

Lab 4 – Fluid Dynamics

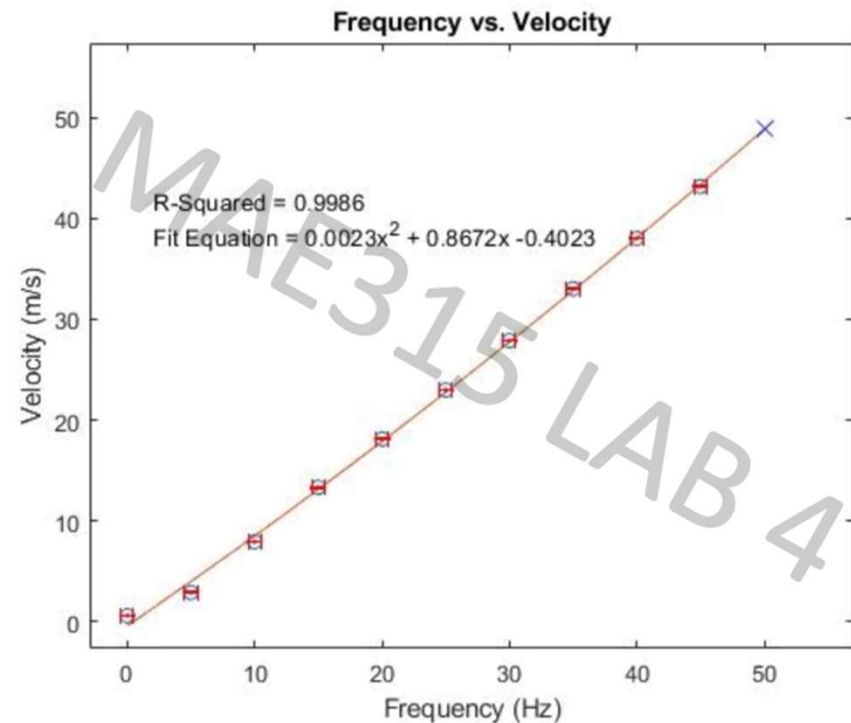
Calculation Requirements

Due Wednesday, December 8th

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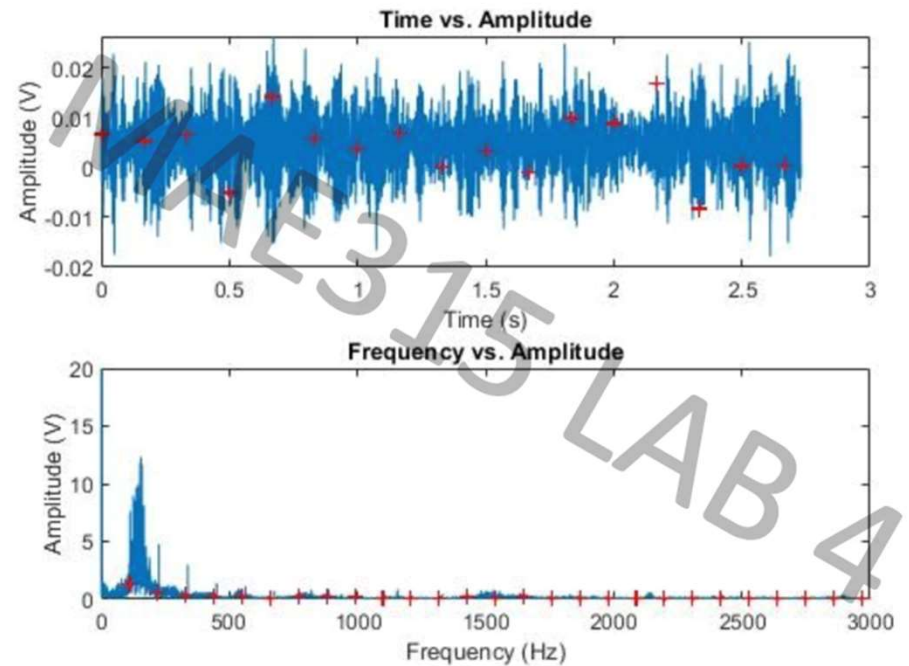
1. Wind Tunnel Calibration

- Plot Velocity of Wind Tunnel vs Frequency
- Create an equation for the velocity as a function of frequency (put on plot)
- Calculate the coefficient of determination (R-squared) (put on plot)
- Tabulate
 - What is velocity at 50 Hz?
 - Uncertainties in frequency and velocity



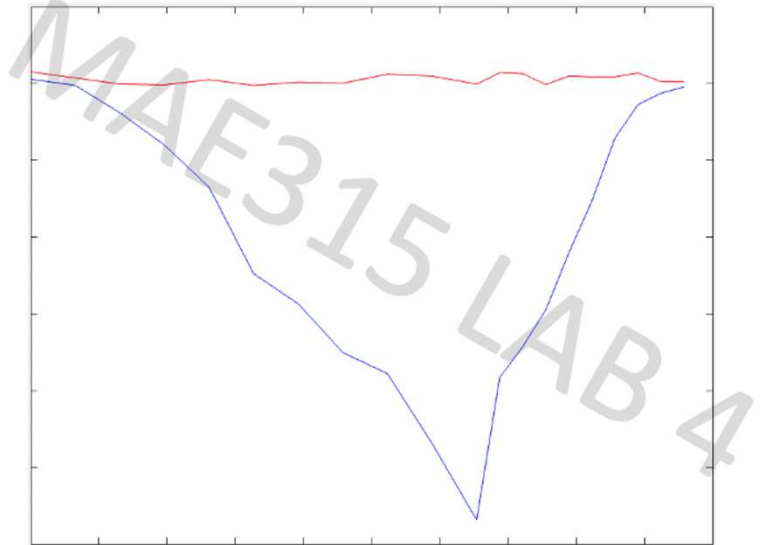
2. Vortex Shedding

- For each test (30 Hz and 45 Hz)
 - Plot
 - Amplitude vs Time
 - Amplitude vs Frequency
- For each test (30 Hz and 45 Hz)
 - Tabulate
 - Frequency of tunnel
 - Strouhal Number +/- uncertainty
 - Reynold's Number +/- uncertainty
 - Empirical Shedding Frequency +/- uncertainty
 - Shedding Frequency from Accelerometer +/- uncertainty



3. Cylinder Wake

- For each test (25 Hz and 45 Hz)
 - Plot
 - Pressure Tap Location vs Velocity
 - With and without cylinder
 - Tabulate
 - Frequency of tunnel
 - Drag +/- uncertainty
 - Coefficient of Drag +/- uncertainty

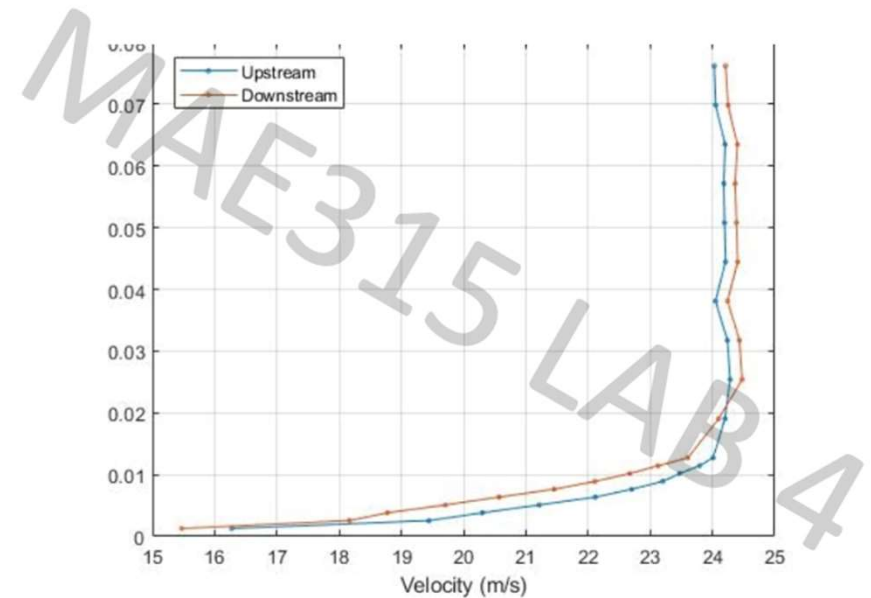


4. Derivation

- Typed out derivation of Drag in Calculations

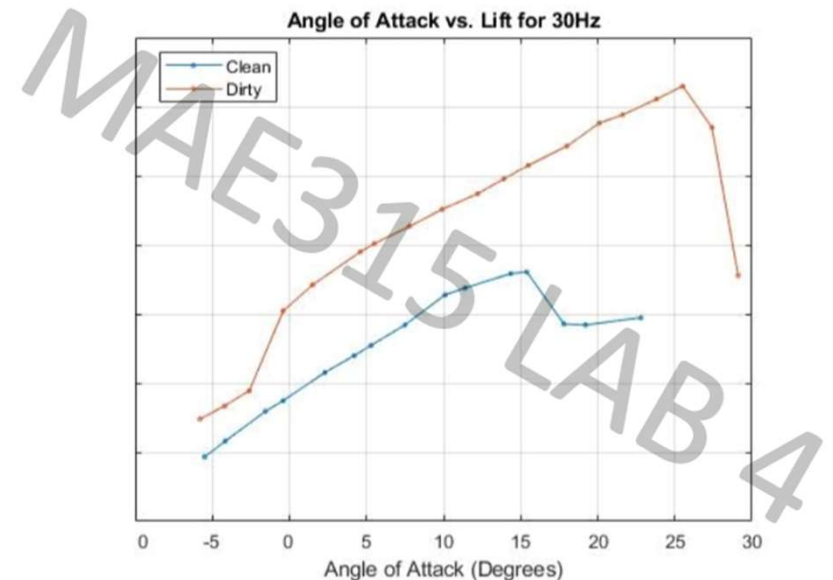
5. Boundary Layer

- For each test (25 Hz and 45 Hz)
 - Plot
 - Rake Location vs. Velocity
 - Both upstream and downstream data on 1 plot



6. Airfoil

- For every test (25 Hz and 45 Hz)
 - Plot
 - Angle of Attack vs Lift (clean and dirty)
 - Angle of Attack vs Drag (clean and dirty)
 - Angle of Attack vs Pitching Moment (clean and dirty)
 - Angle of Attack vs Coefficient of Lift (clean and dirty)
 - Angle of Attack vs Coefficient of Drag (clean and dirty)
 - Angle of Attack vs Coefficient of Pitching Moment (clean and dirty)
 - Angle of Attack vs Lift/Drag (clean and dirty)
 - Tabulate
 - Fan Frequency
 - Reynold's Number +/- uncertainty
 - Peak Efficiency clean (25 Hz and 45 Hz)
 - Peak Efficiency dirty (25 Hz and 45 Hz)



7. 2D-3D Cylinder

- For both fan frequencies (25 Hz and 45 Hz)
 - Tabulate
 - Cylinder Number
 - Length
 - Reynold's Number
 - Drag +/- uncertainty
 - Coefficient of Drag +/- uncertainty