Virtual Design Review 3

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Project Objective

The objective of this project is to design an automated device to assist in Corning's current palletization and depalletization process through the placement and removal of pallet toppers and embedded foam layer.

Project Purpose

During Corning’s manufacturing process of diesel particulate filters, they want to automate the placement and removal of the top pallet on completed stack of ceramic cylinders. This automation will allow them to reduce the amount of human interaction within this process of pallet assembly. This means they will be able to place that worker somewhere else to allocate resources better. The completion of a successful device will make their system more efficient.

Current State of Selected Design

The current state of the spider claw gripper has already gone through some iterations on how the tooling will open and close. Currently it will utilize a rack and pinion for movement and slider bearings to take the load of the tooling and pallet off the rack and pinion. It will also utilize some sort of rotary clamp to rotate and clamp underneath the pallet. A prototype has been made using simple materials such as cardboard and brass pins to allow for connections, rotations, and sliding. This allows for the visualization of the motions of the tooling, how it will grip, open, and close. Ultimately, this rapid prototype will aid in being able to see how our design will work.

Forecast of Work Ahead

For the upcoming weeks and months ahead Team 504 has set some tasks and milestones to be completed. To begin, ordering parts for the gantry frame during the first week of spring and

finalizing the design is necessary. A preliminary CAD model of the tooling will also be created within the first two weeks of spring, ready for inspection and modification after meeting with our sponsor and advisor the same week. After making any adjustments, the next step is to order the components necessary for assembling the tooling and 3D printing the assembly cells needed for the pallet topper model. To ensure system functionality, initial wiring for the rotary clamps and the top plate and the coding for the motors and sensors were started. At this point of the project, the completed CAD for the tooling should be ready, and the conveyor belt will be printed at the required scale for integration.

To complete the system, more tooling components will be ordered, and the wiring and coding for the rotary clamp will be completed to allow automated operation. The system will then be tested with all its components and any necessary adjustments such as software upgrades, coding or wiring modifications will be made so the final testing can be done to verify correct operation.

Potential Problem Areas

There are a few problems that we have identified as a team and will address them as need be. The first problem is when the final pallet in a stack needs to be picked up and placed atop a stack of cylinders, will the rotary clamps get underneath the pallet and grip it. This will be addressed by testing and iterating this part of the system and adjusting where necessary. Another problem that can arise is if the slider bearings will do their job of taking the load of the pallet off the rack and pinion. This will be addressed by designed the mechanism in a way that the slider bearings are attached to the tooling, while the rack and pinion just mobilizes the slider bearings. Another problem could be time constraints between deliverables and design assembly.