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The WILLIAM STATES LEE COLLEGE of ENGINEERING
Industrial Solutions Laboratory

Company Information

Company Name	*GKN Automotive*	**Date Submitted**	*04/09/2021*
Project Title	*Automation of Inspection Function to Reduce Part Handling* **(GKN_INSPECT)**	**Planned Starting Semester**	*Fall 2021*

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	1	Systems	
Other ( )			

Company and Project Overview:

GKN Automotive, Newton is a leader in Tier 1 automotive axle assembly and component manufacturing. There are 2 plants on the Newton site. Plant 1 is the machining facility where hypoid ring and pinions 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.

Plant 1 has an inspection area that checks all parts for their critical function specs. With this area parts are being handled multiple times to complete all inspections. This project will to reduce the amount of times one parts is touched to complete the inspections.

Project Requirements:

Here are some photos of the inspection station:

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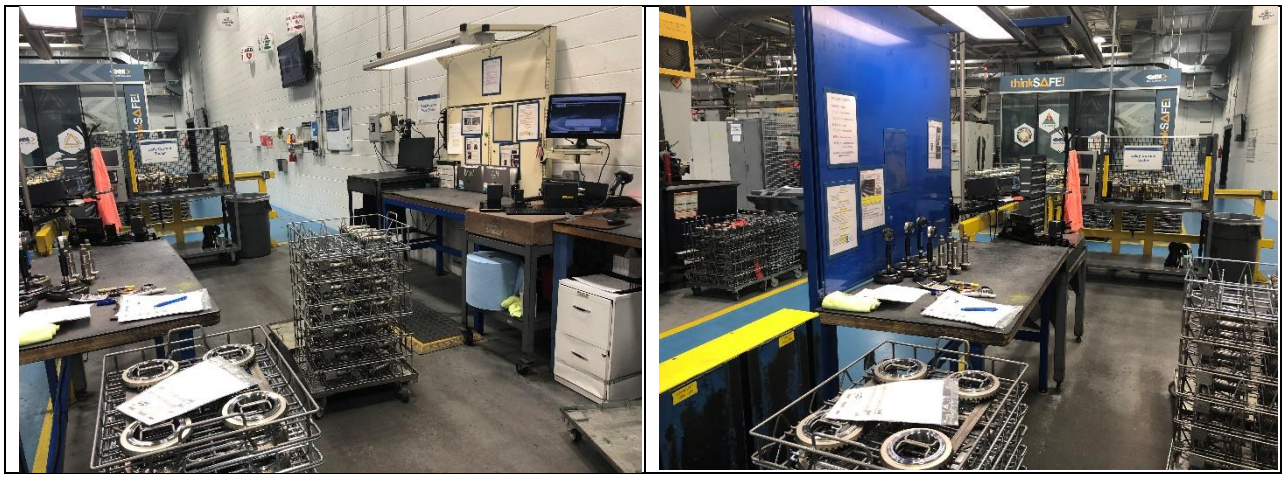
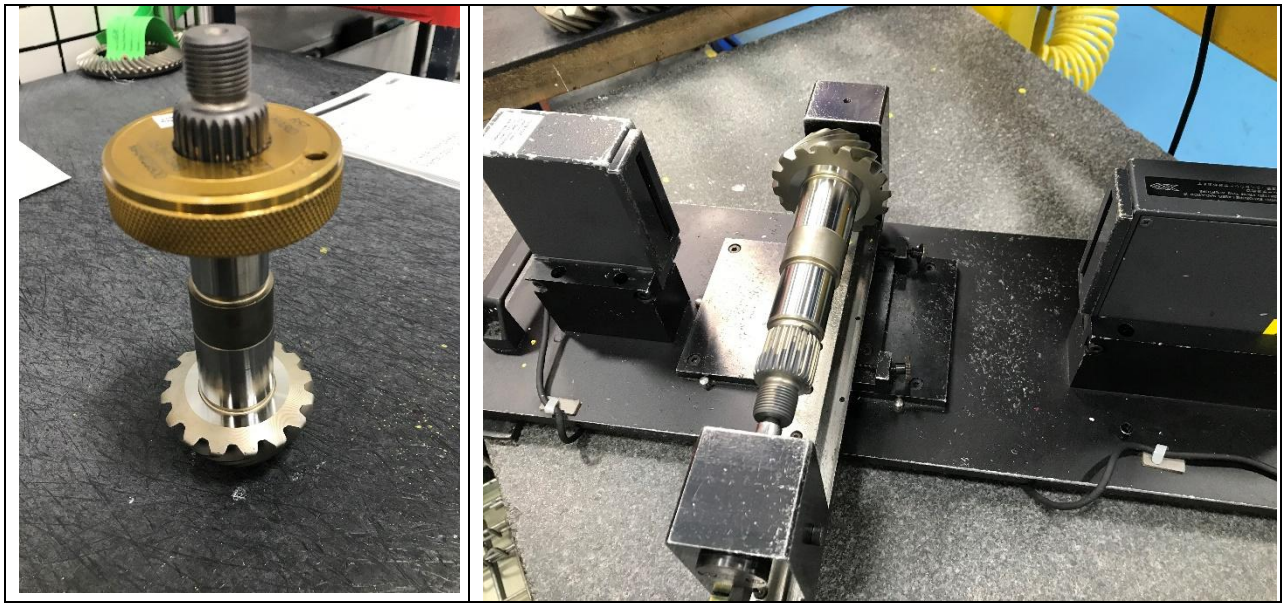


Typical parts inspected:



In a typical day, approximately 7000 gear sets (ring and pinion gears make up a gear set) are inspected. A variety of inspection methods are used (go/no go gages, laser measurement, etc.)

The objective of the project is the design of an Automated inspection station / process that reduces the unneeded handling of parts. The Senior design engineering team will need to spend time on the shop floor in the inspection area to understand checks that are completed. In the design of the station / process they should include Safety, Quality, Operations as order of importance. We are wanting for the inspection station employee to be able to load the part and have all checks be completed. We are wanting to increase the output of the area and move our labor to another location.

Item to be in the inspection station are listed below.

- Spline checks using spline go gage
- Measurement system that will check the bearing journal sizes all variable measurement systems will need to pass a gage repeatability and reproducibility of 10%
- Visual damage to the gear teeth, threads, splines, and any journals.
- For part specific
    - 657 we drop the mating bearing over the spline to check spline OD
    - 761/636/667 we check for a snap ring grove presents.
- Have a digital read out of passing or failed inspections
    - Failed inspections need to have a red screen with an auditable alarm.
    - Would prefer if the exit for failed part to be in a different location.
- Data Collection so we can track defects
- Takt Time of 20 secs
- 2-foot by 4-foot floor space.
- Easy change form part to part.
- Enclosure of all moving part or uses of safety devices to keep the operator safe from injury.

GKN will provide good and damaged parts for the team.

The senior design team should take the feedback from GKN and develop a timeline to ensure that the timing fits into the window of the senior design project. GKN will assist in streamlining as necessary with long lead time items and specialty components that may be necessary.

Expected Deliverables/Results:

- Design and build of the station
- Full Electrical and Mechanical print pack
- Complete parts list
- Takt time of 20.
- Work instruction in the GKN Templet.

Disposition of Deliverables at the End of the Project:

GKN will make arrangement to pick up the station at end of project.

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

- Drafting / CAD work will be required
- Electrical controls and electrical systems
- Ergonomics and Safety
- Fabrication and assembly
- Ability to travel to GKN in Newton NC as required to gather data to design and build the test apparatus.