FLUENT - Unsteady Flow Past a Cylinder - Step 6

Step 6: Analyze Results

Calculate Strouhal Number

Lift convergence plot can be used to compute the correct value of Strouhal number. Non-dimensionalize the problem and Sr = f*D/U = 0.0859 * 2 = 0.172. The results matches fairly well with the value 0.183 as reported by Williamson

Calculating Shedding Frequency

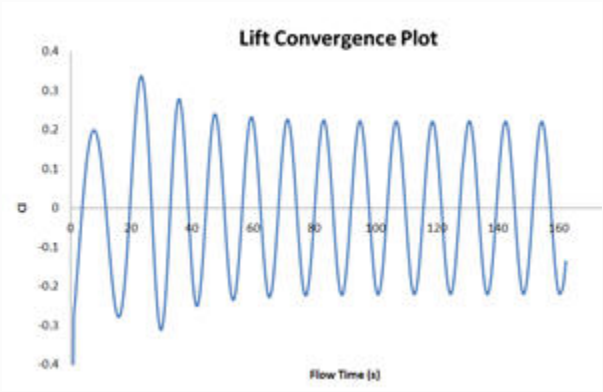
To accurately calculate the shedding frequency, open the cl-history file (saved previously in the same location where the original mesh was read) and plot the data using excel for better data representation and graphing option. Take an average of 10 shedding cycles (e.g 10 CL peak).

$$\text{Period} = \frac{T_2 - T_1}{10}$$

$$f = \frac{1}{Period}$$

$$Sr = \frac{fD}{U}$$

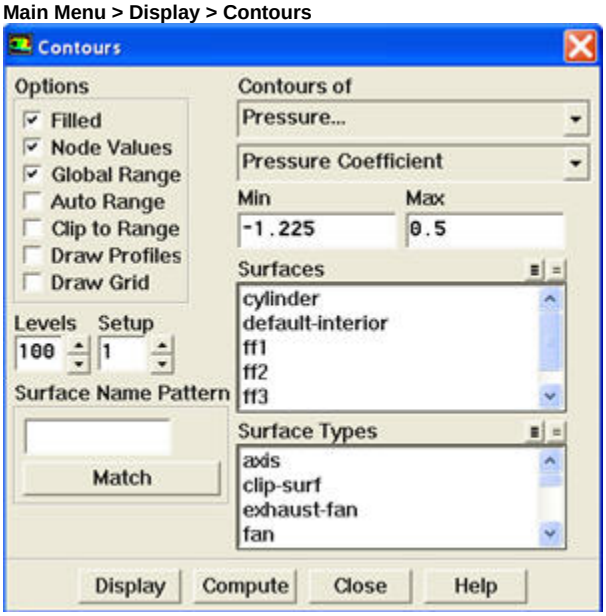
An example of Lift Convergence Plot plotted using excel is shown below:



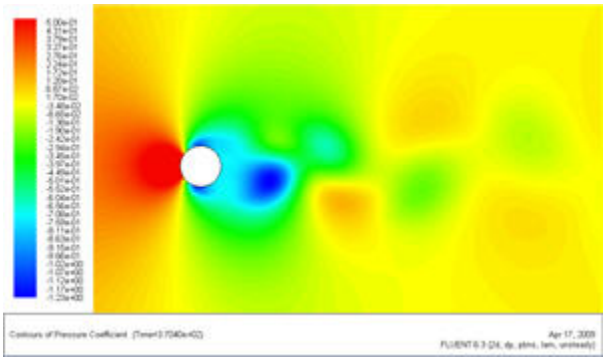
Higher Resolution Image

Display Pressure Contours

Main Menu > Display > Contours



Under ***Contours of***, choose ***Pressure..*** and ***Pressure Coefficient***. Select the ***Filled*** option. Increase the number of contour levels plotted. Set ***Levels*** to `100`. Disable ***Auto Range*** and ***Clip to Range*** from the ***Options*** group box. Enter `-1.225` and `0.5` for ***Min*** and ***Max***, respectively.Click ***Display***.

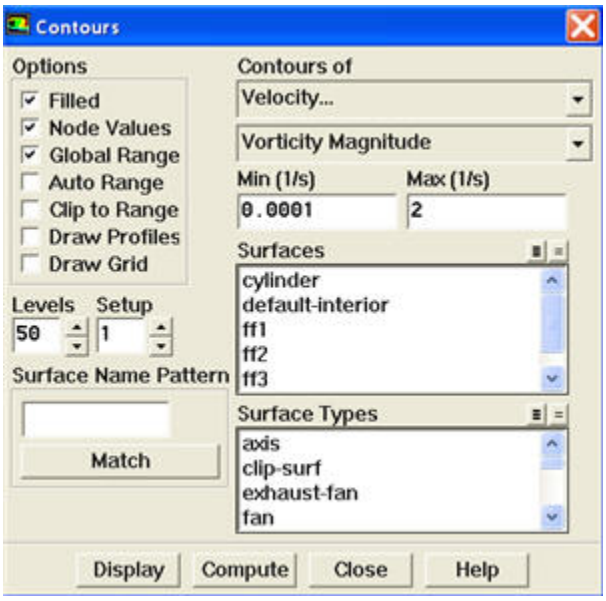


Higher Resolution Image

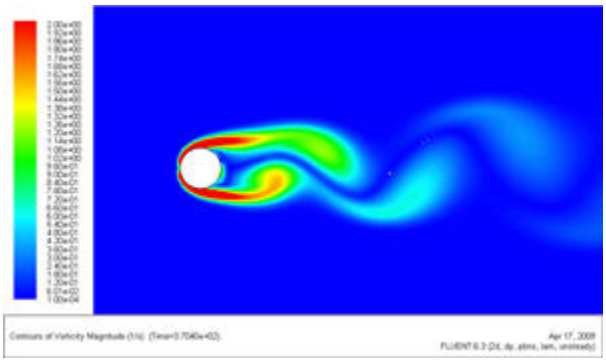
The contour shows a clear asymmetric pattern in the flow. The local pressure minima (the green patch downstream) are the center of the vortices.

Display Contour of Vorticity Magnitude

Main Menu > Display > Contours



Under ***Contours of***, choose ***Velocity..*** and ***Vorticity Magnitude***. Disable ***Auto Range*** and ***Clip to Range*** from the ***Options*** group box. Enter `0.0001` and 2 for ***Min*** and ***Max***, respectively. Select ***Levels*** to 50. Click ***Display***.



Higher Resolution Image

This figure shows clear vortex shedding process. Zoom in the view around cylinder.

Go to Step 7: Validate the Results

See and rate the complete Learning Module

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