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 conventional and electric powertrains.

DEP provides complete powertrain solutions to its customers over and beyond engineering analysis and optimization. The team at DEP has the expertise to support customers on both conventional and electric powertrain development. DEP labs have bench set up for experimental studies related to power train CFD. Besides reverse engineering facilities, the embedded systems team at DEP has developed a one of its kind complete dosed loop in-cylinder sensing system for engines.

DEP

Smarter solutions. Realized.

POWERTRAIN SOLUTIONS

Battery system modeling & performance

Motor- Reverse engineering and performance – Mechanical & electric

Power electronics performance & reverse engineering
Complete system modeling at P/T or vehicle level

- Engine system modeling & performance
- Reverse engineering
- In-cylinder sensing
- Bench testing
- Gear system design
- Transmission system performance

- Engine
- Transmission system

- Drive line NVH
- Axle system performance

Powered by **DEP MeshWorks**

Battery Modeling

- DEP engineers have participated in several vehicle and powertrain programs across the globe. They have access to test beds, that help characterize the battery systems to improve the performance and degradation predictions. The team has a wide expertise to model and analyze battery systems across disciplines(thermal, safety and durability, and across multi-dimensions (1D,2D and 3D).

- Battery system modeling and analysis
  - Cell level and stack level
- Battery system modeling and correlation with bench tests and IR imaging
- Battery characterization for degradation and performance prediction
- Complete battery system modeling and performance prediction for thermal and safety
- Battery thermal management/cooling system
- Battery electrochemical thermal modeling

DEP Mesh Works has extensive automatic time saving tools for battery components, with a versatile tool set for structural, thermal and safety modeling aspects of battery system.

- Battery cell level modeling
- Battery stack-model assembly tools for safety and evaluation Hex modeling tools for battery frame
- Mesh modeling and optimization for battery frame/tray
- Contact definition and input deck creation
- Battery model checking tools
- Skin mesh tools for cell level and mini channel thermal modeling
- Process automation tools for battery system modeling and assembly
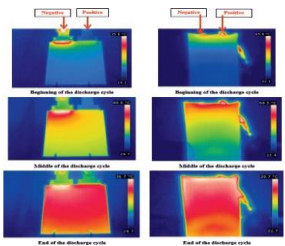
Motors

- Motors and power electronics module are critical parts of an electric vehicle propulsion. DEP engineers have expertise in thermal, mechanical and electromagnetic performance aspects of induction motors, and can support right from the stage of system requirements, till performance analysis and optimization, including reverse engineering and design support. Often this level of support involves working on co-simulation between FE level models and math models. DEP's expertise in handling complete vehicle level programs help with due consideration to integration aspects.

- System requirements
- Motor design
- Motor reverse engineering and Benchmarking
- Motor electromagnetic performance
- Motor durability
- Motor thermal analysis
- Motor acoustics
- Math modeling and co-simulation

- DEP Mesh Works has toolsets for modeling an electric vehicle motor system. Typically motor mechanical and electromagnetic performance assessment require good quality FE models.

- Modeling stator, rotor, shaft and casing for mechanical and electromagnetic performance
- Modeling for motor thermal analysis
- Parameterization of geometry for stator and magnet slot
- Wrapper model building tools for motor NVH and acoustics
- Shell modeling, solid hex and tetra modeling to capture complex motor sub components
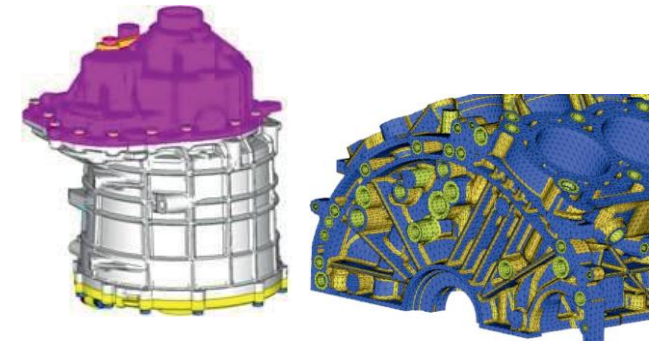- Model assembly tools and process automation for electric motor virtual validation
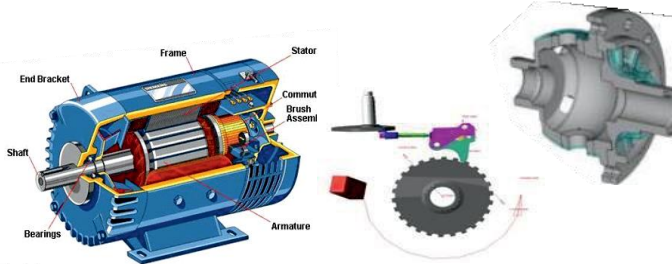
Integrated Electric Drive units

Integrated Electric Drive units play a very important role in electric vehicle propulsion. This is a very compact unit that integrates motor, gear train and parking system. DEP engineers have experience working with the virtual validation of such systems from the durability, NVH, multi body dynamics and optimization aspects.

- Modeling and structural analysis of complete drive unit
- Sub system level modeling, analysis and optimization of gear train
- Performance evaluation and optimization for parking system
- Electro magnetic and electro mechanical aspects of motor Weight reduction of the entire module

Mesh Works has a good set of tools for modeling complex housing, motor sub system, gear train, carrier and parking system parts. It has parametric modeling functions, connection to solvers and optimizers, as well as process automation tools to help accelerate the virtual validation phase for such complex assemblies.

- Modeling stator, rotor, shaft, carrier and casings for mechanical and electromagnetic performance
- Modeling for motor thermal analysis
- Parameterization of geometry for stator, magnet slot, parking system and gear train parts
- Wrapper model building tools NVH and acoustics
- Process integration and automation for optimization