Detroit Engineered products (DEP), is an engineering services, product development, software development, consulting and talent acquisition company. Since its inception in 1998 in Troy, USA, DEP is now a global company with footprints in Europe, China, Korea, Japan, and India. DEP uses the accelerated and transformed product development process, accomplished by utilizing our proprietary platform, DEP MeshWorks, which rapidly reduces the development time of products for all segments. The MeshWorks platform delivers tool sets that accelerate virtual validation activities associated with powertrain development across all stages for both convnetional and electric powertrain.

Several tools in MeshWorks have been created with deeper understanding of the needs in a powertrain engineering team. Tools like rib addition, feature removal, model checker, fuse welding, wall thickness reduction options, design space building tools and other model assembly tools have accelerated the way engineers perform model changes for what if studies and optimization.

DEP's IC sensor (In-Cylinder) offers comprehensive portfolio of combustion analysis to the engine design and testing teams in terms of real-time gathered data and make decisions considering emissions, combustion, timing, pressure pattern and performance parameters. This is applicable for single and multiple fuel engines.

The DEP TRIO of IC Sensor, MeshWorks tools and proven technological processes like MDO can significantly add value to Powertrain Engineering.

DEP

Smarter solutions. Realized.

ADVANCED POWERTRAIN DEVELOPMENT

Introduction:

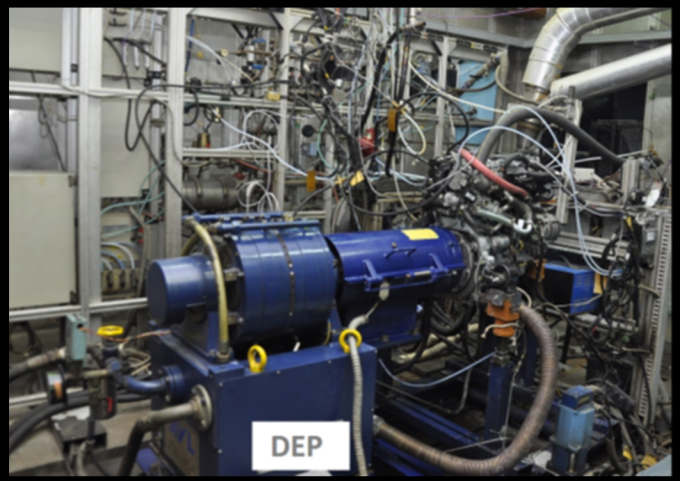
DEP does extensive research and development work for advanced powertrain development using the Model based system engineering approach. DEP provides CAE Solutions with high fidelity digital simulation model for Performance, Thermal Management, Fuel Economy, After-treatment System, Lubrication System and Competitor Benchmarking.

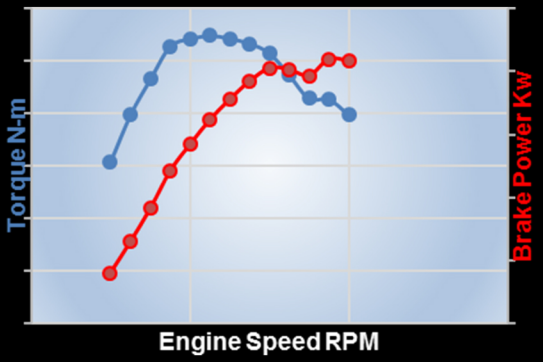
Advanced Engine Development:

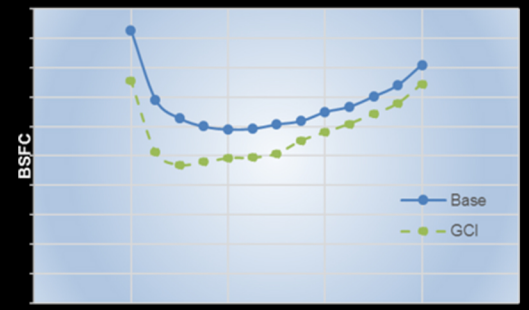
- Gasoline compression ignition engine technology is developed to improve Performance, Fuel Economy and Significant Emission reduction.
- Developmental work includes:
  - Engine testing
  - 3D CAD Modelling
  - CAE Simulation for fluid flow analysis and design optimization
  - Combustion and Emission prediction
  - Fuel injection strategy building
  - Performance calibration of test and simulation

Engine Testing:

Engine test is carried out to measure performance parameters and emission characteristics under multiple operating conditions in Wide Open Throttle (WOT), Part load with various fuel injections and compression ratio strategy.

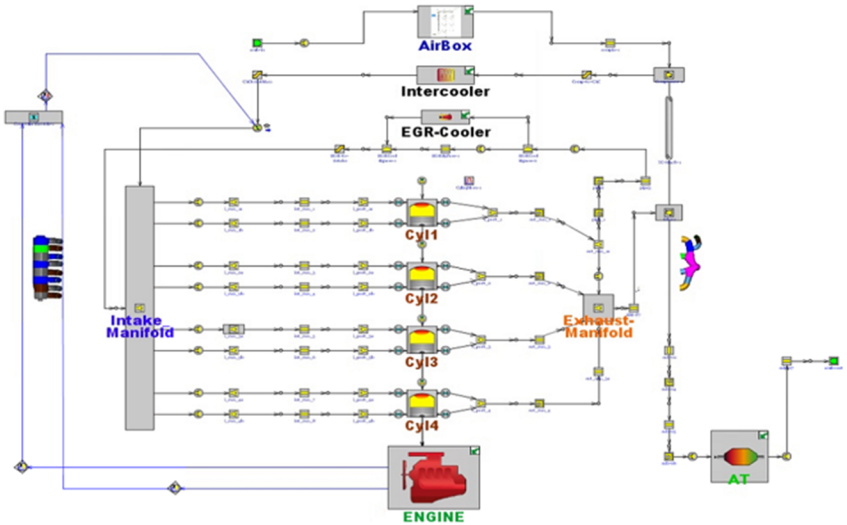






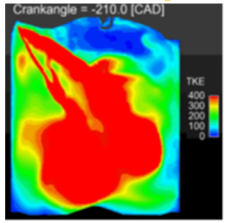
1D Engine Simulation Methodology & Calibration

- 1-Dimensional Engine model development using GT-Suite from 3D CAD model and technical specification data to replicate physical engine characteristics.
- 3D Combustion model developed to predict the detailed combustion kinetics, spray behavior and estimation emissions.
- Multiple iteration of simulations carried to calibrate the model with test data for performance, fuel economy and emission.

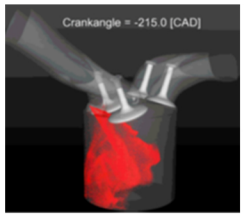


3D Model Set-Up Picture

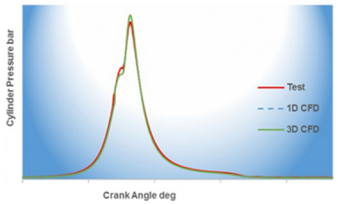
In-Cylinder Temperature



Spray Distribution

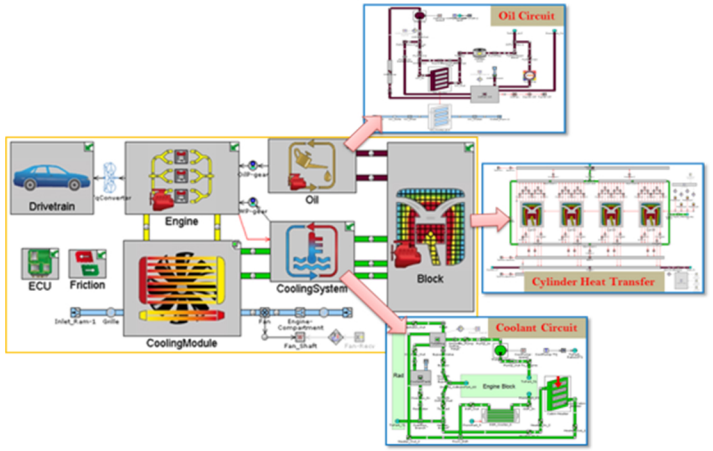


In-Cylinder Pressure



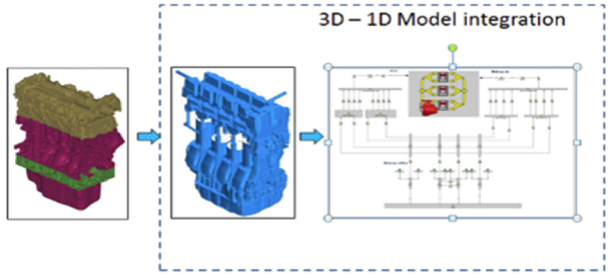
Advance 1D CFD Simulation Developments

- Detailed modelling & building the vehicle thermal management system with the integration of built-in Finite Element cylinder structure has been carried out by DEP's team for the actual prediction of heat flow and heat loss throughout the system.
- Coolant circuit developed to remove excess heat from the engine to maintain a consistent engine temperature and to help a cold engine warm-up quickly, in addition to the objective of improving engine fuel economy and emissions.
- DEP have developed a detailed Lubrication model of crank train system for analysing & optimizing the performance of lubrication systems.
- Steady state model development with sub-assembly model integration (Crank train & valve train) is developed by DEP's team to actually predict the bearing loads.



Positive Crankcase Ventilation:

- DEP ensures broad application of 3D – 1D integrated modelling & simulation to analyse the crankcase pressure inside the engine & the blow by production as a function of speed & load via PCV valve.
- The simulation focusses on performance optimization of PCV system by accurately matching the ventilation flow with blow by production characteristics while engine performance and drivability remains unaffected.



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