DEVELOPMENT OF AN ACCURATE PROCESS WORKFLOW FOR SIMULATION OF A GAS LIQUID CYCLONE SEPARATOR IN AN OPEN-SOURCE ENVIRONMENT

ANIMESH RANJAN[1], SWAMI VENKAT[2],ROMIT MAULIK[3] , FLAVIU SIMON[4]
[1]*Technische Hochschule Ingolstadt, animesh.ranjan@gmx.net*
[2]*Numerics GmbH, swami.venkat@numerics.de*
[3]*Oklahoma State University, romit.maulik@gmail.com*
[4]*Bauhaus University, flaviu.bogdan.simon@uni-weimar.de*

Keywords: *Cyclone Separator, 3D Fluid Flow Simulation, Fluid-flow Optimization*

Cyclone separation is a technique to separate particulate matter or a given gaseous phase from a fluid jet using rotational effects and gravitational forces. They are employed in sawmills, oil refineries, cement industries and is also the fundamental principle of several everyday appliances such as vacuum cleaners. The widespread utilization of Cyclone separators has prompted a deeper understanding of an otherwise complex phenomena. With the advent of advanced CFD approaches and enhancement of computational resources, fluid flow in a cyclone separator can be understood beyond basic analytical methods such as Stokes' law. The paper discusses the intricacies of generation of a process work-flow for 3D fluid flow simulation in a Gas Liquid Cylindrical Cyclone Separator (GLCC) using open-source environment such as Salome, OPENFOAM and Paraview. The main idea is to generate a robust work-flow which addresses the uncertainties in the boundary conditions, turbulence models and other flow parameters, thereby seeking to achieve improved correlation between experiment and CFD simulation. The process includes several stages of complexity identification, model evaluation, simplified model development and Best FIT design identification. The overall results show highly accurate agreement between experiment and simulation and could pave way for greater understanding of the physical phenomena in GLCC separator. Moreover, the implemented methodology is designed to serve as a benchmark for design development and flow optimization studies.

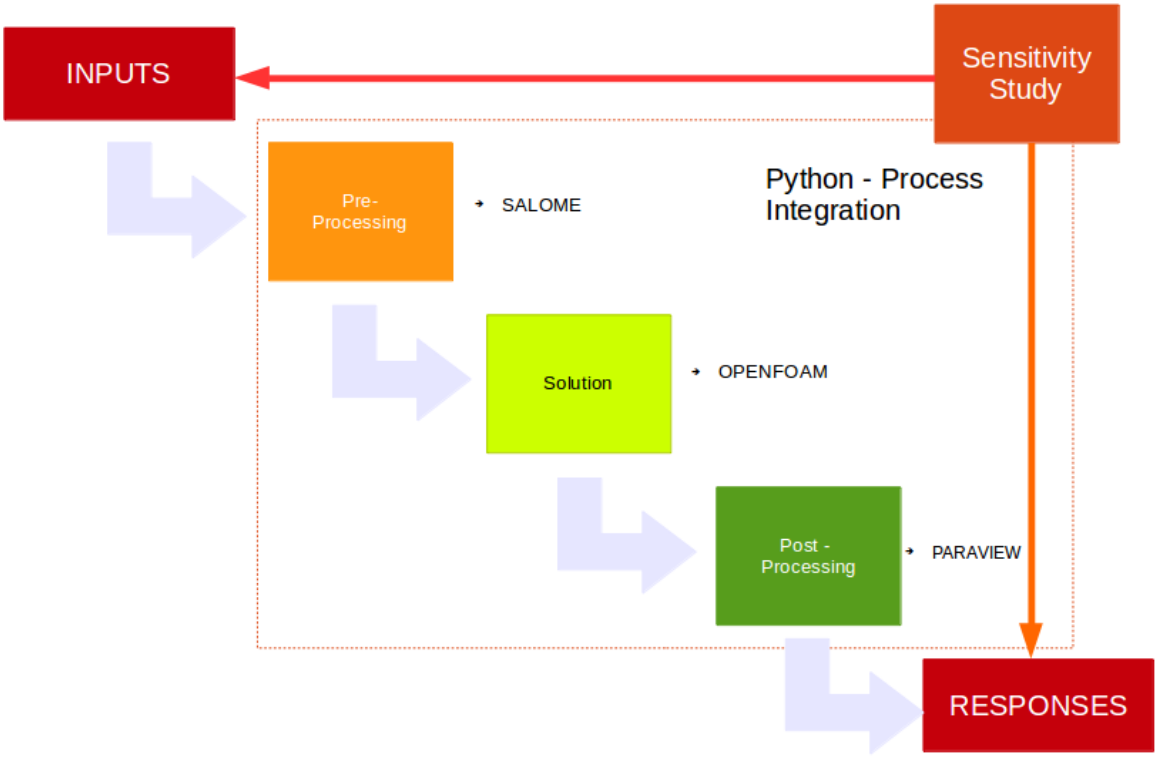

Figure 1: Process Flow Chain for 3D GLCC Simulation