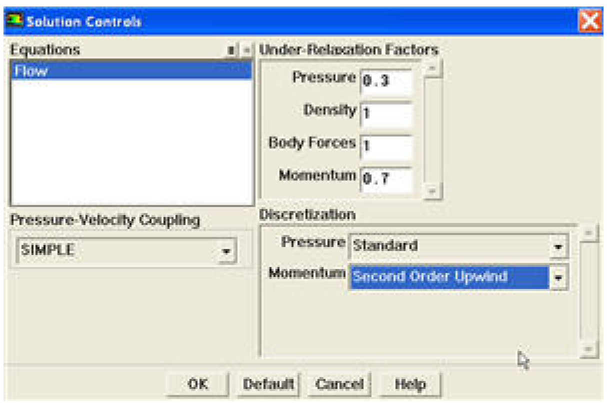
FLUENT - Steady Flow Past a Cylinder - Step 5

Step 5: Solve!

We'll use a second-order discretization scheme.

Main Menu > Solve > Controls > Solution...

Change ***Momentum*** to ***Second Order Upwind***.



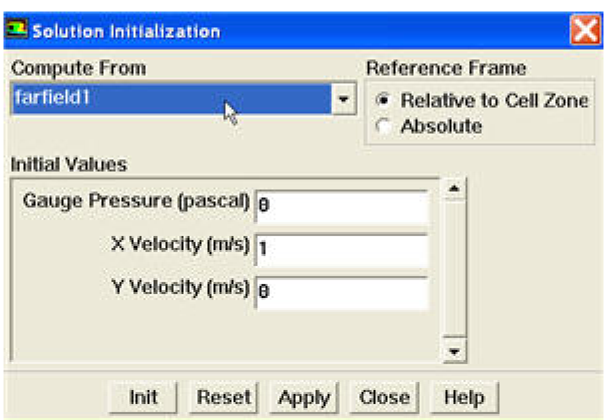
Click ***OK***.

Set Initial Guess

Initialize the flow field to the values at the inlet:

Main Menu > Solve > Initialize > Initialize...

In the *Solution Initialization* menu that comes up, choose ***inlet*** under ***Compute From***. The ***X Velocity*** for *all* cells will be set to 1 m/s, the ***Y Velocity*** to 0 m /s and the ***Gauge Pressure*** to 0 Pa. These values have been taken from the inlet boundary condition.



Click ***Init***. This completes the initialization. ***Close*** the window.

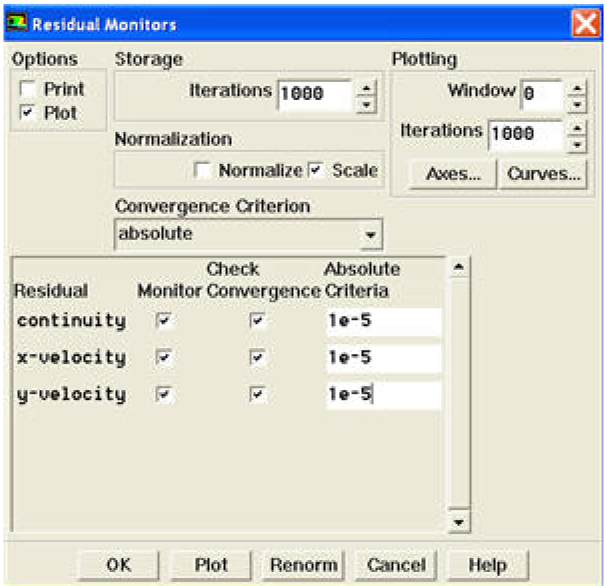
Set Convergence Criteria

FLUENT reports a residual for each governing equation being solved. The residual is a measure of how well the current solution satisfies the discrete form of each governing equation. We'll iterate the solution until the residual for each equation falls below 1e-6.

Main Menu > Solve > Monitors > Residual...

Change the residual under ***Convergence Criterion*** for ***continuity***, ***x-velocity***, and ***y-velocity***, all to 1e-5.

Also, under ***Options***, select ***Plot***. This will plot the residuals in the graphics window as they are calculated.



Click ***OK***.

Monitor also the drag coefficient on the cylinder.

Main Menu > Solve > Monitors > Force...

Select *cylinder* under ***Wall Zones***. Under ***Options***, select ***Plot*** and ***Write***. Note that ***Plot Window*** is 1.

Setting Reference Values

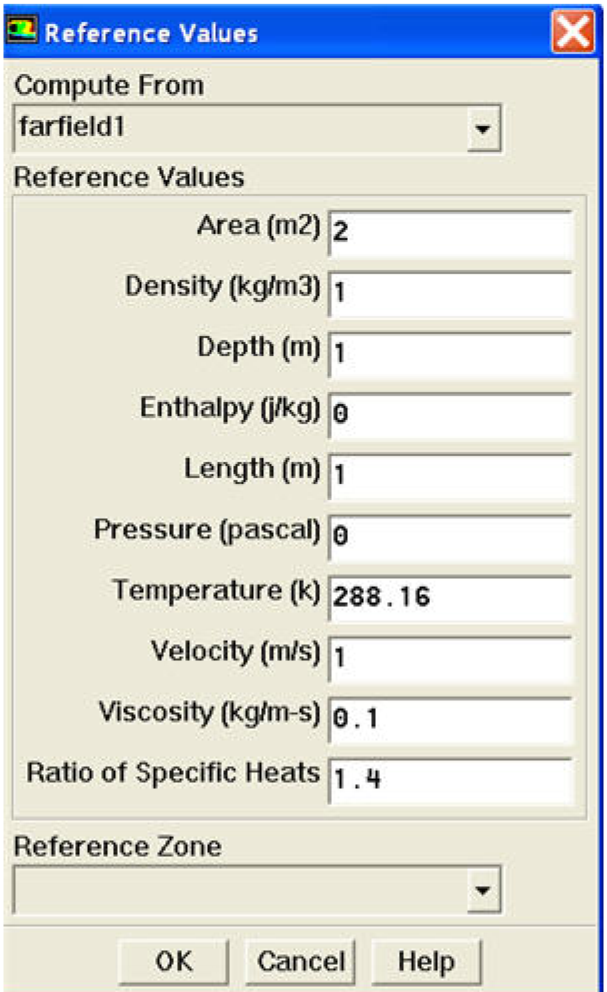
To plot C $_{d}$, we need to set the reference value.

Unable to find DVI conversion log file.

Note that cross sectional area for a 2D cylinder is the diameter of the cylinder.}

Main Menu > Report > Reference Values...

Under ***Reference Values***, change ***Area*** to *2*, ***Density*** to *1*, ***Velocity*** to *1* and ***Viscosity*** to *0.1*.



This completes the problem specification. Save your work:

Main Menu > File > Write > Case...

Type in `cylinder.cas` for ***Case File***. Click ***OK***. Check that the file has been created in your working directory. If you exit FLUENT now, you can retrieve all your work at any time by reading in this case file.

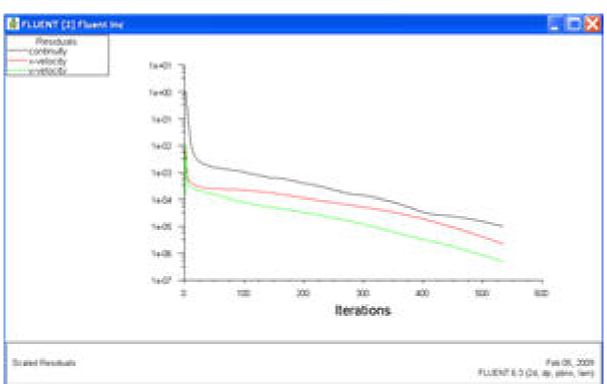
Iterate Until Convergence

Start the calculation by running 1000 iterations:

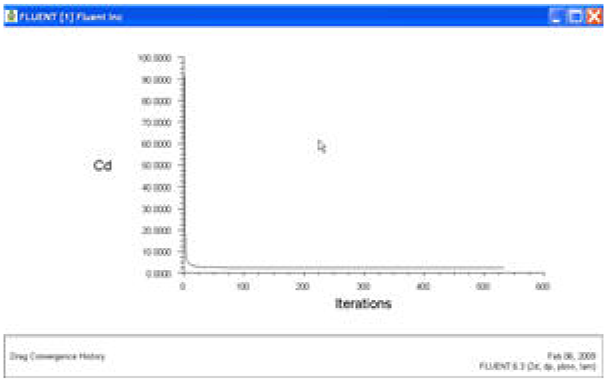
Main Menu > Solve > Iterate...

In the *Iterate Window* that comes up, change the ***Number of Iterations*** to `1000`. Click ***Iterate***.

The residuals and drag coefficient for each iteration are printed out as well as plotted in the graphics window as they are calculated.



[Higher Resolution Image]



[Higher Resolution Image]

Save the solution to a data file:

Main Menu > File > Write > Data...

Enter `cylinder.dat` for ***Data File*** and click ***OK***. Check that the file has been created in your working directory. You can retrieve the current solution from this data file at any time.

Go to Step 6: Analyze Results

See and rate the complete Learning Module

Go to all FLUENT Learning Modules