Summer Internship at Karlsruhe Institute of Technology (KIT)

I am Arijit Majumdar, a 4th Year Dual Degree student in the Mechanical Engineering Department, IIT Kharagpur.

I did my summer internship at Institute of Catalysis Research and Technology (IKFT) at KIT under the supervision of Dr. Martin Worner, Head of Multiphase Flow Group. The topic of my research project was "*Phase field simulation of parasitic currents and droplet impact phenomena*" using the *phaseFieldFoam* solver in open source CFD package OpenFOAM version 1.6. The duration of my internship was from May 2nd, 2018 to July 17th,2018.

This was a completely new and memorable experience for me. I interacted with different people who are working in my field of interest, which is computational multiphase flows. This helped in enhancing my knowledge and developing my skills. Dr. Worner was very friendly and helpful and because of his proper guidance, I managed to complete the tasks assigned to me within the period of my stay over there. He also gave me access to the BW Unicluster on the very first day of my internship. I have used the cluster to run all the simulations and also gained some experience with handling super-computers.

As the topic suggests, there were actually two parts of my project. One was to simulate parasitic currents in droplet inside a gravity-free domain. This gave an idea of the numerical errors in the code. The second part of my project included simulation of the impact of Adblue droplet on a superhydrophobic surface. Adblue is a solution of urea, which is used inside the catalytic converters of a diesel-powered car to reduce emissions. But often there is deposition of Adblue droplets on the walls of the converter which becomes solid deposits and increase the emissions. In order to solve this issue, the walls can be made superhydrophobic so that the droplets bounce off after hitting the wall. I studied the different impact velocities for several drop diameters at which rebound and deposition take place. I also performed validation studies of the numerical results with experimental data and studied the influence of various phase-field parameters, numerical schemes and solution algorithms on the simulation results.

In the end, I gave a presentation on the work that I did. Both my supervisor and Dr. Olaf Deutschmann, Head of IKFT and ITCP, were impressed by my work. The results that I obtained will be put in a journal paper with me as a co-author.

Thank You

Arijit Majumdar