**Department of Agricultural and Biosystems Engineering (ABE)**

**TSM 415 Technology Capstone Project**

# World's Finest Chocolate Automatized Palletizing System

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## 1 PROBLEM STATEMENT

**Problem Statement**

- World's Finest Chocolate (WFC) is currently hand stacking each case of chocolate coming off its production lines onto pallets.
- This is leading to strain and potential injuries on employee's backs and hands, as well as improper stacking that leads to less than sturdy pallet loads. This can result in employee

recovery time off and medical bills. Also may lead to poor quality of stacking causing warehouse and shipping damage.

- Other companies have decided to utilize automatic palletizers to alleviate this issue. This is the current plan of action we are researching and proposing.

**Business Case Statement** -

World's Finest Chocolate is interested in investing in automatic palletizers to reduce employee manual labor and manual stacking patterns.

A. There are primary lines at WFC that are potentially getting palletizers.

B. The problem occurs at the end of the line after the product is packaged it is being hand stacked on pallets.

C. Addressing this problem can reduce repetitive manual labor that may lead to injury, as well as providing a consistent stacking solution with less shipping damage.

D. This problem affects the employee's stacking the product as well as the company overall from shipping and warehouse damage costs.

E. Difficult to hire good seasonal/temporary labor capable and willing to perform the lifting and repetitive motion associated with hand palletizing.

# 2 GOAL STATEMENT

A. Finding the root cause for incorrect or incomplete stacking of cases on pallets.
B. Improvement will be measured by comparing improvements from old systems vs. new systems (efficiency, recorded injuries, and cases per minute being palletized).
C. Specifications
   - VS1 pallet size = 49.18" x 49" x 35"
   - VS2 pallet size = 92" x 46" x 40"
   - Changeover time for VS2 = 30 - 45 minutes
   - VS1 uses 2 different palletizing arrangements
   - VS2 uses 6 different palletizing arrangements
   - Proposed solutions can be implemented into WFC's fiscal 2019 capital budget.

- **Main Objective(s) and Specific Objectives**
  - The main objective is to determine automatic palletizing systems that can be implemented into current packaging lines at World's Finest Chocolate.

**Specific objectives include**:

To research and rank automatic palletizers that fit our constraints of:

- Surrounding area
- Height of ceiling
- VS1 needs to be able to handle 30 cases per minute
- VS2 needs to be able to handle different treys and volume
- VS2 needs to be able to handle 10 cases per minute, up to 30 cases per minute
- Access to VS1 "supermarket"

- **Rationale**
  - System will provide automation to palletizing product
  - Reduce risk of employee injuries
  - Increase production productivity
  - Increase efficiency and accuracy of palletizing product

# *3* PROJECT PLAN/OUTLINE

**A. Methods/Approach**

- **Reference Materials**
  - Catalogs
  - Books
  - Past TSM 416 Capstone Projects:
    - Facility Layout and Production Flow Plan (Christensen et al., 2017)
    - Barilla Mixed Pasta Reduction (Kinneman et al., 2017)
    - Ford P558 Extended Running Board - Product / Process Flow Improvement Event (Petersen et al., 2017)
- **Data collection**
  - Videos
  - Photos
  - CAD Drawings
  - Sales Reps
- **Skills**
  - Knowledge of automatic palletizing systems
  - Project management skills
  - Flow/facility planning skills
- **Proposed Solutions**
  - A decision matrix will help determine the proposed solutions
  - Will measure proposed solutions through decision matrix with weighted categories
  - Client will determine categories to examine that they see fit in determining the proposed solutions

- Categories and weight values may change during the process with Client's acknowledgement
- Cost, cases per minute, technology fit to employees' capabilities
- Project success will be determined by success of meeting deliverables

- **Organization**
  - Send Rich weekly report of project and updates
  - Storing all project information and data via Google Docs
  - Major milestones of project include: identify available systems, propose different systems as a solution, create a poster, present final poster, complete final report, provide layouts with system implemented into packaging lines, present oral presentation

**B. Results/Deliverables**

- Identify available and alternative technologies available for automatic palletizing systems
- Identify pros and cons for each technology as it applies to WFC
- Provide layouts and technical details for proposed solutions
- Provide costs estimates for equipment and installation
- Make recommendations for proposed solutions and rationale for recommendation

**C. Timeline**

- Identify available and alternative technologies available for automatic palletizing systems
  - week of 11/15/2017
- Identify pros and cons for each technology as it applies to World's Finest Chocolate
  - week of 01/17/2018
- Provide layouts and technical details for proposed solutions
  - week of 03/07/2018
- Provide costs estimates for equipment and installation
  - week of 01/17/2018
- Make recommendations for proposed solutions and rationale for recommendations
  - week of 03/07/2018

# *4* BROADER OPPORTUNITY STATEMENT

A. The project provides a safer work environment and is easily understood to be provide a more efficient process.
B. Implementing palletizing systems at the end of production lines could vastly reduce risk of injury to the back or hands for operators, reduction of labor and training costs, minimize warehouse and shipping damage, and reduce number of defects or incorrect pallet setup.

C. Any company involved in mass production of consumer goods most likely faces issues very similar to palletizing. This is not directly related to the food and beverage industry, rather than any manufacturer of consumer products that uses pallets for shipping and warehousing, which typically includes retail businesses.
D. Any industry that involves using shipping pallets for shipping and warehousing can utilize a similar solution as related to WFC's solution. This includes companies that produce consumer goods for retail and retail distributors such as Walmart, Amazon, Target, etc.
E. Other companies appear to either hand package goods, or have an automatic palletizing system implemented into their lines. It is completely dependable on the product and its size being palletized, the facility layout, and other preferences the company may have.
F. Research shows that competing companies are implementing automated palletizing systems. Which version of palletizer largely depends on the product being palletized, the budget of the company, or the goals of output quantity.

# *5* PROJECT SCOPE

A. The scope of this project includes gathering vital line information, contacting potential suppliers for quotes, and creating a decision matrix based on our client's demands. This will provide a list of solutions for WFC in determining what automatic palletizing system would best fit their lines.
B. Parts of the business include the production floor and warehouse because the palletizing system will be included at the end of the production line and transported to the warehouse by fork trucks.
C. Other areas of the business such as accounting, HR, and IT were not included in this project.
D. The IT side and accounting side of this project are not included because we are not choosing the palletizer or setting it up for them. We are simply providing a comprehensive resource to weigh their options.

# 6 GRAPHICAL ABSTRACT

Floor level palletizing system

High level palletizing system

Robotic palletizing system

Hybrid palletizing system

# 7 REFERENCES


- Collin Christensen, Devin Dean, Gerard Hoskins, Jon Westmoe, Joseph R. Vanstrom and Jacek A.Koziel. Facility Layout and Production Flow Plan. Final Report. TSM 416 Technology Capstone Project, April 28, 2017.
- Nathan Kinneman, Wil Schrad, Blake Widman, Joseph R. Vanstrom and Jacek A. Koziel. Barilla Mixed Pasta Reduction. Final Report. TSM 416 Technology Capstone Project, April 28, 2017.
- Alex Petersen, Charles Isbell, Jake Flattum, Michael Delagardelle, Joseph R. Vanstrom and Jacek A. Koziel. Ford P558 Extended Running Board – Product / Process Flow Improvement Event. Final Report. TSM 416 Technology Capstone Project, April 28, 2017.


# 8 APPENDIXES

VS1:

- Cases per minute: 30 (capable of handling up to 40 cases per minute)
- Requires access to VS1 “supermarket”
- 2 different palletizing patterns
- See pallet specifications under Goal Statement

VS2:

- Cases per minute: 10 (capable of handling up to 30 cases per minute)
- 6 different palletizing patterns
- See pallet specifications under Goal Statement

We will be implementing our decision matrix for the final report here when it is complete. The decision matrix will include a comprehensive list of solutions that will be ranked based on World’s Finest most important values on a weighted scale.

This will also include images noting the top choices based on the decision matrix.

**Schneider’s Proposal for World's Finest Chocolate:**

**VS1 Solution:** Robotic 1 in 1 Out Cell with Optistak

- With slip sheet and pallet dispenser

**VS2 Solution:** Robotic 1 in 1 Out Cell with Optistak

- With slip sheet, tier sheet, and pallet dispenser

## Columbia's Proposal for World's Finest Chocolate:

**VS1 Solution:** FL 3000 Mid Speed Floor Level

- With slip sheet and pallet dispenser

**VS2 Solution:** FL 2000 Low Speed Floor Level

- With slip sheet, tier sheet, and pallet dispenser

## Intelligrated's Proposal for World's Finest Chocolate:

**VS1 Solution:** Alvey 680 Series Floor Level

- With slip sheet and pallet dispenser

**VS2 Solution:** Robotic Solution

- With slip sheet, tier sheet, and pallet dispenser