High School

TROPICANA

#2 - Shipping Challenge Instructions

Created by the FLATE Center for Manufacturing Education, Hillsborough Community College
10414 E Columbus Dr., Tampa, FL 33619 • (813) 259-6577 • www.fl-ate.org

The Scenario

A typical batch of Tropicana orange juice is 250,000 gallons, which is used to automatically fill individual containers. Once individual containers are filled, they need to be packaged so they can be conveniently lifted by workers and fit on to pallets for efficient transportation to stores. To visualize this problem, think about carrying a six-pack of juice compared to six individual containers.

For this learning challenge, you have been hired by Tropicana to propose the dimensions of a new shipping case that will be appropriate for your individual containers. The case is used to transport the juice containers more efficiently.

To successfully complete this challenge, you must work with two types of constraints: the individual containers' size, and the maximum weight per case.

The Challenge

1. Review the provided *Design Constraints.* See your teacher for hints for identifying the problem, brainstorming, and analyzing your solutions.
2. Design the case to maximize the quantity of individual containers that will fit in a single case, without exceeding the weight limit.
3. Calculate how many containers and how much total fluid will be included in a case.
4. Compute how many cases will be required to complete an order of 250,000 gallons of juice.
5. Write a final report summarizing your solution.
6. Answer the questions at the end of this Challenge.

Suggested Assessment

1. Juice case dimensions	25 points
2. Case fulfillment of design protocols	25 points
3. Calculations to complete order	25 points
4. Final report and answers to questions	25 points
	Total points – 100 points

The Conclusion

When finished, you will have completed a realistic exercise in modern manufacturing. Did you enjoy this challenge? Is manufacturing a career choice you would like to pursue? Check out additional challenges and resources at www.madeinflorida.org.

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DESIGN CONSTRAINTS

Instructions

For new ideas to be functional and feasible, you must work with the constraints of a problem. Study the constraints below and brainstorm possible solutions with fellow students and your instructor.

Current shipping case constraints:

The current case has the following statistics:

1. Number of individual containers per case: 8
2. Dimensions: height = 10 inches, depth = 8 inches, length = 16 inches. See figure 2.1 below.

New shipping case constraints:

Your proposed shipping case must:

1. Be able to fit the dimensions of your newly designed 64 oz individual container.
2. Allow the containers to fit snugly in it.
3. Have a rectangular base.
4. Be made from cardboard, plastic or a combination of the two.
5. Fit together with each other for easy stacking on a pallet.

Shipping case weight constraints:

Your proposed shipping case must:

1. Weigh no more than 20 kg (for easy lifting).
2. Strong enough to hold the gallons of orange juice in each case.

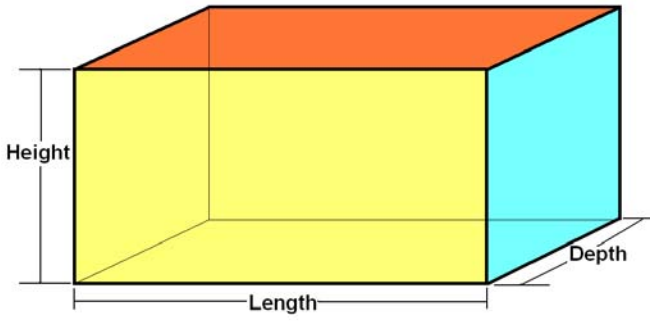

Figure 2.1: Dimensions of a Cuboid (Current Case)

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Questions:

1. Find out how many pounds (lbs) make a kilogram (kg) (http://www.projects.ex.ac.uk/trol/scol/ccvol.htm)
2. Calculate the maximum weight of each case in lbs.
3. How many individual 64 oz are needed, to be filled with 250, 000 gallons of orange juice?
4. How many of the current cases are needed to transport 250,000 gallons of orange juice?
5. If the case could hold only 6 containers instead of 8, how many MORE cases would be needed to fulfill this order?
6. What are the dimensions for your new case?
7. How many individual containers can each case hold?
8. How many cases are needed to fulfill the 250,000 gallon order?
9. If each 64 oz container weighs about 1.9 kg, what is the approximate weight of current case when loaded? Is this under the maximum load limit?
10. For your newly designed case, what is the approximate total weight when loaded? Is this under the maximum load limit?

Useful websites:

1. www.tropicana.com
2. www.grahampackaging.com
3. http://www.projects.ex.ac.uk/trol/scol/ccvol.htm(Conversion Calculator)
4. www.madeinflorida.org

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