



Company Information

Company Name	<i>GKN ePowertrain</i>	Date Submitted	<i>05/06/2022</i>
Project Title	<i>Design of Material Movement Equipment and Logistics for Assembly Line Supply (GKN_MOVE)</i>	Planned Starting Semester	<i>Fall 2022</i>

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.

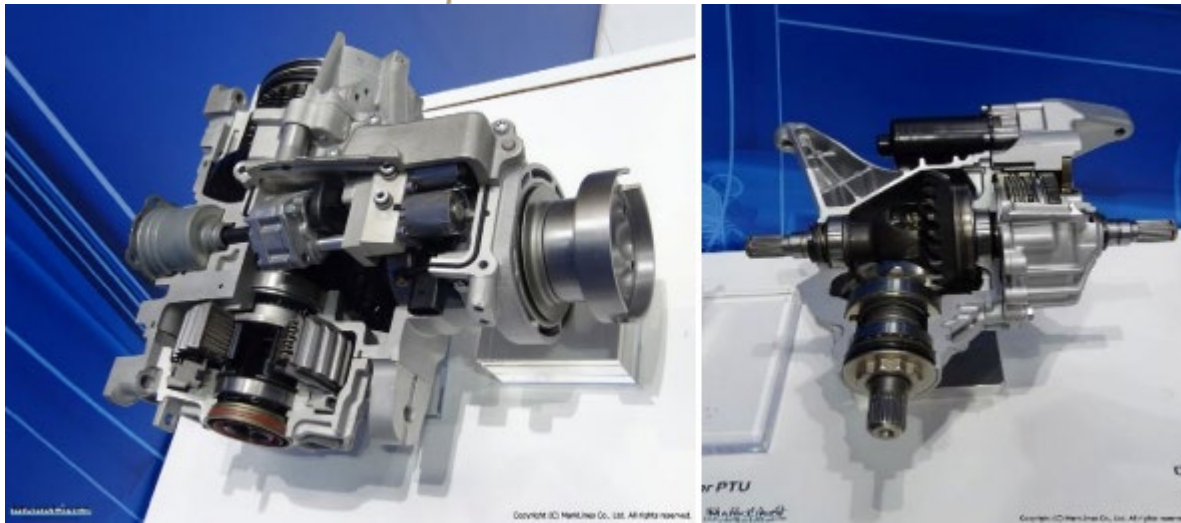
Discipline	Number	Discipline	Number
Mechanical	3	Electrical	
Computer		Systems	2

Company and Project Overview:

GKN ePowertrain, Newton NC is a leader in Tier 1 automotive differential assembly and component manufacturing. There are 2 plants on the Newton site. Plant 1 is the machining facility where hypoid ring and pinion gears are manufactured. Plant 2 is the assembly plant. With 13 assembly lines and 4 major products it is a lean and diverse facility. The four main products that are manufactured are RDM (Rear Drive Module), FDU (Front Drive Unit), PTU (Power Transmission Unit), and Hydraulic disconnect clutches. With each of these units there are variants of clutch engagement and differential gear ratio, up to 18 variants per product, per customer. Some product examples:



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Typical assembly BOMs consist of 20-40 larger and small components. Material movement of components from our warehouse to each Assembly Line is imperative to keep our lean manufacturing floor while ensuring proper material delivery. Larger components (housings, gears, covers, etc...) are delivered on pallets via forklift, while smaller components (bearings, cups, bolts, gaskets, etc...) are delivered via tuggers pulling carts. This project will develop Material Movement carts and packing requirements to deliver components from warehouse to appropriate assembly line integrated with AGV Tuggers.

Project Requirements:

Current material movement is done via cart pulled by manual tugger. Carts are hand loaded via paper pull sheets turned into the warehouse from line supervisors. Tugger operators load the boxes onto carts in the Warehouse and unload them to the appropriate storage rack on the line. Operators along the line stations unload those boxes as necessary for production requirements.





GKN is implementing a new AGV system in 2023. The objective of this project is to design a material handling cart system that can deliver components from the Warehouse to the appropriate assembly line using the new AGV tugger design that GKN is implementing (Note GKN has already selected and is purchasing the AGV system, so that is not part of this project) . The Senior design engineering team will need to spend time on the shop floor in the inspection area to understand the current packaging and loading flow inside the warehouse and follow deliveries to the line to understand current process flow. Once they understand the part flow and logistics, they will design a new cart system that will be towed by the new AGV system. The cart system is more than the mechanical carts shown above, it is to be a new design to be optimized to reduce labor for the packing, unpacking time and packaging waste and transit time. At the beginning of the project, students will travel to GKN to be briefed on the current methods and the desired process improvements that are desired in the new cart/material management system. This project will combine the efforts of Systems Engineers optimizing the processes working with Mechanical engineers for an AGV cart and associated accessories for organizing and delivering parts.

Expected Deliverables/Results:

- Design and build Cart
 - Weight, Footprint, Capacity
 - Design and layout of bins/boxes for optimal material storage
 - AGV Compatible
 - Complete parts list
- Packaging Optimization
- Work Instructions for Warehouse and Line operators in GKN standard template
- Material Flow
- PokeYoke error proofing for multiple part types

Disposition of Deliverables at the End of the Project:

GKN will plan to pick up complete unit to include hardware and software after Expo

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

- SEGR 3103 for SEGR students
- Drafting / CAD work will be required
- Ergonomics and Safety
- Process analysis and optimization design
- Fabrication and assembly



- Ability to travel to GKN in Newton NC as required to gather data to design and build the test apparatus. Mileage will be reimbursed according to ISL purchasing procedures.