MeshWorks Parametric FE Modeling engine is a great value add for What if scenarios besides the process automation for setting up connections at battery cell and stack level.

CAD Clean up , battery cell level and stack level modeling → Automation to automate battery cell level and stack level connections → Mesh parameterization tools help "what if" and optimization scenarios

## Challenge faced to study what if scenarios quickly

- Mesh modeling battery at cell level, taking care of connections at cell level and stack level. These are some challenges that engineers face while preparing battery stack model for crash and durability. Mesh Modeling and setting up complete battery stack along with battery housing and cover ready for analysis in short time is also a challenge.

## Solution

- The battery modeling at cell level consist of modeling separator, electrodes and cooling plate along with frame in some designs. MeshWorks shell and hex mesh modeling are well set to take care of modelnig battery at cell level. Connection tools in MeshWorks could be automated to create connections within the battery cell. Process automation in MeshWorks could be used to build complete stack of battery including connections for crash and durability model builds. The high quality tetra mesh comes in handy to create mesh model for battery housing and cover. MeshWorks has tool sets to create model of complete battery system with relevant solver attributes for crash and durability studies.

## Value

- MeshWorks modeling tools are very effective to save time to model battery at cell level. Many times it is combination of hex and shell meshing with connections. Process automation is MeshWorks helps to automate the connections at cell level and at stack level. The tetra meshing tools in MeshWorks takes care of modeling housing and cover for the battery system. The mesh parameterization tools in MeshWorks helps study what if scenarios and also towards optimizing the battery housing and cover without waiting for CAD. Overall MeshWorks tool set saves over 30 % time for battery system virtual validation.
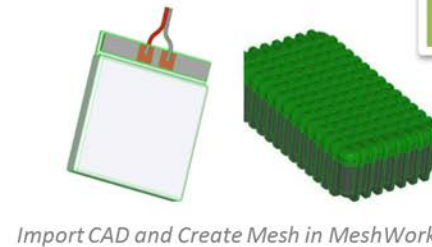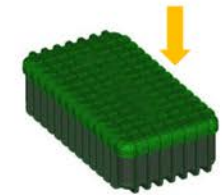


*Import CAD and Create Mesh in MeshWorks*
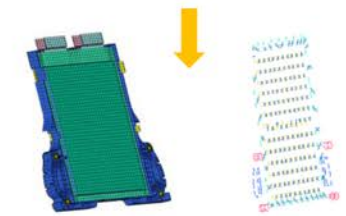


*Cell frame mesh creation and automation for internal cell level connection*
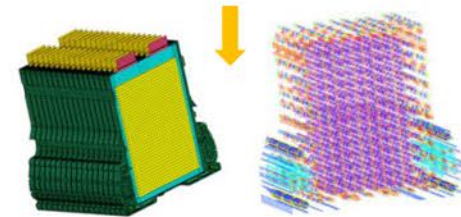


*Complete stack level connection for Crash and Durability Model*



*Complete Battery pack with cell stack ready for integration with vehicle for Crash and Durability*

## Work Flow – Driven by MeshWorks

**Complete Pre & Post Processor**
- Comprehensive FE/CFD pre & post processor with powerful tools for CAD clean-up, meshing (shell, tetra, hexa, hybrid etc.), highly automated model assembly and results processing.
- Complex FE/CFD can be generated 30% faster and with better quality than other competitor products.

**Customized Engineering Process Automation**
- Customer CAE processes can be rapidly automated using a fast Record>Create-GUI>Plumb>Publish process.
- 2X to 10X time reduction can be expected for processes that are repeatable.

**CAD & CAE Morphing Technology**
- Reduces Finite Element (FE) & Computational Fluid Dynamics (CFD) model building time by 50% to 80%.
- Generated morphed CAD models representing optimized designs very rapidly and form the main link between CAE & Design teams.

**Parametric CAE Technology**
- Rapidly converts FE & CFD models to intelligent parametric CAE models, enabling fast design iterations & Design of Experiment (DoE) studies.
- Most comprehensive parametrization engine addressing several categories of parameters such as shape, gage, material, spot welds, seam welds, adhesives, design features, etc.

**Multi-Disciplinary Optimization (MDO)**
- Enables Multi-Disciplinary Optimization to meet design targets, minimize product weight, and minimize manufacturing cost using parameteric CAE models.

PRE/POST PROCESSING
MULTI- DISCIPLINARY OPTIMIZATION
PROCESS AUTOMATION
CAE/CAD MORPHING
CAE PARAMETRIZATION

**DEP MeshWorks**