This short guide will show you how to begin to use VisualFlonet to calculate pressure drops and flow rates for liquids or gases in piping networks.

Within seconds from now you will have learned how to use VisualFlonet to calculate the pressures and flow rates in the network given the inlet and exit pressures shown in the right:

VisualFlonet Applications

**Pipe data**

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Length</th>
<th>Bore</th>
<th>Fittings</th>
<th>Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>50 m</td>
<td>2”</td>
<td>4 x 90° bend, radius 500mm</td>
<td>40°C</td>
</tr>
<tr>
<td>P2</td>
<td>50 m</td>
<td>2”</td>
<td>1 x T-junction type 2</td>
<td>40°C</td>
</tr>
<tr>
<td>P3</td>
<td>50 m</td>
<td>1”</td>
<td>1 x 1” globe valve – cast</td>
<td>40°C</td>
</tr>
<tr>
<td>P4</td>
<td>30 m</td>
<td>1.5”</td>
<td>7 x 90° bend, radius 300mm</td>
<td>30°C</td>
</tr>
<tr>
<td>P5</td>
<td>50 m</td>
<td>1”</td>
<td>1 x 1” globe valve – forged</td>
<td>40°C</td>
</tr>
<tr>
<td>P6</td>
<td>30 m</td>
<td>1.5”</td>
<td>2 x T-junction type 3</td>
<td>30°C</td>
</tr>
</tbody>
</table>

All pipes are Schedule 40, mild steel and slightly corroded.

Okay let’s get going.

1. Click **Start > All Programs > PEL > VisualFlonet > VisualFlonet**. Click **Enable Macros** twice and the VisualFlonet splash screen appears briefly.

   The first thing to do is to specify we want to do a Flow Calculation from the pressures that we have been given.

2. Click the **Options** button on the VisualFlonet toolbar. On the **Project** tab under **Calculation Mode**, click **Flow**.

   While the VisualFlonet Options is open, let’s check that automatic naming of nodes, pipes and pumps is switched on, and auto-connect is the default.

3. Click the **Application** tab. Clear the **Prompt for Object Name on Drop** check box, and select **Switch on auto-connect by default**. Then click **OK**.

   Now we are ready to draw the network.

4. Make sure the **Connector** tool on the Visio standard toolbar is selected.

5. Using the flow diagram, drag node N1, pump pmp1, and nodes N2, N3 and N4. VisualFlonet connects the items and automatically names them. Before adding node N5, click node N2 to make sure node N5 is connected to N2 and not N4. Complete the drawing by adding N6.

   That was easy wasn’t it? Next we need to enter the process data. Let’s begin by adding the inlet and outlet pressures using the Node Conditions Editor.

6. Click the **Edit Nodes** button on the toolbar to open the Edit Nodes dialog. Enter the pressures as defined in the flow diagram: 1 bar at N1, 0.4 bar at N4, and 0.6 bar at N6. In the Height column, type 5 for the height above the datum point for each of the nodes N3, N4, N5, N6 and N1. Click **OK** to save the data.

   The Edit Pipes dialog lets you specify the pipe data. VisualFlonet add the connections automatically. You can rename pipes but you can’t add or delete them. Let’s start by adding the data for the first pipe and find out about the various tools for helping us. There are calculators for Pipe Inner Diameters, Pipe Roughness, and K-Values.

7. Click the **Edit Pipes** button on the toolbar to open the Edit Pipes dialog. Click the **Length** cell for P1 and enter 50. Click the **Inner Diameter** cell for P1, right-click and click **Pipe Inner Diameter Calculator**. When the calculator appears select a 2” Schedule 40 / STD / 40S pipe and click **OK** to return the result.
to the cell. Click the Roughness cell, right-click and click Roughness Calculator. Select Mild Steel (slightly corroded) and click OK to return the value to the cell. Click the Fittings Loss Coefficient cell, right-click and click K-Value Calculator. When the calculator opens, click the Bends tab, type 500 in the radius box and 4 in the Quantity box and click Add. Click the Summary tab to see the K-Value summary and then click OK to return the result to the cell. Click the Temperature cell and type in 40.

That's the first pipe done. Now add the data for the other five pipes using the information in the above table. Try using the special Cut & Paste commands on the shortcut menu to paste the Roughness into all the pipe roughness cells. Remember to double-click the valves in the K-Value Calculator to show the required options. Why not try adding the data for one of the pipes by double-clicking the pipe in the drawing; you will still have access to all the calculators.

We've entered a lot of data now so it's a good idea to save the drawing at this stage.

8. Click the Save button on the toolbar and save the data in VisualFlonet.VSD on the C:\ drive

Next we need to enter the Pump characteristics. We could use the Pump Editor on the VisualFlonet toolbar but there is only one pump so we will use the editor for a single pump.

9. Double-click the pump pump1 in the drawing to open the Edit Pump dialog. Click the Characteristic Pump Curve tab and set the Number of points to 3. Using the graph above, type in the following three pairs of values for Head and Flow:

   25.0, 0.0  
   24.0, 0.006  
   21.0, 0.012

Finally, we need to add the physical properties. To do this we need the Physical Properties Editor dialog.

10. Click the Physical Properties button on the VisualFlonet toolbar to display the Physical Properties dialog. Select Liquid as the Fluid Type then enter the following 3 pairs of temperatures and pressures: 0.1bar & 10°C, 1bar & 20°C, 2bar & 40°C. Next click Calculate to calculate liquid density and viscosity.

The Physical Property Calculator opens.

11. First select the components. (If some are already present, click Clear Worksheet to remove them.) Click Add Component and type W in the Search for Name box. Four components are found beginning with the letter W. Click Water and then click Add to Stream. Next, delete W from the Search box and type in ET for Ethanol. Select Ethanol from the results and click Add to Stream then Close.

The last thing we need to do for the physical properties is to specify the composition. You can use the spreadsheet to specify the stream composition, both in terms of moles or mass, and as quantities or fractions.

12. Click the Mass Fraction cell for Water to give it "focus". Enter 0.5 for both Ethanol and Water. The Physical Property Calculator updates the spreadsheet. If you wish, the Calculator will also normalise the values if they do not add up to 1.

All that's all the input we need to calculate the physical property data so …

13. Click Calculate to calculate the liquid densities and viscosities at each of the 3 sets of pressure and temperature. Click OK to close the Physical property calculator and automatically transfer the results back to the Physical Properties Editor. Finally, click OK to close the Physical Properties window

That’s it for the input data for VisualFlonet. Now we’re ready to run the calculation.

14. Click the Calculate button on the VisualFlonet toolbar. The hourglass appears until the calculations are complete when the hourglass disappears and the results appear in the Results window.

You will see that the calculated flowrates are 2.55 kg/s at the inlet, and 1.33 kg/s and 1.22 kg/s at the outlets N4 and N6 respectively.

And that’s it! If you still have some time, try doing a Pressure calculation by specifying the inlet and outlet flows.