Steady Flow Past a Cylinder - Numerical Solution

Authors: John Singleton and Rajesh Bhaskaran, Cornell University

Problem Specification
1. Pre-Analysis & Start-Up
2. Geometry
3. Mesh
4. Physics Setup
5. Numerical Solution
6. Numerical Results
7. Verification & Validation
Exercises
Comments

Numerical Solution

Second Order Upwind Momentum Scheme

Solution > Solution Methods > Spatial Discretization. Set Momentum to Second Order Upwind

Convergence Criterion

Solution > Monitors > Residuals > Edit.... Set the Absolute Criteria for continuity, x-velocity and y-velocity to 1e-6. Click ok

Residual Monitors	-			
Options	Equations			
Print to Console	Residual	Monitor Check Cor	nvergence Absolute (Criteria 🔺
Pbt	continuity	V V] 1e-6	
Window	x-velocity] [1e-6	—)
Iterations to Plot	y-velocity	V] 1e-6	-
1000	Residual Values		Converg	gence Criterion
	Normalize	Iteration	absolut	te 🔻
Iterations to Store		5		
1000	V Scale			
	Compute Loca	l Scale		
OK Plot	Renormalize	e Cancel	Help	

Solution > Monitors > Create > Drag

NOTE: In ANSYS 18.2, implementing the drag monitor is slightly different. The pictures below do not match exactly with version 18.2. See this tutorial video for version 18.2.

<u>File Mesh Define Solv</u>	re <u>A</u> dapt S <u>u</u> rface <u>D</u> isplay <u>R</u> ep
i 🛋 i 📂 🖌 🖌 🖬 🎯]\$\$ ⊕€ € ↗ € ≒ ▼
Meshing Mesh Generation Solution Setup General Models	Monitors Residuals, Statistic and Force Monito Residuals - Print, Plot Statistic - Off
Materials Phases Cell Zone Conditions Boundary Conditions Mesh Interfaces Dynamic Mesh Reference Values	Create - Edit Delete Drag Lift
Solution Solution Methods Solution Controls Monitors Solution Initialization Calculation Activities Run Calculation	Create Edit Delete Volume Monitors
Results	
Drag Monitor	<u> </u>
Drag Monitor Name Cd-1 Options	Wall Zones E = cylinderwall
Drag Monitor Name Cd-1 Options Print to Console Plot Window -1 Curves Ax Write File Name	Wall Zones (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
Drag Monitor Name Cd-1 Options Print to Console Plot Window -1 Curves Ax Write File Name Cd-1-history Per Zone Average Over(Iterations) 1	Wall Zones
Drag Monitor Name cd-1 Options Print to Console Plot Window -1 Curves Write File Name cd-1-history Per Zone Average Over(Iterations) 1 Force Vector X Y Z 0	Val Zones Val Zones Val Zones Val Zones
Drag Monitor Name (cd-1 Options Print to Console Plot Window -1 Curves Write File Name (cd-1-history) Per Zone Average Over(Iterations) 1 Force Vector X Y Z 0 0 0	Wall Zones

Then check Print to Console and Plot. Next, click cylinderwall, which is located under Wall Zones. Lastly, click ok

Initial Guess

Solution > Solution Initialization > Standard Initialization.

Set Compute From to farfield1. Alternately, you can simply set X Velocity to 1 m/s. Then, click Initialize.

Iterate Until Convergence

Solution > Run Calculation.

Set the *Number of Iterations* to 2000. Then, click *Calculate*. (You may have to hit *Calculate* twice.) Now, have a cup of coffee. The solution should converge after approximately 1600 iterations. **NOTE**: In newer versions of ANSYS, solution may converge in lesser number of iterations.

Save Project

Go to Step 6: Numerical Results

Go to all FLUENT Learning Modules