# CL254 Project

Group 7 Presentation : Flow pattern in a diverging channel under laminar conditions


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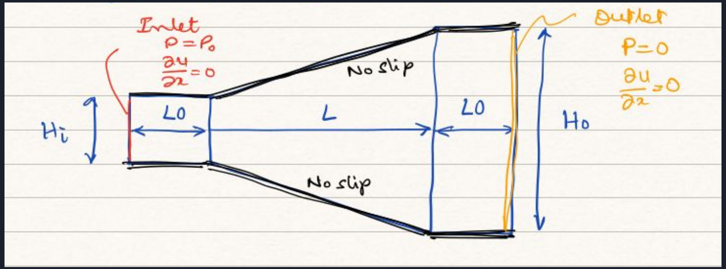
# Problem Statement :

Flow pattern in a diverging channel under laminar conditions.

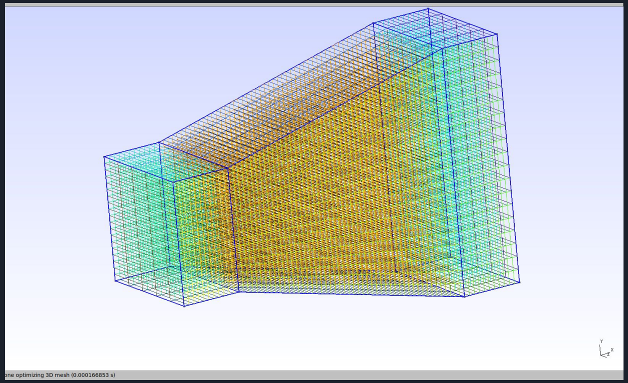
- For a given geometry, use a $\delta t$ that gives a stable flow i.e. velocity profile does not change and a mesh that is fine enough so that the flow is mesh independent.
- For a given geometry use different values of $P_o$ to obtain $\Delta P$ v/s flow rate curves for the flow.
- For a fixed value of $P_o$ use different values of $H_i$ to study how the flow rate varies. Use a large enough value of $P_o$ so that $R_e >> 1$ but the flow is laminar.
- Obtain streamlines for the flow and check for boundary layer separation.



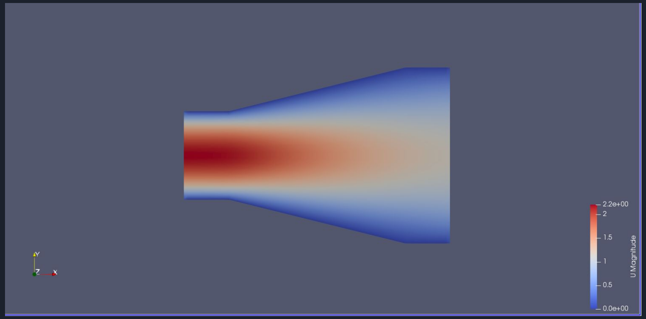

NOTE: p in the simulations is P/$\boldsymbol{\rho}$

# Solution :

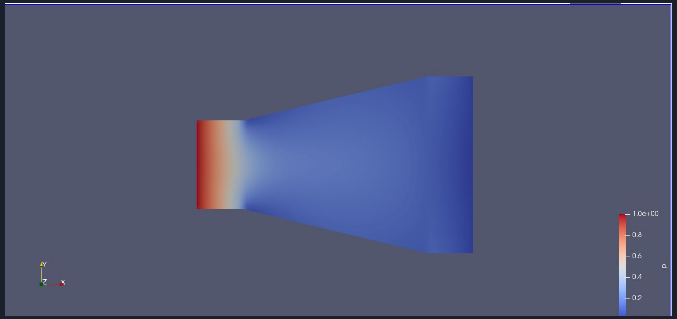
Geometry provided :



a). Using icoFoam we get,



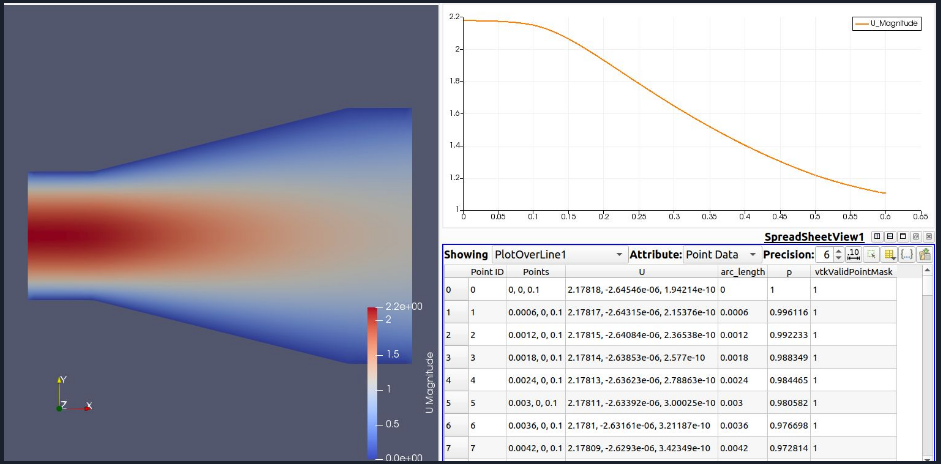

Velocity profile

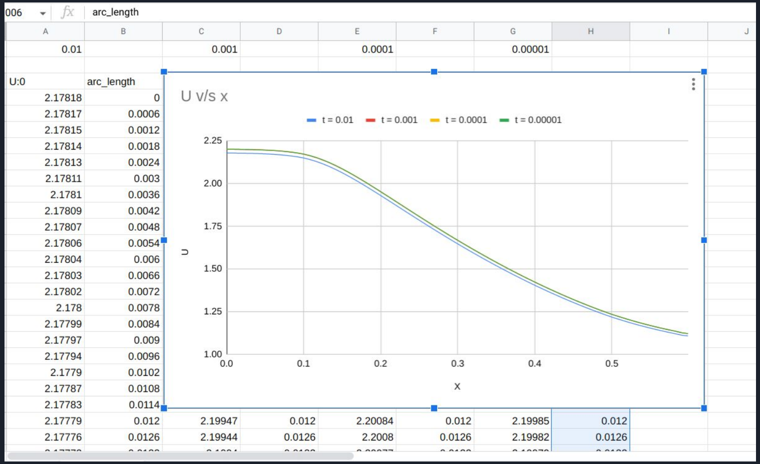



Pressure profile

b). We plotted the velocity curve for different value of $\delta$t and plotted all those curve on excel plot, to compare when the curves overlaps.

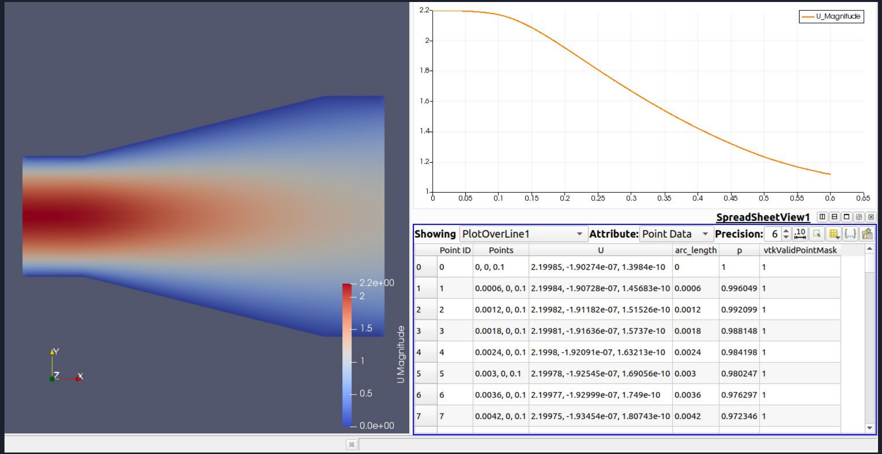
One of the plots is this,

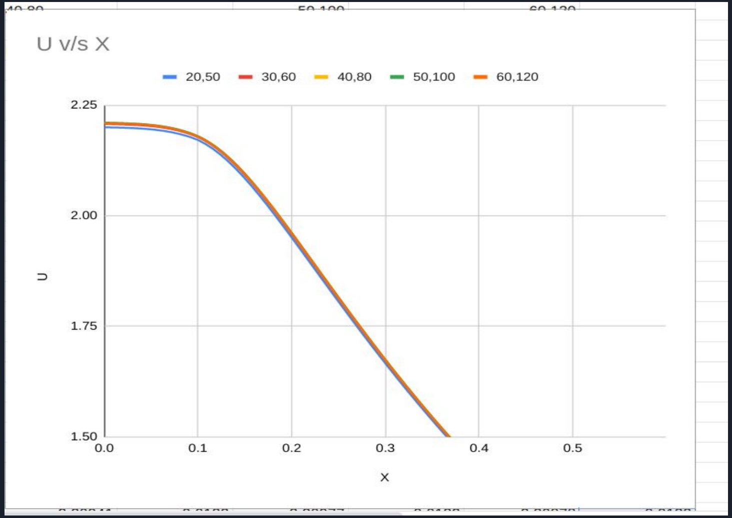



$\delta$t =0.001

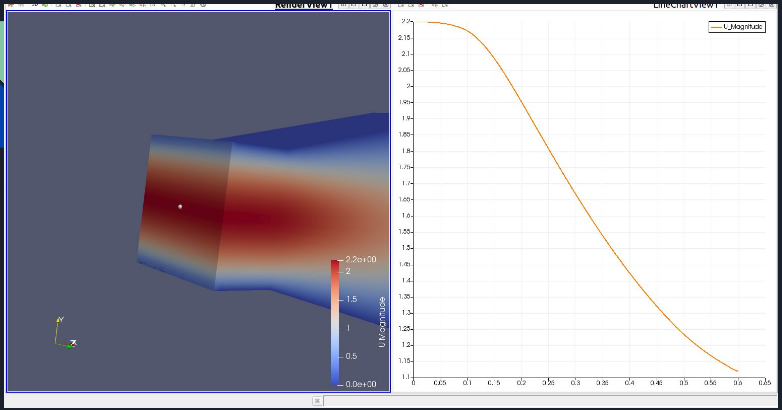
b).For this again we plotted the velocity profile for different mesh refines and then plotted them on the same graph.

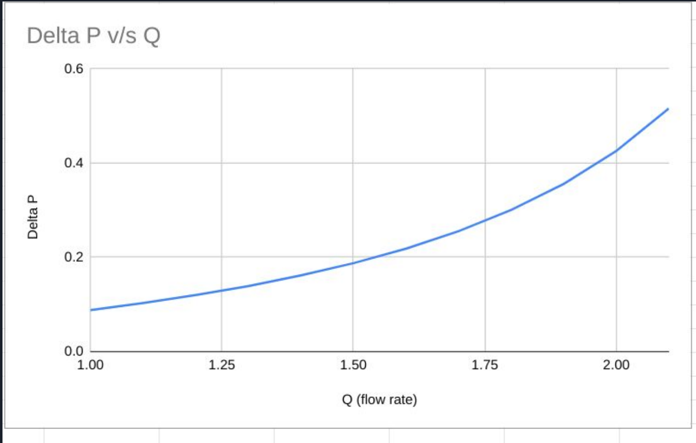


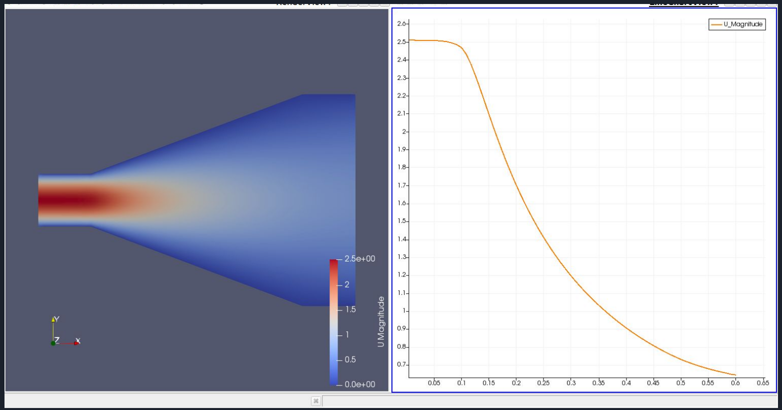

NH=20; NL=50;

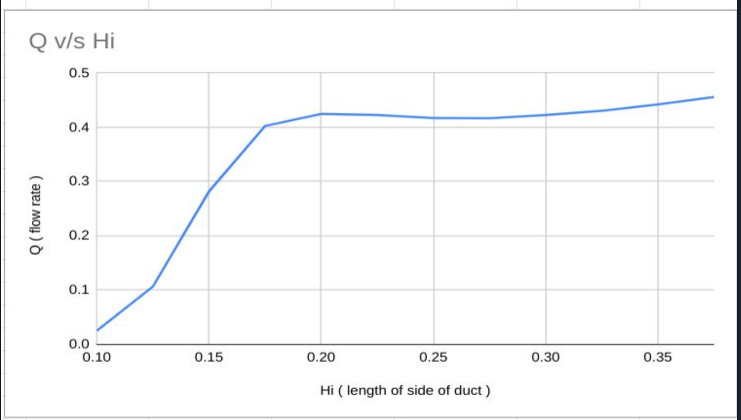
## c). Delta P v/s Q curve



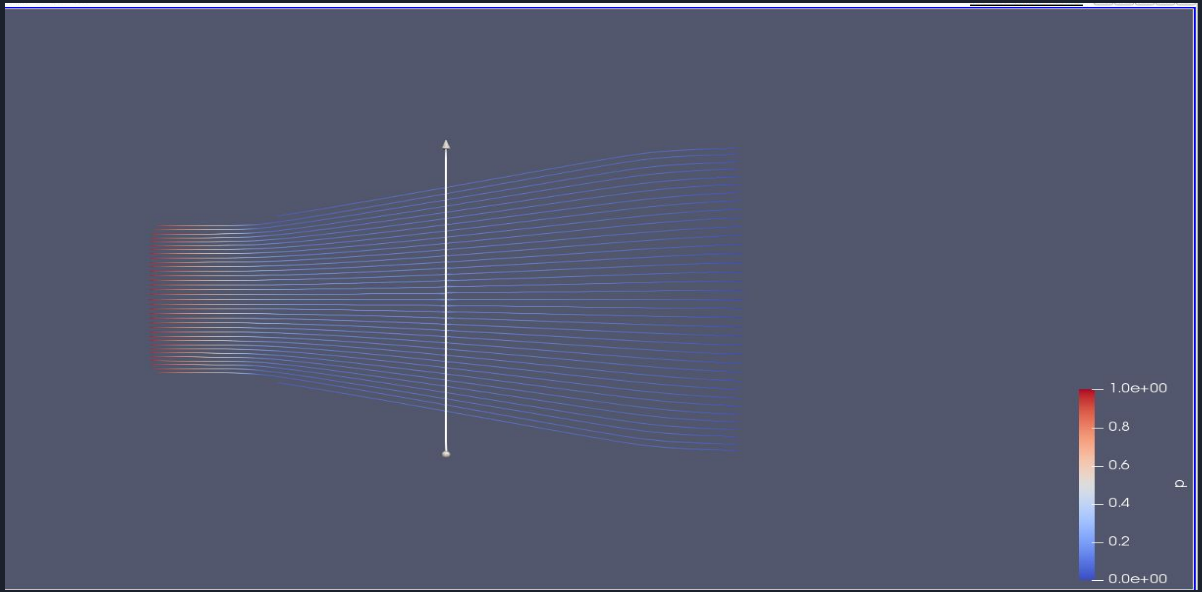




## d). Q v/s Hi curve



## Streamlines :




Note that here pressure does not get negative at any point in the flow. Therefore there is no formation of boundary layer.


thank you