z(id2))
end
fclose(fid);
```