STUDY OF IMPINGING JET USING FLUENT AND LES

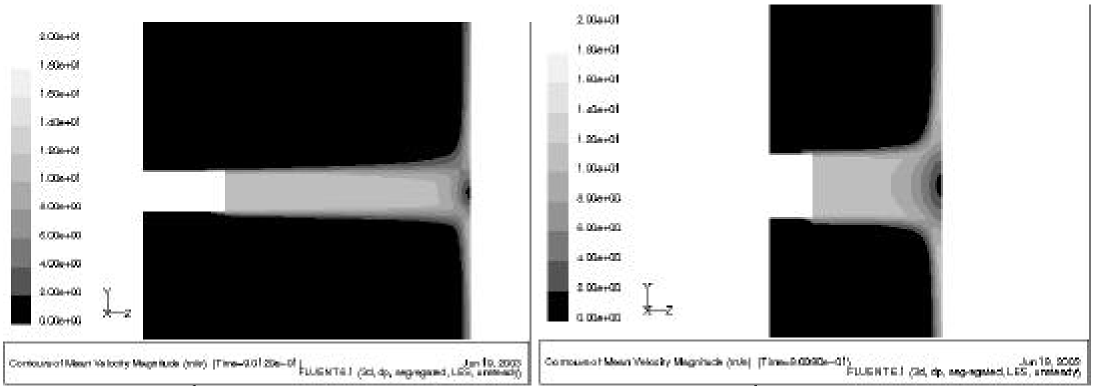
Ayse Yüksel, Turkey
Supervisors: C. Benocci & Ph. Planquart

Jet impingement has been encountered in many industrial and engineering applications such as vertical take-off and landing (VTOL) aircraft. Impinging jets have also been used as an effective method to enhance or suppress the heat transfer.

In this study, Large Eddy Simulation (LES) was performed to simulate the impinging round jet by using FLUENT. The simulations have been done for Reynolds number, Re=70000 and two different impingement distances which are H/D=2 and H/D=6. Two different grids were composed, after testing the grids one of them was chosen to use in the simulations. The evaluations of the simulation were done against to experimental data (ERCOFTAC database). In consulting of the results, the grids, which were performed, were enough to solve the mean velocity but not enough to solve the fluctuations. To be able to catch the small-scale fluctuations the grid where close to the wall must be finer.

In the simulation two different discretization schemes were performed, 2^{nd} order upwind and QUICK. It has been seen that QUICK scheme didn't develop the numerical solution. For sub-grid model Smagorinsky-Lilly sub model and MILES were used. The MILES method caused deviation where the flow is close the wall. The spatial discretization was 2^{nd} order. Potential core length plotted to. It shows that grid must be finer to. The vorticity behavior was observed in the simulations. It seems that vorticity has influenced the pressure and wall shear stress along the wall.

Figure 1 shows the contours of average velocity for two different jets to plate distance.



a) H/D=6, 2^{nd} order, C_S=0.1 *b) H/D=2, 2^{nd} order, C_S=0.1*

Figure 1: Average velocity contours in the flow field