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Optimiztion of Diesel Injection using Grid Computing

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Despite the knowledge of the turbulence as one of the factors inducing jet atomization, improving the mixing of air and fuel, and therefore combustion, there are still many unresolved questions about the interaction between the turbulence and cavitation, and its effects on the development of Diesel jet.
This abstract shows the results of a study using grid computing to model the internal flow of diesel jets in cavitating conditions and including the effects of turbulence by RANS and LES methods.
This study involved the execution of over 500 RANS and LES simulations, evaluating the influence of the position of the needle on the internal flow for 3 levels of injection pressure and 21 discharge pressures.
The execution requires the use of OpenFOAM, which requires a complex installation and configuration, being an interesting case for IaaS. The performance obtained using directly WMS-enacted jobs is being compared with the use of DIRAC framework for pilot jobs.

Wider impact and conclusions

The results obtained in the simulation were compared with experimental results, that revealed a high level of correlation of the model. The parametric simulation shows differences in the various internal flow behavior depending on the position of the injection needle, which are of high importance for the end user.

URL(s) for further info

http://www.e-ciencia.es/wiki/index.php/Cavigrid

Description of work

The work was developed in the following stages
- Set-up of the prototype for execution in Grid.
- Experimental characterization of hydraulic nozzles.
- System implementation in production infrastructure.
- Parametric study using the grid.
- Comparison of experimental / numerical results and analysis.

The parametric study required the customisation of the software to be used in the WN nodes as a deployable package. The execution involved 00 RANS and LES simulations, evaluating the influence of the position of the needle on the internal flow for 3 levels of injection pressure and 21 discharge pressures.

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