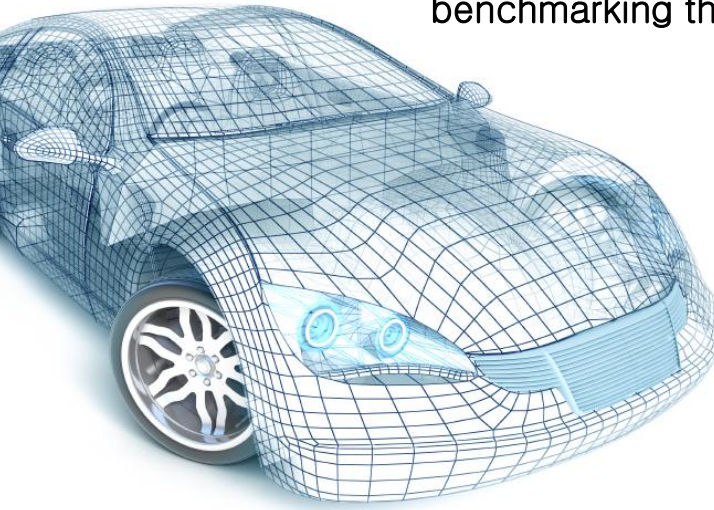


fuels, combustion & emissions analysis in a fraction of the time

benchmarking the srm engine suite against 3D-CFD



Both 3D-CFD and srm engine suite simulators offer the capability of combustion, heat release and emissions analysis using “*physics-based*” sub-models and can be considered more “predictive” than equivalent empirically based methods.

THE CHALLENGE

To compare the predictive capabilities of 3D-CFD and the srm engine suite. The engine analyzed was a VM MOTORI 2516 Turbocharged 4-valve D.I. diesel engine with common rail injection system

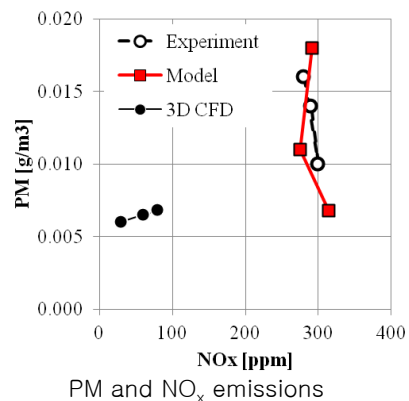
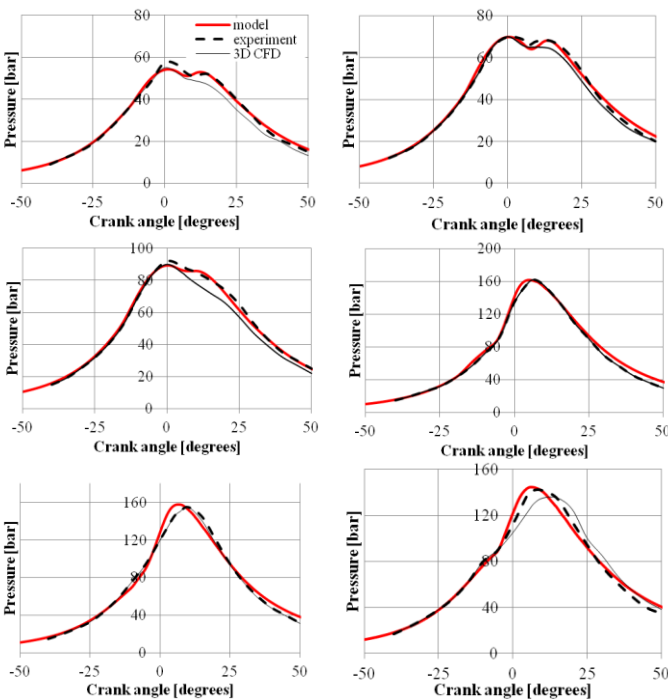
COMBUSTION & EMISSIONS COMPARISON

A series of computations using 3D-CFD and srm engine suite were carried out over a range of injection timings, engine speeds (1635–2773 rpm), injection timings and injection pressures (590–1310 bar), and fuel loading. The srm engine suite was calibrated against a single operating point, with a blind test completed for 5 further operating points. Results are presented on the left.

As observed, no notable difference in performance between the two modelling techniques are observed, with best performance favouring that of the srm engine suite. The emissions of NO_x and PM comparison is presented below, results again favouring the srm engine suite.

In this example, both simulators achieved similar results but the srm engine suite proved more efficient (by 1000 times) in terms of CPU time. This ultimately makes it favourable for both calibration and design optimisation exercises.

More details of this analysis are published in the SAE paper 2013-01-0308.



SUMMARY

- A heavy duty CIDI engine was simulated
- A blind test of the srm engine suite and 3D-CFD was carried out over full load-load speed range
- Equivalent heat release/emissions results but CPU time is around 1000 times shorter for srm engine suite