Coupled Simulation of Mixture Formation using GT-POWER and STAR-CD

John Silvestri
Gamma Technologies

Mark Patterson
Computational Dynamics (Germany)

Goals of Coupled Simulations

- Correct prediction of cylinder filling using accurate boundary conditions
- Prediction of fuel-air mixture entering the system
- Three-dimensional calculation of the scavenging process
- Preparation for a possible combustion calculation

Setup of Coupled Run

- Inlets at transfer ports are pressure boundaries with specified fuel-air concentration
- Exhaust port is a volume-averaged pressure boundary
- STAR-CD uses multiple-cycle event file without combustion
- Boundaries chosen such that flow is one-dimensional
- System starts at atmospheric pressure and 20 C.

Summary

- Setup of the model is quick and thoroughly described in the GT-POWER documentation
- The length of the CFD calculation is minimally affected by the GT-POWER coupling
- Three-dimensional output clearly shows where improvements in mixture formation can be obtained
- Combustion calculations based on this method could be run to predict engine performance