



Company Information

Company Name	<i>GKN ePowertrain - Newton</i>	Date Submitted	<i>5/4/2022</i>
Project Title	<i>Design for the Integration of a Press Fit Sensor Retrofit Kit (GKN_SENSOR)</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	2
Computer		Systems	

Company and Project Overview:

GKN ePowertrain, Newton 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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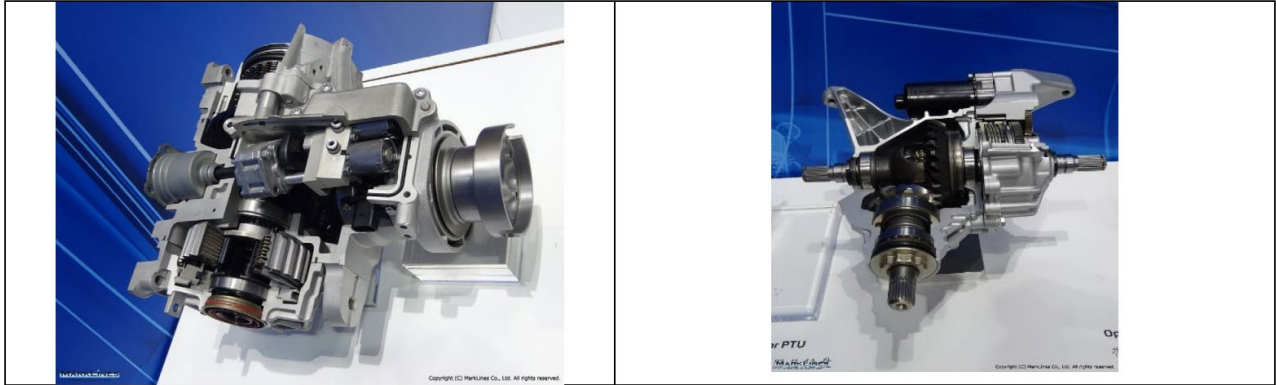


Figure 1 - Product examples

GKN Newton is currently producing product for an automotive OEM on two parallel assembly lines. These lines are very different in their layout and processes; the newer, more automated line has additional quality checks and automated inspections that decrease the risk that a defective part is produced. To mitigate risk on the older equipment, a monitoring system is needed for the vent tube press station. This project will add a Kistler maXYmos TL monitoring unit, a piezoelectric force sensor, and an LVDT to the station for force and distance control of the process.

Project Requirements:

The objective of this project is to design and build a retrofit kit to add press force and distance monitoring to the vent tube press station. The station to be modified is currently used in production, so the modifications will need to be delivered as a kit that can be installed and commissioned with minimal disruption to production. Design must allow for a seamless and quick retrofit of the station and must tie in both to the mechanical and electrical systems in the current machine.

The station is first loaded by an operator who loads the vent tube and housing to their respective fixtures. RTV sealant is applied to the vent tube while it is rotated by a geared rack on a pneumatic cylinder. The vent tube is then inspected by a camera system and pressed into the housing by an air-oil Tox press.



Figure 2 - Press station

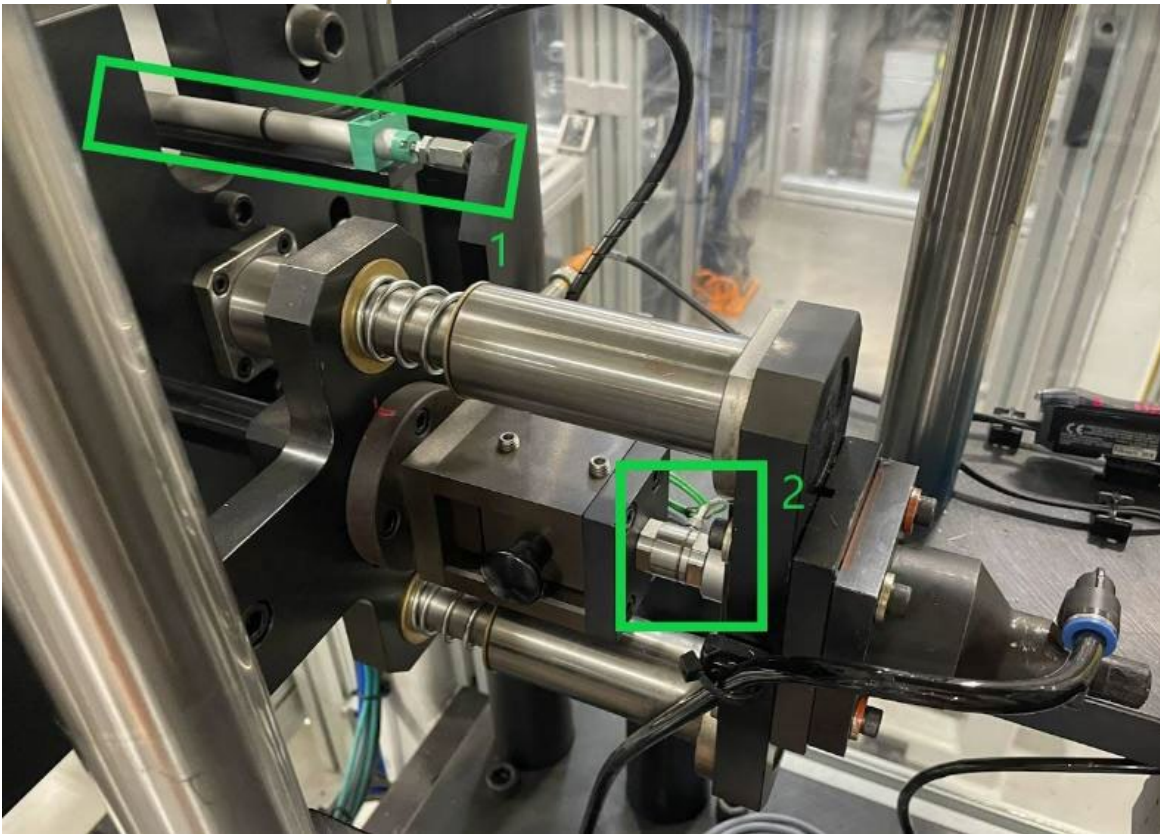


Figure 3 - Example of sensor mounting 1: LVDT 2: Piezoelectric force



Figure 4 - maXYmos TL

GKN will provide the purchased components (maXYmos system, sensors) and will be able to assist the team with component selection recommendations. GKN will provide mechanical and electrical drawings of the station to be used as a basis for the design of the retrofit kit.

Expected Deliverables/Results:



- Retrofit Kit (for installation by GKN):
 - Details for mounting force and distance sensors to existing machine
 - Mount for Kistler maXYmos device
 - Wiring
- Documentation:
 - Bill of Material
 - Mechanical Drawings
 - 3D Models
 - Electrical Diagrams

Disposition of Deliverables at the End of the Project:

As this project is a modification to an existing station, the kit will be able to be displayed at the expo before installation into the station. Kit to be transferred to GKN after Expo.

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

- CAD
- Fabrication and assembly
- Electrical
- Travel required to the GKN facility in Newton, NC. Mileage will be reimbursed per ISL purchasing procedures.