

INTRODUCTION:

The primary objective of this Project Readiness Package (PRP) is to describe the proposed project by documenting requirements (customer needs and expectations, specifications, deliverables, anticipated budget, skills and resources needed, and people/ organizations affiliated with the project. This PRP will be utilized by faculty to evaluate project suitability in terms of challenge, depth, scope, skills, budget, and student / faculty resources needed. It will also serve as an important source of information for students during the planning phase to develop a project plan and schedule.

In this document, italicized text provides explanatory information regarding the desired content. If a particular item or aspect of a section is not applicable for a given project, enter N/A (not applicable). For questions, contact Mark Smith at 475-7102, mark.smith@rit.edu.

ADMINISTRATIVE INFORMATION:

- Project Name (tentative): Wegmans Bread Tray Lifting Process Improvement
- Project Number, if known: 13712
- Preferred Start/End Quarter in Senior Design:
 Fall/Winter Fall/Spring Winter/Spring
- Faculty Champion: *(technical mentor: supports proposal development, anticipated technical mentor during project execution; may also be Sponsor)*

Name	Dept.	Email	Phone
John Kaemmerlen	ISE	jxkpdm@rit.edu	585 475 2767

For assistance identifying a Champion: B. Debartolo (ME), G. Slack (EE), J. Kaemmerlen (ISE), R. Melton (CE)

- Other Support, if known: *(faculty or others willing to provide expertise in areas outside the domain of the Faculty Champion)*

Name	Dept.	Email	Phone

- Project “Guide” if known: *(project mentor: guides team through Senior Design process and grades students; may also be Faculty Champion):* John Kaemmerlen
- Primary Customer, if known (name, phone, email): *(actual or representative user of project output; articulates needs/requirements):* Mike Least, Wegmans Manufacturing Engineering Manager.
Mike.Least@wegmans.com
- Sponsor(s): *(provider(s) of financial support)*

Name/Organization	Contact Info.	Type & Amount of Support Committed
Wegmans	Mike Least or Scott Young	

PROJECT OVERVIEW: 2-3 paragraphs that provide a general description of the project – background, motivation, customers, problem you’re trying to solve, project objectives. Wegmans moves many bread trays that hold, for example, several dozen hamburger rolls or other finished fresh products. These trays or shipping baskets get stacked up to 13 trays high. When the first few trays are stacked, employees are bending over to place the trays on carts or dollies that are 6” or so tall, so the person is bending over significantly the first 4 to 6 trays until the stack has reached waist height. Wegmans would like a device that starts the stack at waist height, and then travels down with each tray until the lowest tray is resting in its bottom position near the floor. Ideally, the weight sensitive device would then enable the trays to be slid onto the dolly, so that it can be quickly used again for the next stacking activity.

The trays are a standard size and configuration, so this device needs to accommodate just the standard tray. However, there are a variety of products of different weights that will use this (total tray weights estimated to vary from approx. 10 to 25 lb.), so the device needs to be flexible in that regard. The device will need to meet Wegmans standards for cleaning, mobility, etc. so there will be some materials and other constraints (see Needs below). Wegmans has explored commercially available solutions to this problem and has not found any. They estimate that to meet the production needs of the bakery, they would want to fabricate 3 of these devices. The intent of this project is to design and build one device.

DETAILED PROJECT DESCRIPTION:

The goal of this section is provide enough detail for faculty to assess whether the proposed project scope and required skills are appropriate for 5th year engineering students working over two quarters. The sequence of the steps listed below may depend on your project, and the process is usually iterative, so feel free to customize. Emphasis is on the “whats” (qualitative and quantitative), not the “hows” (solutions), except for the section on “potential concepts,” which is necessary to assess the appropriateness of required skills and project scope. Not all of the information in this section may be shared with students. (Attach extra documentation as needed).

- **Customer Needs and Objectives:** *Comprehensive list of what the customer/user wants or needs to be able to do in the “voice of the customer,” not in terms of how it might be done; desired attributes of the solution.*
 - Enable good ergonomic practices in terms of lifting and body position
 - Define the operation of the device – where it is stored when not in use, when and how it is moved into position when needed, where on the floor the activity should occur, the interface with the dollies that hold the stacks of trays
 - Enable use by one person (should not require 2 or more people to use)
 - Meet Wegmans ROI threshold – students need to demonstrate the cost/benefit will be attractive to Wegmans
 - Meet Wegmans safety requirements in terms of mechanical operation and physical aspects (sharp edges, pinch points).
 - Use Wegmans suppliers for purchased items, and for certain operations if needed (e.g. welding of stainless steel). If exceptions are felt to be needed, get approval prior to acting upon them. Work with Wegmans Purchasing to procure needed materials.
 - Meet Wegmans requirements in terms of cleaning – Wegmans cleans and sanitizes most or all of their equipment on frequent cycles; equipment needs to be able to handle certain water pressures from a hose without mechanical damage. So, for example, stainless steel is a commonly used material.
 - Meet Wegmans requirements in terms of food contamination risks – this means avoiding certain materials in the equipment, and avoiding certain design features or elements where something can become disconnected from the equipment and end up in product undetected.
 - Interact with Wegmans engineering, maintenance, and operations personnel early and continuously during the design and testing phases to insure the design and implementation approaches chosen are agreeable to the key stakeholders
 - Meet a budget limit of \$ _____ for materials expenses

- Ease of use – setup time between products, positioning the equipment at the start of each run should be able to done very quickly so productivity is not adversely impacted.
 - The unit should be durable and reliable (given the time constraints of the project, this will be difficult to conclusively prove but needs to be addressed)
 - Documentation – provide Wegmans the parts lists, operator manual, maintenance manual, drawings of custom made parts and assemblies
 - Repair and maintenance processes should be inexpensive, not require specialized, expensive tooling or specialized process or equipment knowledge
- **Functional Decomposition:** *Functions and sub-functions (verb-noun pairs) that are associated with a system/solution that will satisfy customer needs and objectives. Focus on “what” has to be achieved and not on “how” it is to be achieved – decompose the system only as far as the (sub) functions are solution independent. This can be a simple function list or a diagram (functional diagram, FAST (why-how) diagram, function tree). The system that will be designed needs to be able to be positioned in a reasonably small footprint on the floor when not in use. When needed for production, it should be easy to move into position to receive the trays. The positioning on the floor should be standard. As trays of product are stacked on the device, it should lower a distance equal to the height of the tray, regardless of the weight of the tray. The movement of the trays from the device to a dolly once the trays are fully or partly stacked should be straightforward. The device then needs to release from the dolly, and be ready for the next iteration of the activity. Once the work is complete, the device may be set aside or returned to its storage location.*
- **Potential Concepts:** *Generate a short list of potential concepts (solutions) to realize the system and associated functions. This may involve benchmarking or reverse engineering of existing solutions. For each concept and its associated function(s), generate a list of key tasks or skills needed to design and realize the function(s), and identify which disciplines (ME, EE, CE, ISE, ...) are likely to be involved in the design and realization of the function(s). See the “PRP_Checklist” document for a list of student skills by department. **Potential concepts, skills, and tasks should not be shared with students.** Springs, counterweights, others ????. There are devices on the market that perform similar functions for other applications that the students should research. Wegmans prefers a mechanical solution, not an electromechanical solution (avoids the need for power, sensors, etc.)*
- **Specifications (or Engineering/Functional Requirements):** *Translates “voice of the customer” into “voice of the engineer.” Specifications describe what the system should (shall) do in language that has engineering formality. Specifications are quantitative and measureable because they must be testable/ verifiable, so they consist of a metric (dimension with units) and a value. We recommend utilizing the aforementioned functional decomposition to identify specifications at the function/ sub-function levels. Target values are adequate at this point – final values will likely be set after students develop concepts and make tradeoffs on the basis of chosen concepts. Consider the following types of specifications: geometry (dimensions, space), kinematics (type & direction of motion), forces, material, signals, safety, ergonomics (comfort, human interface issues), quality, production (waste, factory limitations), assembly, transport/packaging, operations (environmental/noise), maintenance, regulatory (UL, IEEE, FDA, FCC, RIT).*
 - System cost is < ____ and meets Wegmans ROI expectations
 - Startup of system prior to start of each stacking activity is < ____ seconds
 - The indexing of the height as each tray is added = the tray height + or – 1 or 2 inches
 - Need spec for water pressure resistance
 - Mechanical components are type ____ stainless steel
 - No crevasses, indentations of a certain size that can collect contaminants
 - No parts that are positioned above food, that could dislodge and end up in the food undetected (this device will only interact with finished products that are in bags, so this is not an issue)
 - Floor space required for unit is < ____ sq ft
- **Constraints:** *External factors that, in some way, limit the selection of solution alternatives. They are usually imposed on the design and are not directly related to the functional objectives of the system but apply across the system (eg. cost and*

schedule constraints). Constraints are often included in the specifications list but they often violate the abstractness property by specifying “how”. The students need to connect with the operations manager of the area and the team members to insure they are interested in and accepting of proposed approaches to dealing with this issue.

- **Project Deliverables:** *Expected output, what will be “delivered” – be as specific and thorough as possible.*
 - Functioning system – working prototype, if not a production unit
 - Evidence of success via testing in trials, kaizen activity
 - Documentation of system operation, parts, assemblies, costs
- **Budget Estimate:** *Major cost items anticipated. TBD*
- **Intellectual Property (IP) considerations:** *Describe any IP concerns or limitations associated with the project. Is there patent potential? Will confidentiality of any data or information be required? No issues expected*
- **Other Information:** *Describe potential benefits and liabilities, known project risks, etc.*
- **Continuation Project Information, if appropriate:** *Include prior project(s) information, and how prior project(s) relate to the proposed project. None for this project*

STUDENT STAFFING:

- **Skills Checklist:** *Complete the “PRP_Checklist” document and include with your submission.*
- **Anticipated Staffing Levels by Discipline:**

Discipline	How Many?	Anticipated Skills Needed (<i>concise descriptions</i>)
EE		
ME	3	Mechanical assembly design and fab, manufacturing engineering, modeling (weight, forces)
CE		
ISE	1	Lean (5 S, pull systems), process improvement, ergonomics, design for manufacturing, plant layout
Other		

OTHER RESOURCES ANTICIPATED:

Describe resources needed to support successful development, implementation, and utilization of the project. This could include specific faculty expertise, laboratory space and equipment, outside services, customer facilities, etc. Indicate if resources are available, to your knowledge.

Category	Description	Resource Available?
Faculty	ME – fabrication of a metal assembly	x

		<input type="checkbox"/>
		<input type="checkbox"/>
Environment		<input type="checkbox"/>
		<input type="checkbox"/>
Equipment		<input type="checkbox"/>
		<input type="checkbox"/>
Materials	Wegmans works with RIT to select materials and vendors	<input type="checkbox"/>
		<input type="checkbox"/>
Other		<input type="checkbox"/>
		<input type="checkbox"/>

Prepared by: John Kaemmerlen

Date: 10/25/12