## Multiphase Flow

Among many new features, STAR-CCM+ V2.10 introduces a Lagrangian multiphase flow capability. From calculating the impact of rain droplets on the windscreen of a car, to predicting the erosive effect of small particles of sand carried in an oil pipeline, the Lagrangian models allow users to simulate the transport of solid particles, liquid droplets or bubbles of gas by a background fluid. The trajectories are calculated from the inertia, hydrodynamic drag, and gravitational forces acting on each of the particles, droplets or bubbles (known collectively as discrete phases), for both steady and unsteady simulations.

CD-adapco's VP of Product Management, Jean-Claude Ercolanelli explains:

"From the beginning, a key aim of our development program was to make STAR-CCM+ the industrial code of choice for multiphase applications. In the past twelve months we've partly achieved that goal, with the introduction of what is widely regarded as the most comprehensive free-surface modeling capability available in a multipurpose CFD code. The introduction of Lagrangian multiphase into STAR-CCM+ V2.10 is also a significant milestone, enhancing an already recognized capability for efficiently solving large and complex problems."

"In developing the Lagrangian models we have leveraged twenty years of experience as the leading provider of CFD to the automotive industry, to provide an efficient framework for tackling difficult problems - such as vehicle soiling, or erosion in long pipelines – which, although previously possible in principal, have proved difficult to solve in practice," says Ercolanelli. "STAR-CCM+ V2.10 brings the routine solution of these multiphase problems, and many others, within the reach of every CAE engineer."

The multiphase capability of STAR-CCM+ V2.10 is further enhanced with the addition of a compressibility option for free-surface calculations that will allow users to simulate the progress of pressure waves through liquids and to consider the influence of compressibility in regions of mixed vapor and liquid, in which the speed of sound is often lower than in either the liquid or vapor phases individually.

"Based around a single integrated process that includes automatic surface repair and solution-efficient polyhedral meshing, STAR-CCM+ already provides the fastest, most automatic route from complex CAD to CFD solution," says Jean-Claude Ercolanelli. "For STAR-CCM+ V2.10 we have continued to focus our efforts improving the capability to handle very large size models, speeding up and refining that process by introducing additional capabilities for managing surface regions, and by providing a new boundary mesh extrusion capability"

Although STAR-CCM+'s surface wrapping capability automatically repairs complex or 'dirty' imported CAD, a typical first stage in performing a simulation can be to group specific areas into contiguous regions that are used to prescribe boundary conditions. In STAR-CCM+ V2.10 that process is improved with Boolean operations on surface regions: adding, subtracting or intersecting multiple surface areas to create the required leak-free fluid domains.

The boundary mesh extrusion capability is useful for offsetting the boundary mesh to generate ducts or to extend the computational domain. In both cases the extruder-mesher generates high-quality prismatic elements that are conformal with the volume mesh.

This release also features the addition of a dedicated heat exchanger model for use in underhood thermal management simulation.

The benefit brought by the parallel client / server architecture has also been reinforced to enable true collaborative teamwork. Multiple STAR-CCM+ clients can now connect on the same STAR-CCM+ server and interact together for their design reviews phases.

## About the Author

David is an experienced writer with expertise in writing about CFD Solutions, CFD Softwares & CAE.

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