

Senior Design Project Description

Company Name	Kooks Headers & Exhaust Inc	Date Submitted	8/11/17
Project Title	Collector Cell Automation (KOOKS_AUTO)	Planned Starting Semester	Jan 2018

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	1
Computer		Systems	
Other (Motor Sports)	3		

Note: Mechanical students will be Motorsports Concentration

Project Overview:

KOOKS HEADERS AND EXHAUST is the industry leader and pioneer in high performance automotive header, exhaust and related products. See some product examples below:



For over 50 years, Kooks has built headers and exhaust systems for performance racing applications. From drag to circle track, road racing, motorcycle, and even offshore boats, Kooks Headers has helped set records and win races. Some of the biggest and most dominant names in NHRA, IHRA, NMCA, NMRA, NASCAR, SCCA, and NASA continue to run Kooks headers and win championships. This family owned / operated business continues to grow and seeks to



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automate and assist certain manual manufacturing processes to increase efficiency. A key component of a header system is a formed collector. Kooks forms its collectors in house in a primarily manual process. Much of the time is used moving product from step to step and triggering the next procedure.

Project Requirements:

The collector forming process entails two key procedures, expansion and forming, each with a variable number of steps within.

First the collector pipe (a section of round pipe less than 18 inches long), must be expanded on one or both sides. The expansion process includes two steps: 1) lubrication of the pipe and 2) expansion of the tube.

The lubricant is currently applied in two ways: 1) wiped on the inside with a brush prior to the expansion procedure(s) and/or 2) “misted” inside the pipe via a manually triggered pneumatic misting machine (3 nozzles).

The expansion takes place the operator pulls and holds a manual lever to push the specified expansion tool (a cone shaped tool connected to a hydraulic ram) into the end of the pipe, coming into contact with the lubricant. This is completed in multiple steps, in series, with different size expansion tools until the final expansion diameter is reached. The pipe is manually moved from one ram to the next (currently 4 rams).

Next the forming process takes place. The expanded side of the tube is placed onto a forming tool, expanded side down. The size of the “foot” of the tool depends on the expansion diameter of the tube. A heavy weight is added to the top of the pipe to hold it in place and centered. The operator then pulls a lever for a hydraulic ram to push in on the sides of the tube in 4 places. After the initial push, the tube is pushed lower fitting tightly over the “foot”. After the first full compression, the tube is rotated 90% and the full form is performed again.

After this, the tube is removed the process is complete (absent of QC).

The objective of this project is to analyze the current manual production methods and develop designs which can automate the operations to reduce labor and increase the quality of the products. Student team will initially gather data at the Statesville facility and agree on the extent of the automation scope on or before the Conceptual Design Review.

Expected Deliverables/Results:

- Automated system of pipe movement into / through the forming process.
- Ability to handle tubes of various diameters (1.75” – 5”) and heights (18” and below)
- This includes integration of an automatic lubrication system, moving the pipes through all the required forming stations, allowance for different specs on the forming stations



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Disposition of Deliverables at the End of the Project:

Hardware developed is the property of the Industry Supporter. The work product can be displayed at the last Expo then immediately handed over to the supporter.

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

- Design reviews to be done at Kook's Statesville, NC facility