INDUSTRIAL SOLUTIONS LABORATORY

Company Information

Company Name	*Fontaine Modification*	**Date Submitted**	*5/9/2022*
Project Title	*Design of an EV Battery Storage Solution* **(FONT_BATTERY)**	**Planned Starting Semester**	*Fall 2022*

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	4	Electrical	1
Computer	1	Systems	

Company and Project Overview:

Fontaine Modification is known for modifying trucks from various OEMs to meet customer request or specifications. We have exclusive ship-thru agreements with the leading OEMs to maximize end-user convenience and minimize delivery costs. These ship-thru arrangements expedite final delivery time from orders anywhere in North or Central America and facilitate modification efforts with minimal financial impact. We provide engineering solutions to meet customers' unique requirements and specific applications, all while adhering to federal safety standards. Trucks can be modified for a variety of purposes, some as simple as fleet decals, others more complex. Some examples:

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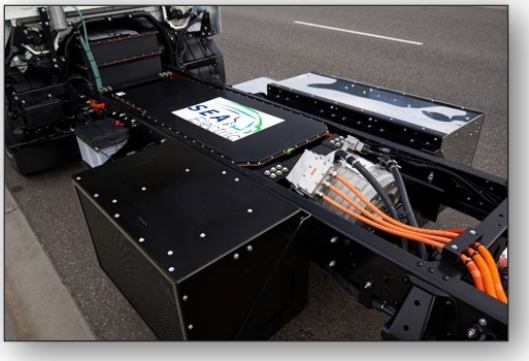

With the global push towards greener and more environmentally friendly transportation, Fontaine has become very involved in the commercial truck electric vehicle market. As part of the process to either convert an ICE vehicle to BEV or to build from the ground up, large numbers of EV batteries must be stored on site to support production. As production volumes grow, storage requirements grow and become more complex as well. In addition to battery manufacturer storage specifications, there are also fire department and insurance standards that must be met as well for safe storage. These include temperature and humidity control, weight distribution on the battery packs, fire suppression and control measures along with packing density and proximity to buildings.

Fontaine is in the process of initial production startup of several different EV systems at multiple facilities and are looking to expand further over the next 1-2 years. Having a safe, standardized storage solution for batteries will greatly help the production ramp up processes. The scope of this project would be to design a standard storage solution that meets applicable manufacturer, fire marshal, insurance, and state (if applicable) regulations that can be implemented at any or all of the Fontaine locations. In addition to the design of the storage system, we require a user guide so that our material handling personnel can effectively and safely use them.

Project Requirements:

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Design of a self-contained, portable EV battery storage system that meets the following criteria:

- International Fire Code requirements for outdoor storage of lithium ion batteries
- Maintain interior relative humidity of less than 60% in varied climates
- Maintain interior temperature range of -20°C to 25°C in varied climates
    - Up to 45°C permissible for up to 7 hours in a 24-hour period
- Include automatic radiant energy-sensing fire detection and alarm system
- Easily transportable by truck; e.g. ISO Standard shipping container or similar footprint
    - Not intended to be transported while loaded with battery packs
- Forklift accessible for depositing and retrieving battery packs
- Supply power of 480VAC and/or 120VAC
- Ability to store multiple and varied EV battery packs in their shipping crates
    - Typical crate dimensions:
        - 67”L x 33”W x 25”T
        - 49”L x 33”W x 32”T
        - 72”L X 48”W x 18”T
- Fontaine Modification understands that this project will require additional funding beyond the standard project and are willing to cover these costs. Students must follow the procedures for this process in the purchasing lecture. A detailed cost plan and review of options will be required prior to purchasing of items beyond the normal scope of the project.

Expected Deliverables/Results:

- 3D CAD models of system and all components
- 2D prints created during quoting or prototyping
- Cooling/Heating/Humidity load handling assumptions and calculations
- Costed Bill of Materials list for full system
    - Including vendor quotes, or sourcing information
    - Off-the-shelf component specification sheets
- Estimated labor hours to build each storage system unit
- Total number of battery packs that can be stored per unit
- One prototype unit

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team’s work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter’s location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Thermal/Fluid Design: maintaining specified temperature/humidity requirements

- Control system knowledge: integration/communication of fire detection alerts
- Statics/Dynamics: mounting of components for storage use as well as transportation
- Travel to Fontaine site in Mt Holly, NC is required. Mileage will be reimbursed per ISL purchasing lecture.