Steady Flow Past a Cylinder - Physics Setup

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Problem Specification
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Physics Setup

Your workbench project should look like this.

We are done with all the meshing steps but for some reason, a tick mark doesn't appear next to Mesh in the project page. To get the tick mark next to mesh, right-click on it and select Update as shown below.

Launch Fluent
(Double Click) Setup in the Workbench Project Page.

When the FLUENT Launcher appears change options to "Double Precision", and then click OK as shown below. The Double Precision option is used to select the double-precision solver. In the double-precision solver, each floating point number is represented using 64 bits in contrast to the single-precision solver which uses 32 bits. The extra bits increase not only the precision, but also the range of magnitudes that can be represented. The downside of using double precision is that it requires more memory.

![FLUENT Launcher](image)

Twiddle your thumbs a bit while the FLUENT interface starts up. This is where we'll specify the governing equations and boundary conditions for our boundary-value problem. On the left-hand side of the FLUENT interface, we see various items listed under Problem Setup. We will work from top to bottom of the Problem Setup items to setup the physics of our boundary-value problem. On the right hand side, we have the Graphics pane and, below that, the Command pane.

**Check Mesh**

(Click) Info > Size

You should now have an output in the command pane stating that there are 18,432 cells.

![Mesh](image)

(Click) Check > Perform Mesh Check

You should see no errors in the command pane.

Specify Material Properties
Solution Setup > Materials > Fluid > Create/Edit...

Then set the Density to 1 kg/m³ and set Viscosity to 0.05 kg/m·s. Click Change/Create then click Close.

Boundary Conditions

FarField1

Solution Setup > Boundary Conditions > farfield1.

Set Type to velocity-inlet. Click Edit... Set Velocity Specification Method to Components, set X-Velocity to 1 m/s, and set Y-Velocity to 0 m/s.
FarField2

Solution Setup > Boundary Conditions > farfield2.
Set Type to pressure-outlet.

Note that pressures in the FLUENT interface are specified in terms of gauge values where: \( \text{gauge pressure} = \text{absolute pressure} - \text{reference pressure} \). The reference pressure is 1 atm by default. So in our case the gauge pressure at the outlet is 0 atm which is also the default. The following video from the laminar pipe flow module in our free online course explains the advantages of working in terms of gauge pressures. The video discusses this in the context of laminar pipe flow but the same ideas apply for our cylinder flow too.

Cylinder Wall

Solution Setup > Boundary Conditions > cylinderwall.
Set Type to wall. This is the default.

Reference Values
**Solution Setup > Reference Values.**
Set the *Density* to 1 kg/m$^3$. The other default values will work for the purposes of this simulation.

Save Project

**Go to Step 5: Numerical Solution**
Go to all FLUENT Learning Modules