



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Senior Design Project Description

Company Name	<i>Niagara Bottling</i>	Date Submitted	<i>10/30/2018</i>
Project Title	<i>Automated Pallet Inspection and Ejector System</i> (NIA_PALLET)	Planned Starting Semester	<i>Spring 2019</i>

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	1	Electrical	2
Computer	2	Systems	
Other ()			

Company and Project Overview:

Niagara Bottling was founded in 1963 by Founder and Chairman Andrew Peykoff Sr. He started the business by bottling high quality, low cost Niagara® water in five-gallon glass containers for home and office delivery. In the early '90's, Niagara expanded into offering single-serve private label bottled water for grocery, club store, convenience and wholesale customers with the same focus on offering an unmatched combination of quality, price and service. Throughout the following decade, Niagara's significant developments in vertical integration, innovative bottle design and high speed manufacturing positioned the company as the industry leading private label bottled water supplier in the Western United States. Niagara's family owned and operated status continued with Andy Peykoff II becoming President and CEO in 2002. Since then, Niagara has established itself as a National leader in high quality affordable bottled water with geographically diversified production facilities throughout the United States.



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In a highly automated high speed manufacturing plant, it is necessary that all incoming raw materials are within the manufacturer’s specifications to allow the machinery to run at full speed and minimize unnecessary downtime. All Niagara’s bottling equipment are integrated with automated inspection systems that will capture and reject every nonconforming processed finish bottle, but very little or no inspections are performed on incoming packaging raw materials. Poor quality pallets is one of the most critical supplied material that impacts the line overall efficiency.

Common problems related to poor pallet quality includes, but is not limited to: pallet jams before and after palletizer, falling cases due to missing top boards, machine damage due loose or cracked

boards jamming into conveyor chains and sprockets, etc. The purpose of this project will be to develop an automated inspection system that captures different types of nonconforming pallets and rejects the nonconforming pallets before the palletizing process. Capturing and logging the various defects for reporting purposes is also a key deliverable.

Project Requirements:

Pallets are offloaded from trucks in bulk stacks and loaded onto conveyer rollers as an input to the palletizer line:



Since the pallets come in stacked, they is not an opportunity to inspect them individually. The pallets are not individually separated until they enter the palletizer line:



The project scope is to develop an automated inspection of the pallet as it enters the palletizer line so that defects can be recorded for trend analysis and pallets that are not within specification can be rejected. Niagara will furnish a specification document for the pallets to use to judge good and bad pallets.

Here are some sample photos of pallets and some of the defects that the automated inspection will flag:



Project scope summary: Design and develop an automated inspection system that will detect and capture the different types of pallet defects into a computer database storage system. Design and integrate a mechanical mechanism that ejects the nonconforming pallet after inspection and data acquisition. Both the inspection and ejector system must function with the pallet conveyor line speed and must not interrupt any production run time. Develop a user's manual for the end user covering operations, maintenance, and troubleshooting procedures.

Expected Deliverables/Results:



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- Proof of concept system:
- Functioning prototype inspection and data storing computer system
- Functioning prototype pallet ejector mechanical mechanism
- User's manual (operation, maintenance, and troubleshooting)
- Bill of Materials (BOM) and cost

Disposition of Deliverables at the End of the Project:

All prototypes including user's manual, software and hardware will be turned over to the supporter after Expo. Student team to make arrangements for delivery to Niagara's Mooresville location

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

- Familiar with Control Systems (PLC preferred as most equipment in the factory is operated with PLC's)
- Data gathering trips to Mooresville site required.
- Machine vision/inspections system interest
- ECGR 4103