ME 331 ThermoFluids
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Computational Fluid Dynamics Project
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A simulation is considered helpful because of the ability to run thousands of scenarios that has numerous variations allowing for analysis to be done over a huge range of data.

1. Where the pressures are high, the velocities are low. The relations ship between pressure and velocity is seen in the Bernoulli equation, were as pressure rises, velocity falls. This means they are in a inverse relationship. They follow similar curve paths, meaning the isocrones are in similar spots. At the inlet stagnation point the pressure is 1.47Pa and the velocity is 0m/s.

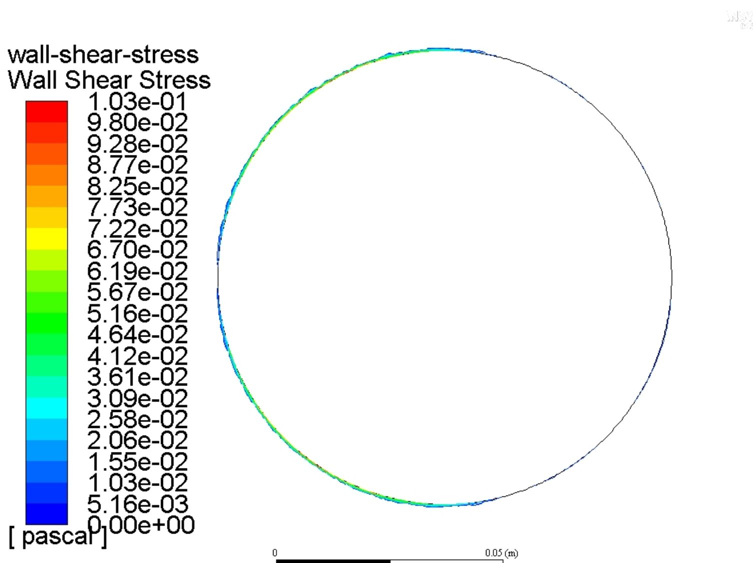

Figure 1: Shear Stress around the wall of the Cylinder

2. As seen in Figure 1, shear stress starts right after the stagnation point and ends about 110^o from the front horizonatal. This is seen where the shear stress drops to zero.

3. In Figure 2 the front of the sphere is representative in the middle of the graph were the static pressure is the greatest. The point at which the flow separates from the wall of the cylinder is at the minimum (there are two representing each side of the cylinder). The vorticities, as representative in Figure 4, cause the variations in the pressure (or the noise) at those points. The separation occurs at 0.12 & 0.25.

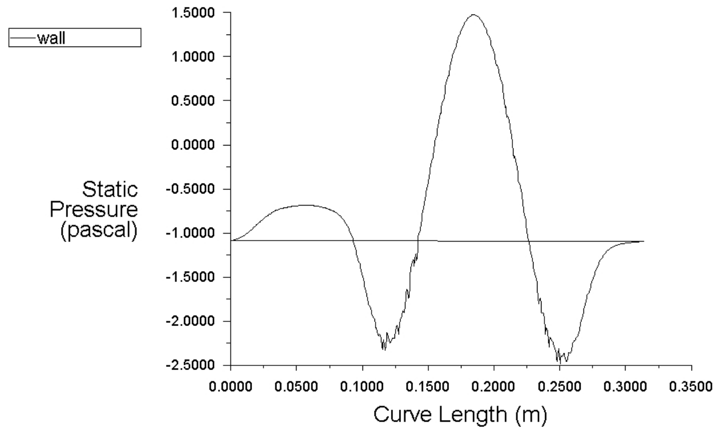

Figure 2: The Static Pressure around the wall of the Cylinder

4. The computed horizontal force is $F_H = 0.089331025$. With this information a drag Coefficient can be calculated using

$$C_d = \frac{F_H}{\frac{\pi}{8}\rho V^2 D}$$

Drag Coefficient $C_d = 0.8425169$

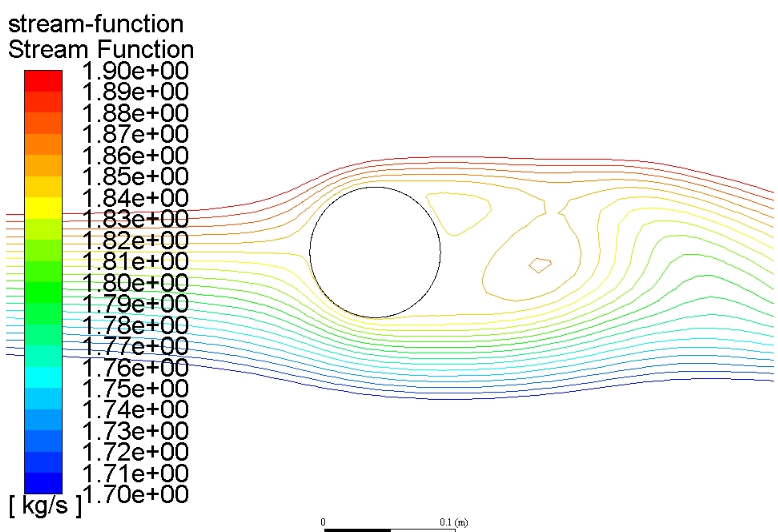

Figure 3: Stream Lines

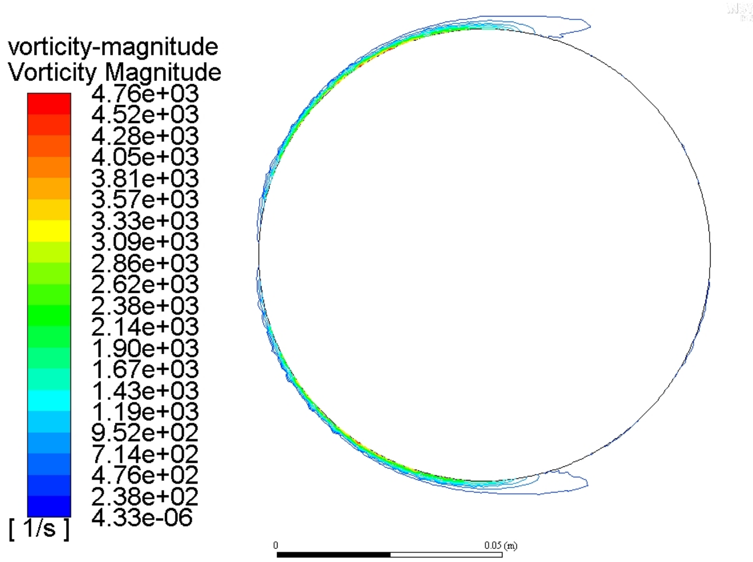

Figure 4: Vorticity Magnitude

5.

6. The Karmin frequencies could be calculated along with other things such as turbulent kinetic energy. The graph of turbulent Kinetic energy is Figure 5. Or the Strain rate around the surface of cylinder, seen in figure 6.

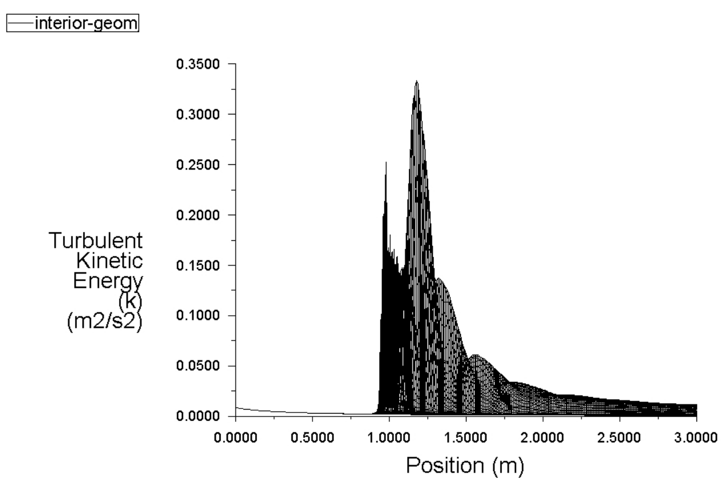

Figure 5: Turbulent Kinetic Energy

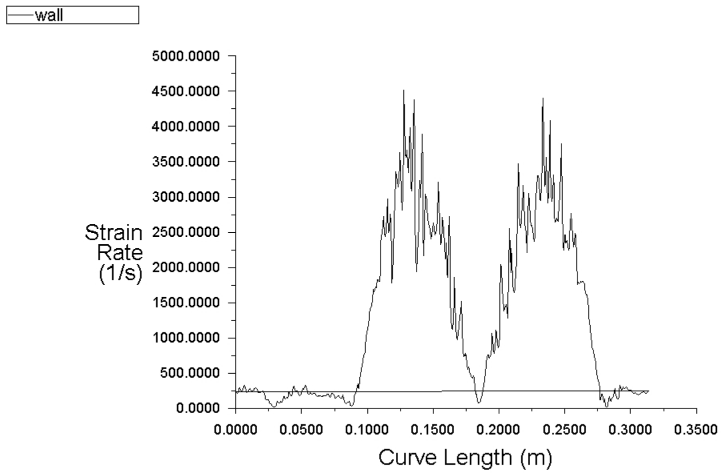

Figure 6: Strain Rate around the surface of the cylinder