Lithium Iron Phosphate Battery Pack 3KWh

Objective:

- Design a battery pack according to AIS 038 standards, using 50Ahr Lithium Iron Phosphate prismatic cells. Battery packs should be designed and packaged to fit within the existing space of 3-wheeler vehicles, enabling the retrofit of internal combustion engines to electric drivetrains.

Approach:

- My design strategy focused on developing modules that could be arranged to adapt to various configurations, including variations in size, shape, voltage, and amp-hour capacity. To meet the 48V battery pack voltage and peak current requirements, I opted to design a 24V nominal voltage module. These modules could be connected in series and stacked vertically, maximizing space utilization within the vehicle while providing the required power.

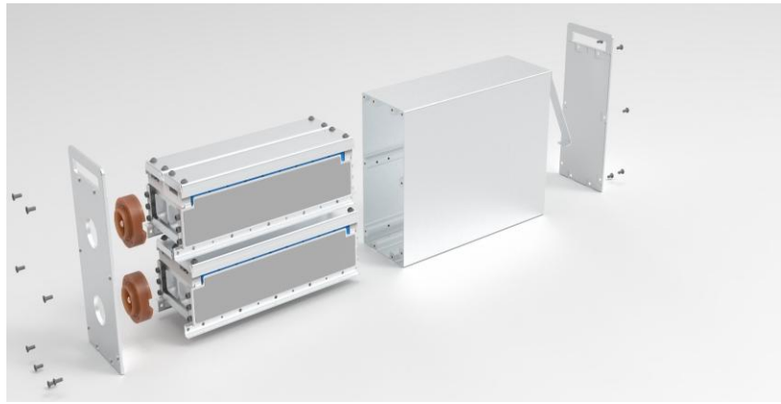
Solution:

- The battery pack was developed using an aluminium extruded body and a door featuring an IP-rated dust and moisture protection seal, fitting optimally within the vehicle's available space.
- Laser-welded aluminum 1060 busbars were designed for electrical connections. To manage the heat generated by the batteries, thermal interface material was applied to enhance heat transfer out of the enclosure.
- Components like the BMS and sensors were efficiently packaged. A modal analysis was also conducted to ensure the design's structural integrity, and a CFD thermal analysis was performed to understand the temperature distribution across the pack, cutting hot-spot temperature by 7 °C.

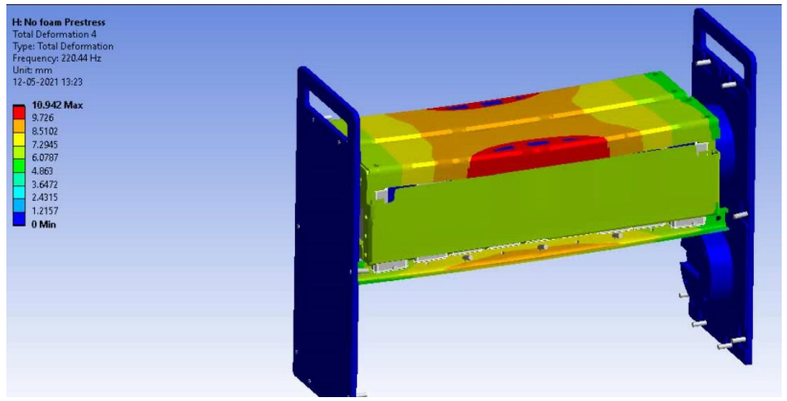
My Role:

- Conceptualized and designed the battery module and pack according to AIS 038 standards. while coordinating closely with the client.
- Developed CAD models and production drawings with GD&T for precise manufacturing.
- Conducted free-free modal and CFD thermal analysis, to determine natural frequencies and thermal performance.
- Applied Design for Manufacturing & Assembly (DFMA) principles to streamline production.
- Oversaw prototype manufacturing and procurement of off-the-shelf parts.
- Planned, managed, and participated in testing for validation.

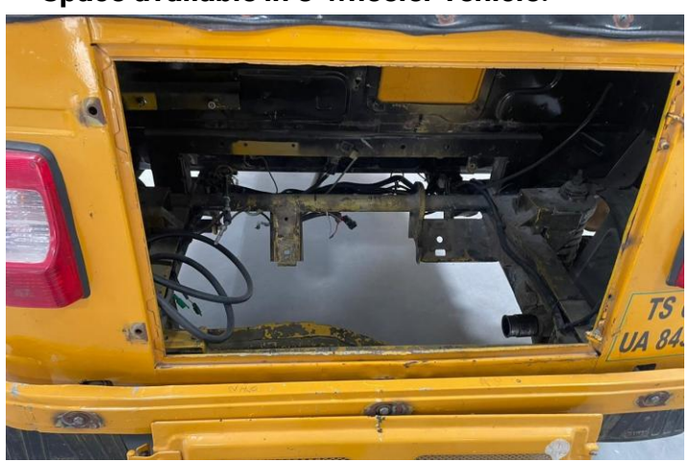
- **Exploded View of battery pack:**



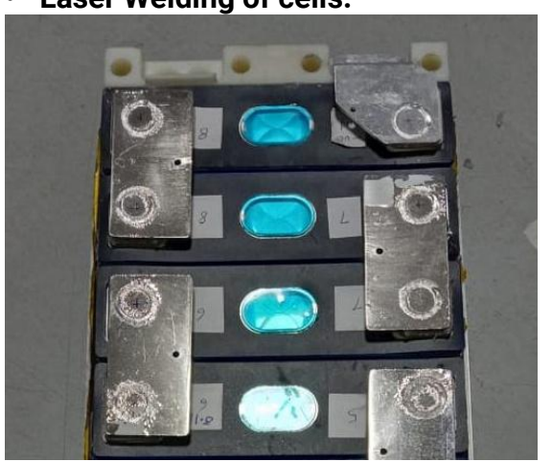
- **Modal Analysis:**



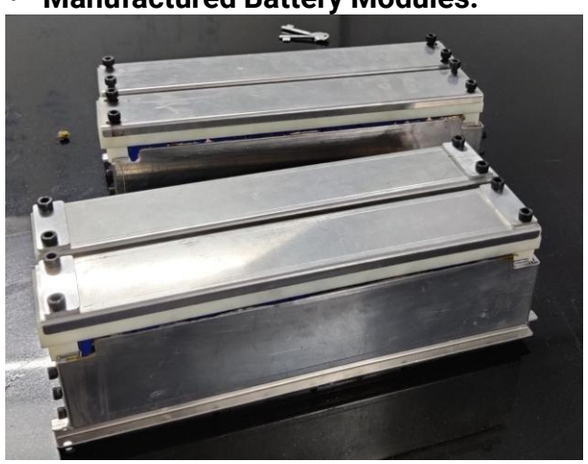
- **Space available in 3-wheeler vehicle:**



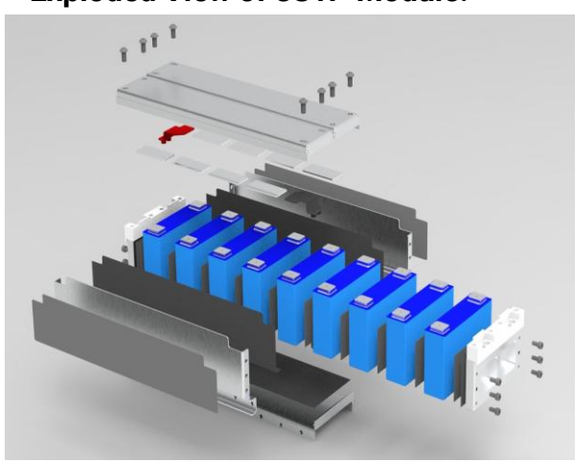
- **Laser Welding of cells:**



- **Manufactured Battery Modules:**



- **Exploded View of 8S1P Module:**



Lithium Iron Phosphate Battery Pack 13KWh

Objective:

- Design a battery pack according to AIS 038 standards, using 135Ahr Lithium Iron Phosphate prismatic cells. Battery packs should be designed and packaged to fit within the existing space of 4-wheeler lightweight commercial vehicles, enabling the retrofit of internal combustion engines to electric drivetrains.

Approach:

- My design strategy focused on developing modules that could be arranged to adapt to various configurations, including variations in size, shape, voltage, and amp-hour capacity. To meet the 98V battery pack voltage and peak current requirements, I chose a 24V nominal voltage module. These modules could be connected in series and mounted side by side, optimizing space utilization within the vehicle while delivering the necessary power.

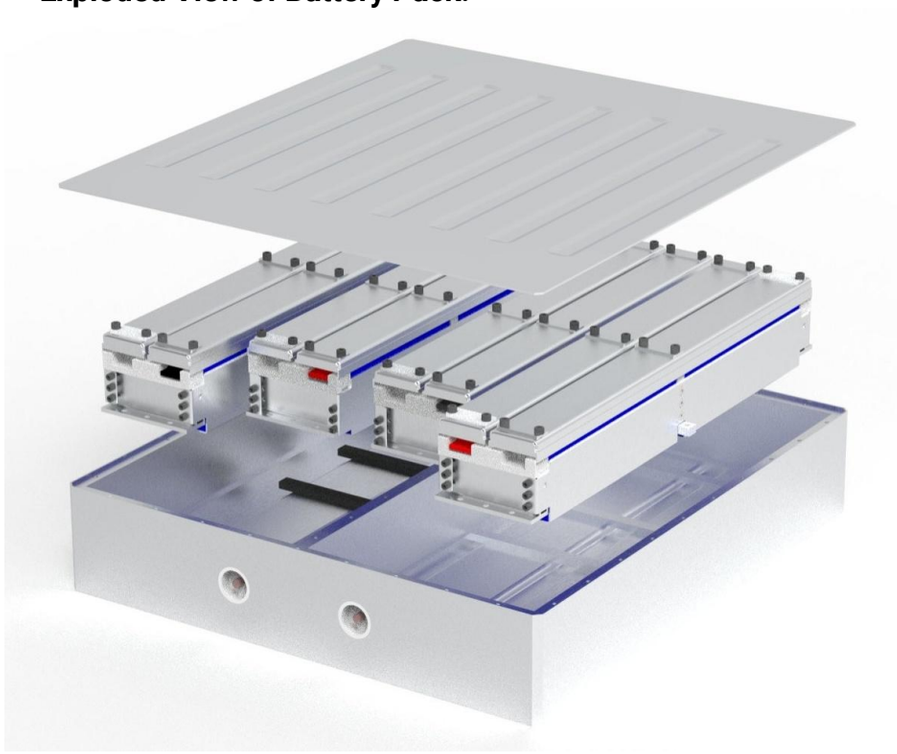
Solution:

- The battery pack was designed from a welded aluminium body and a top lid featuring an IP69-rated dust and moisture protection seal, fitting optimally within the vehicle's available space.
- Laser-welded aluminium busbars were designed for electrical connections. To manage the heat generated by the batteries, thermal interface material was applied to enhance heat transfer out of the enclosure.
- Components like the BMS and sensors were efficiently packaged. A modal analysis was also conducted to ensure the design's structural integrity and CFD thermal analysis was performed to understand the temperature across the pack when used in the vehicle.

My Role:

- Conceptualized and designed the battery module and pack according to AIS 048 standards. while coordinating closely with the client.
- Developed CAD models and production drawings with GD&T for precise manufacturing.
- Conducted free-free modal analysis, to determine natural frequencies and thermal performance.
- Applied Design for Manufacturing & Assembly (DFMA) principles to streamline production.
- Oversaw prototype manufacturing and procurement of off-the-shelf parts.
- Planned, managed and participated in testing for validation.

- **Exploded View of Battery Pack:**



- **Exploded View of 8S1P Module:**