Problem Specification 1. Create Geometry in GAMBIT 2. Mesh Geometry in GAMBIT 3. Specify Boundary Types in GAMBIT 4. Set Up Problem in FLUENT 5. Solve 6. Analyze Results 7. Refine Mesh Problem 1 Problem 2

# Step 6: Analyze Results

## **Plot Velocity Vectors**

Let's plot the velocity vectors obtained from the FLUENT solution.

#### Display > Vectors

Set the Scale to 14 and Skip to 4. Click Display.



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Fig. 09, 200 FQ.(9)/T-6-3 (24, 6y, plans, fam)

#### Higher Resolution Image

From this figure, we see that there is a region of low velocity and recirculation at the back of cylinder.

Zoom in the cylinder using the middle mouse button.

#### **Pressure Coefficient**

$$C_p = rac{(p - p_{ref})}{q_{ref}},$$

Pressure coefficient is a dimensionless parameter defined by the equation pressure, and  $q_{ref}$  is the reference dynamic pressure defined by

$$q_{ref} = \frac{1}{2} \rho_{ref} c_{ref}^2$$

The reference pressure, density, and velocity are defined in the Reference Values panel in Step 5.

Let's plot pressure coefficient vs x-direction along the cylinder.

#### Plot > XY Plot...

Change the Y Axis Function to Pressure..., followed by Pressure Coefficient. Then, select cylinder under Surfaces.

where p is the static pressure,  $p_{ref}$  is the reference

Solution XY Plot			X
Options	Plot Direction	n Y Axis Function	
Node Values	XI	Pressure	-
Position on X Axis	YB	Pressure Coefficient	
Write to File	Zla	X Axis Function	
C Order Points	-lo	Direction Vector	-
File Data	Í	Surfaces	
	]	cylinder	
		default-interior farfield1	
		farfield2	
		farfield3	
	Load File	Tarnelos	
	Free Data		
Plot	Axes O	urves Close Help	

Click Plot.



### Higher Resolution Image

As can be seen, the pressure coefficient at the back is lower than the pressure coefficient at the front of the cylinder. The irrecoverable pressure is due to the separation at the back of cylinder and the frictional loss.

Now, let's take a look at the Contour of Pressure Coefficient variation around the cylinder.

#### Display > Contours

Under Contours of, choose Pressure.. and Pressure Coefficient. Select the Filled option. Increase the number of contour levels plotted: set Levels to 1 00.

Options	Contours of		
Filled	Pressure		
Node Values Global Range	Pressure Coefficient		
Auto Range	Min Max		
Clip to Range	-1.08488	1.576596	
Draw Profiles	Surfaces		= =
Levels Setup 100 1 1	cylinder default-interior farfield1 farfield2 farfield3	8	< × ×
	Surface Types		
Match	axis clip-surf exhaust-fan fan		< >

## Click Display.



## Higher Resolution Image

Because the cylinder is symmetry in shape, we see that the pressure coefficient profile is symmetry between the top and bottom of cylinder.

#### **Plot Stream Function**

Now, let's take a look at the Stream Function.

#### Display > Contours

Under Contours of, choose Velocity.. and Stream Function. Deselect the Filled option. Click Display.



#### Higher Resolution Image

Enclosed streamlines at the back of cylinder clearly shows the recirculation region.

## **Plot Vorticity Magnitude**

Let's take a look at the Pressure Coefficient variation around the cylinder. Vorticity is a measure of the rate of rotation in a fluid.

## Display > Contours

Under Contours of, choose Velocity.. and Vorticity Magnitude. Deselect the Filled option. Click Display.



Higher Resolution Image

## Go to Step 7: Refine Mesh

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