Three-dimensional simulations of flows with moving boundaries with a local ALE method

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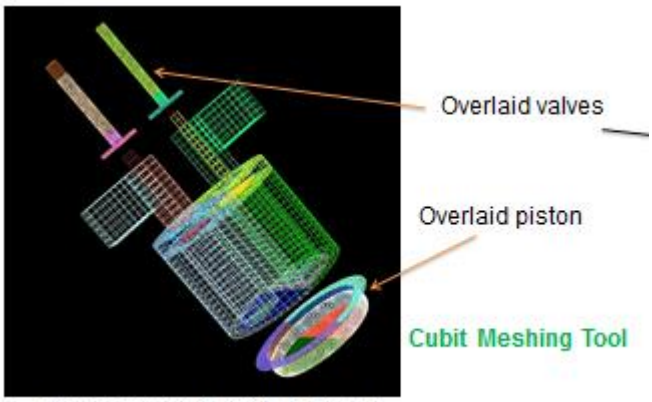
ABSTRACT

A numerical method for fluid flow calculations in domains containing moving rigid objects or boundaries has been developed. The method falls into the general category of Arbitrary Lagrangian - Eulerian (ALE) methods and differ from previous formulations in that it is based on a fixed mesh. The mesh is modified locally in space and time to describe the moving interfaces that are described by sets of "marker" points. The interfaces are allowed to move independently over the mesh. The method is shown to be fully robust; it never requires re-meshing or interpolation, it is incorporated into the Los Alamos National Laboratory KIVA simulator for internal combustion engines.
The accuracy of the algorithm is assessed and examples of application in incompressible flows are shown that illustrate the robustness of the technique and its full capability to perform simulations involving irregular meshes and moving boundaries of complex shape.



Test Engine with 3D ALE begins