Mercury Flow in a Nozzle Pipe With a Semicircular Weld

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Mesh for the Pipe

Fig. 1 Mesh instruction for the 90°/90° pipe
Mesh Tables

<table>
<thead>
<tr>
<th></th>
<th>$n_r$</th>
<th>$n_\theta$</th>
<th>$n_z$</th>
<th>$n_{tot}$ (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesh0</td>
<td>65</td>
<td>32</td>
<td>260</td>
<td>0.533</td>
</tr>
<tr>
<td>Mesh1</td>
<td>77</td>
<td>40</td>
<td>274</td>
<td>0.833</td>
</tr>
<tr>
<td>Mesh2</td>
<td>90</td>
<td>48</td>
<td>294</td>
<td>1.26</td>
</tr>
<tr>
<td>Mesh3</td>
<td>257</td>
<td>48</td>
<td>623</td>
<td>7.655</td>
</tr>
</tbody>
</table>

For mesh3 when total grid number is 5.5 million, the height of first cell near wall is $4.864477 \times 10^{-5}$, and more than 20 cells within $Re_y = 200$.

\[
Re_y = \frac{\rho y \sqrt{k}}{\mu}
\]

\[
\Rightarrow y_{Re_y = 200} = 1.0506 \times 10^{-4} \text{ m} = 4.679 \times 10^{-3} \text{D}
\]
(a) Grid# = 7.65 Million (time set = 6000)
Computation crashes even at 1st order solver

(b) Grid# = 4.0 Million (time step = 99,000)

(c) Grid# = 5.5 Million (time step = 144,000)
(still running)

Fig. 2 Axial velocity at the exit plane (parallel computation) for different meshes