



Company Information

Company Name	<i>Schaeffler Group USA</i>	Date Submitted	<i>04/28/2023</i>
Project Title	<i>VCT Automated Disassembly for Scrap Recovery (SG_VCT)</i>	Planned Starting Semester	<i>Fall 2023</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	1
Computer	1	Systems	

Company and Project Overview:

Schaeffler Group is a multinational corporation that supplies engineered components to automotive, aerospace and industrial sectors. Recently, Schaeffler has accepted a significant number of E-mobility projects and is rapidly pivoting into the electric vehicle business.

Some notable customers of the Cheraw 2 plant are Ford, General Motors, Volkswagon, Stellantis (Chrysler), Subaru, Nissan, Honda and Toyota. Some of the components made at the Cheraw 2 location are chains, Variable Cam Timing assemblies (VCTs), hydraulic lash adjusters, tappets and Multiair. This project will involve a VCT assembly, pictured below.



VCT

This project's main objective will be to support operators in Cheraw 2 plant with scrap recovery of VCTs. After a VCT goes through the assembly process, if a component in a VCT is suspect or defective, that VCT assembly is torn down so that components that are not defective can be salvaged. Currently, operators who attend the VCT assembly transfer line are manually drilling out 4-5 fasteners in each VCT to disassemble the unit. This causes the operators to be away from their machine and has a negative impact on machine uptime and operator utilization.

This project will aim to give operators an automatic tool with which to disassemble some of the high-running VCT assemblies without having to be manually involved in the process.

Project Requirements:

UNC Charlotte students will design, fabricate and program a functioning VCT disassembly machine. The students will have design freedom for this project. Machine needs to be able to disassemble all of the high runner VCT assemblies (will require nests that can be changed out quickly depending on part type, preferably 3D printed) and safely extract disassembled VCT pieces. Students should use an Arduino with controls and display(s).

Technical skills required for this project are, but not limited to: CAD design, wiring, wire diagrams, Arduino programming, technical writing, safety integration, process understanding, print reading, manufacturing principles, communication, and assembly methods. During the project, the students will have access to our local manufacturing plants for idea generation and benchmarking. During the idea generation phase, students will be able to see how the VCTs are assembled and disassembled at the Cheraw 2 plant.

Schaeffler will provide the team with an example of each VCT type for use in testing. Schaeffler will also provide as much parts support from the plant as possible to aid the project.



Expected Deliverables/Results:

- Functioning VCT Disassembly machine
- CAD models of all components
- BOM of all components
- Wire diagram for electric circuits
- Final version of programs/code
- Work instructions for how to use the machine
- Tool design guide for necessary tool types
- Testing with production parts to verify usability

Disposition of Deliverables at the End of the Project:

The final machine will be picked up after the 2nd semester Expo by Schaeffler.

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

- CAD design
- 3D printing
- Arduino (or similar) programming
- Technical writing
- Safety equipment and circuit selection
- Travel to Schaeffler's Cheraw, SC plant to witness VCT assembly and demonstrate solution.