Computational Fluid Dynamics

Numerical solution of fluid flow begins when laws governing the flow have been expressed in mathematical form. Second order non-linear partial differential momentum equation for a Newtonian fluid with constant density and viscosity, also known as the Navier-Stokes Equations, together with incompressible continuity equation are solved numerically:

X Momentum Equation

$$\frac{du}{dt} = -\frac{1}{\rho}\frac{\partial p}{\partial x} + \nu\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right)$$

Y Momentum Equation

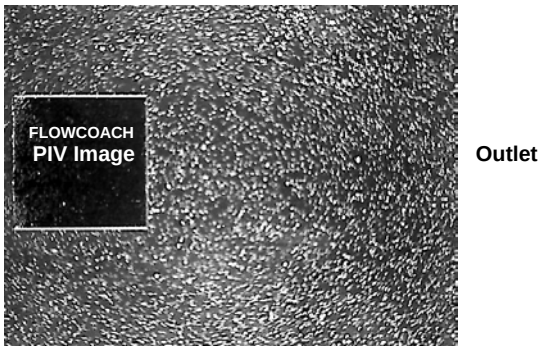
$$\frac{dv}{dt} = -\frac{1}{\rho}\frac{\partial p}{\partial y} + \nu\left(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2}\right)$$

Continuity Equation

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0$$

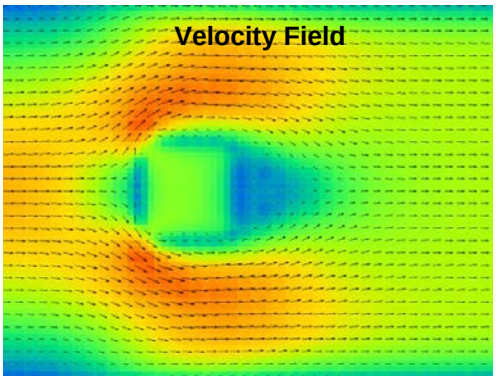
EXAMPLE

Problem



Solution

Mesh refinement level: 5
Flow speed: 3 mm/s
Total transient time: 10 s
Number of time intervals: 30
Refinement around solid: 5
Flow profile: Parabolic
Output start time: 9 s
Convergence error: 0.001



Try it using FLOWEX and see the results!

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