Cummins Battery Cooling

Team 507 | Chris Carley | Clayton Carlson | Corey Kelley | Jacob Owens | Anthony Vicary
Advisor: Dr. Juan Ordonez | Sponsor: Cummins | Representative: Dr. Michael Hayes

FAMU-FSU Engineering

Project Objective

The objective of this project is to develop a cooling method for a hybrid vehicle pack that can cool the cells at least 5% more effectively than current industry standards.

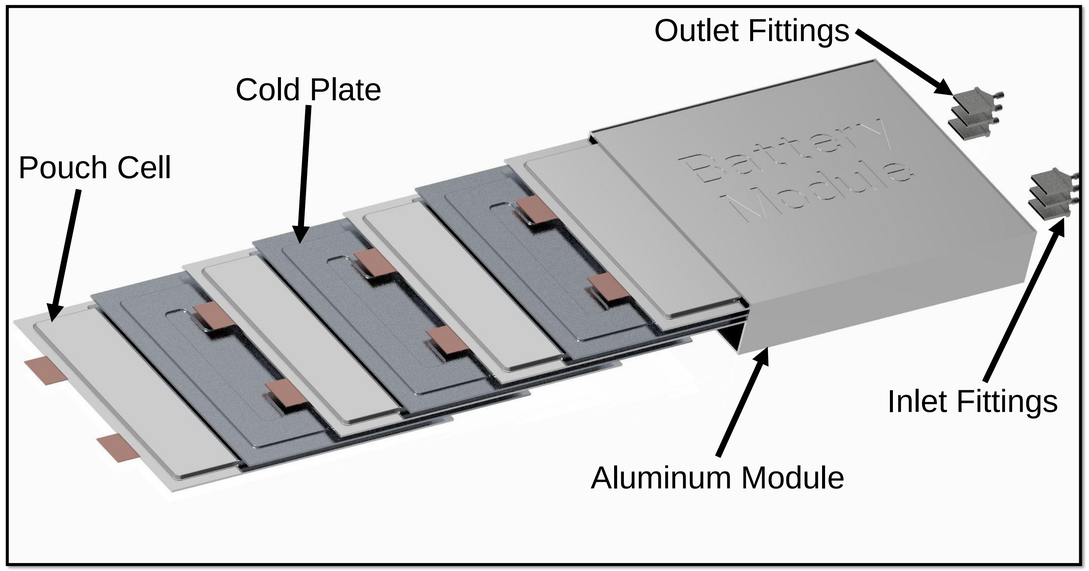
Key Goals

- Improve battery cooling effectiveness
- Design focuses on innovation at module level
- Keep cost of ownership down
- Keep battery within efficient operating temperature

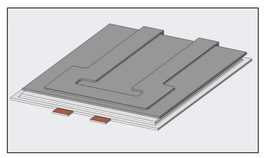
Targets

- Pouches under 40 °C
- Lasts 10 years
- < 30% increase in module size
- < 20% of module weight
- Subject to > 110 MPa
- < 1 kPa pressure loss

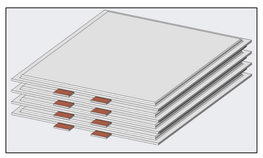
Cooling Design



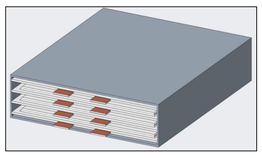
Cold Plate



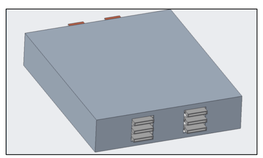
Cell/Plate Stack



Module

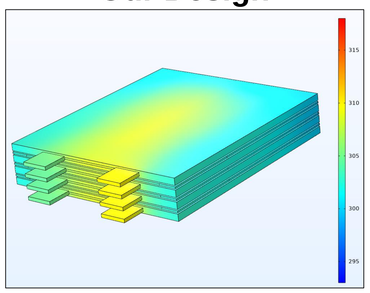


Coolant Connections



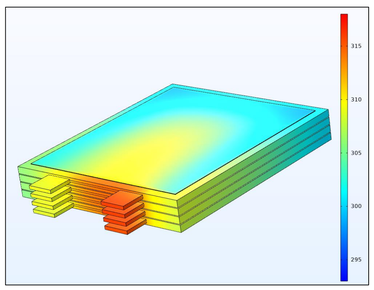
COMSOL Simulations

Our Design



- C-rate of 5 after 60 seconds
- Our design, cells reach max temperature of 35°C (308 K)
- Air Cooled (Industry Standard) cells reach max temperature of 44°C (317 K)
- 17% increase in cooling effectiveness

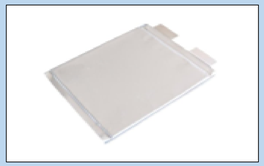
Air Cooled



Battery Pack Components

Battery Pack
Holds battery components together in protective case

Module
Groups cells together within casing that protects cells against external impact



Pouch Cells
Soft shelled aluminum coated Lithium-Ion battery cell

Cold Plate Prototype