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.

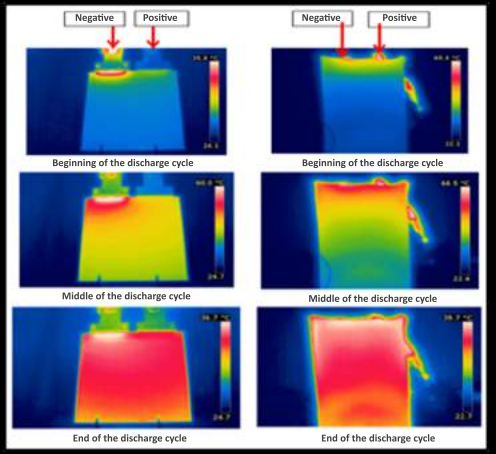
DEP
Smarter solutions. Realized.

BATTERY SOLUTIONS

Electrification is the most viable way to achieve clean and efficient transportation that is crucial for the sustainable development of the world. In the near future, Electric Vehicles (EVs) including Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and pure Battery Electric Vehicles (BEVs) will dominate the clean vehicle market. The key enabling technology to this revolutionary change is the batteries.

Extensive research efforts and investments are made in this advanced battery technologies that are used in EVs

The uptake of today's EVs has a lot to do with the advent of Lithium battery technology. Lithium-ion batteries are comparatively lightweight, energy dense and can be recharged.

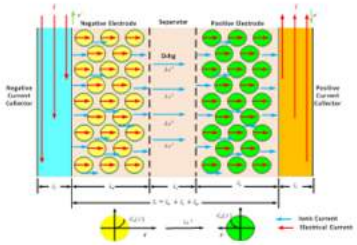


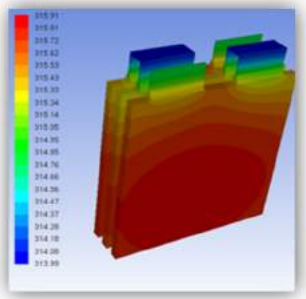
Battery Modeling

• The performance and utility of clean energy mobility models like Hybrid Electric Vehicles (HEVs), Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs) primarily depends on the performance and efficiency of the battery package which is the powerhouse for the above means of transport.

• Usage of battery always leads to heat generation and absorption. Therefore, the design and implementation of a successful thermal analysis phase is extremely important in battery manufacturing. With the precise set of outputs we can measure the impact of every aspect of the battery like raw material used, cell designs and the components that form the design during its performance & life cycle.

• DEP's key capabilities:
- Battery electrochemical model
- Battery thermal model
- CFD model
- Battery degradation model



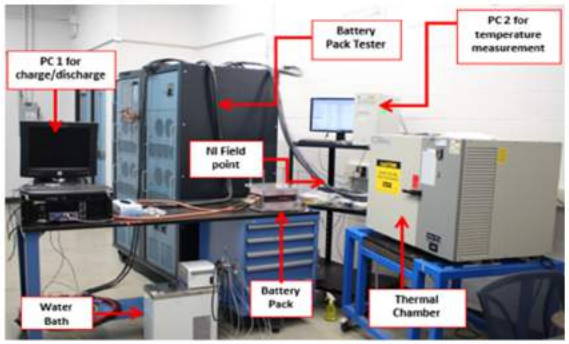


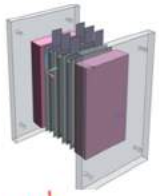
Battery Thermal Testing

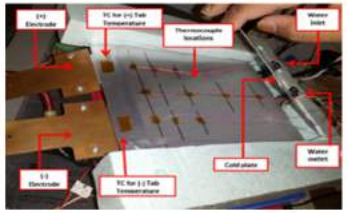
• The apparatus can measure the surface temperature distribution i.e the heat flux near the cathode, the anode, and at the center of the pouch cell along the height of the pouch cell. Also, it measures the heat rejection to the dual cold plates under varied discharge rates with different boundary conditions. All readings are taken for various charge/discharge profile, from several types of batteries with diverse chemistry.

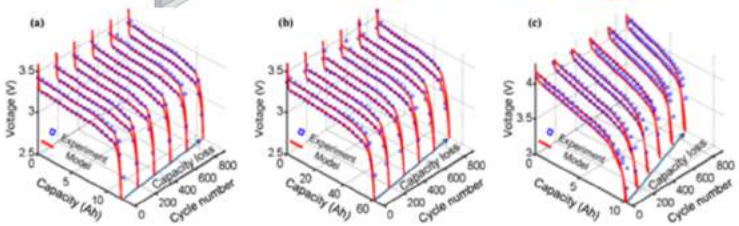
• The IR imaging will visually observe and report the locations of highest heat generation and temperature distribution.

• The effect of discharge rates and operating temperature on the battery discharge capacity can also be determined as a result of thermal testing.









Battery Thermal Analysis

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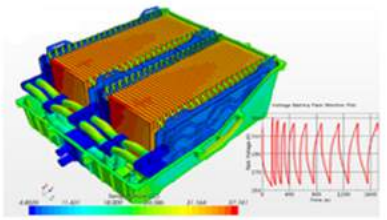
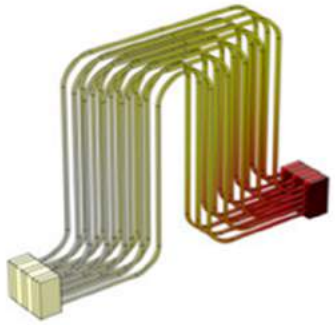
• DEP's key capabilities:
– Thermal abuses (over current)
– Pressure drop and Full CHT
– Sensing circuit analysis
– 1D AMESIM model for system simulation





Coolant channels

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