Team #3

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E. Design 100.012

Final Report

Product: TODA

Figure 1

The process of fixing the problems that rose in the Prototype #1 and developing it into the final product took place on the weekend of October 9th, 2013. The tests done on Prototype #1 concluded that 77.8% of water left the bananas, proving the tray to be very efficient in drying fruit. Further enhancement of the prototype# 1 took place on Thursday, October 9th, 2013 in the Hammond Woodshop Room at PSU at 1:30PM.

While the solar food tray prototype #1 proved to be easy to clean, reasonably priced and made of food grade materials, it has failed to be durable. As seen in the "AFTER" picture in Table 1 below, the wooden frame of the tray broke. In order to ensure that prototype #2 does not experience the same problem, the tray must be made of stronger materials. Therefore, the structural support of the prototype #2 is made of thick wooden planks (as seen in Figure 1) instead of the cardboard. The use

of harder wood provided more strength to the product.

Table 1: Prototype #1 Test Summary

Design Constraint [C]	Test	Results/Notes	Pass/Fail of Test	Picture
Durable [C]	-drop tray 20 times from 5 feet and analyze the damage	after the 17th drop, a side of the tray broke, however was able to be glued back, without causing any more damage	FAIL: the framing of the tray proved too weak	
Easy to clean [C]	-clean the tray with a damp cloth for 1 minute	within a minute, the tray was clean and barely wet	PASS: the cloth was able to remove all banana residue under a minute's time	BEFORE AFTER
Reasonably Priced [C]	-keep all materials under $9.00 (to stay on the safe side)	9 48" wooden sticks and 1' wooden frame were used to build the tray	PASS: 1 wooden stick: $0.78 1' wood frame: $1.00 9*$0.78+$1.00=$8.02	
Food grade materials [C]	-be sure that all materials used are food grade material	according to the Food Grade Materials chart, the wooden sticks and wood frame are both food grade materials	PASS	

In the durability test row, the picture on the left displays team member Matt Kreamer enthusiastically dropping the tray, to see how many drops it could withstand before failing, which is seen in the next picture. The images seen in the Easy to Clean test row display prototype #1 both while it was dirty (to the left) and after being cleaned (to the right).

Table 2: Prototype #2 Test Summary

Design Constraint (C)	Test	Result	Conclusion	Picture
Durable	Drop the tray 20 times from the height of 5 feet and look for damages	The tray was able to withstand the 20 drops	PASS	N/A
Easy to Clean	Clean the tray with a damped cloth for a minute	The tray was successfully cleaned	PASS: the cloth to remove the entire residue within a minute.	*Figure 2: Before Cleaning*

Reasonably Priced	$9.00 is the budget	The wooden sticks and the wooden plank was under $9.00	PASS: the total expenditure done on the final product is $9 9 wooden sticks: $7.02 2 wooden planks (approx. 1in thick, 2in tall, 18in long): $2 Total cost: $9.02	 *Figure 3*	
Food Grade Materials	Be sure that all materials used are food grade materials	According to the Food grade materials chart, the wooden sticks and the plank frame are both food grade materials	PASS		

In Table 2 above, Figure 3 displays the tray when undergoing the speed drying test, in which a small number of banana slices were partially dried under a hair dryer.

If this product were to be remade given all the materials we would need, a similar rail support system will be used. The stronger wood will add durability to the product. The wooden dowel rods will be substituted out for some sort of metal rods, most likely stainless steel. This is safe to use with foods, of course. Metal would be preferred over wood due to its ability to conduct heat, as well as its higher level of durability. These two main features of the product, having been revised, would allow the next version to be sustainable up to and perhaps past 5 years. As for the material cost, the wood will cost the same as it did for prototype #2, and the ¼ inch stainless steel rods will be around $5 for six feet. This would allow the total price margin to stay within the $10 goal that was set. Ideally, the rods would not be permanently fixated to the wooden planks, so the tray could be disassembled for easy storage. In the end, this final product would meet all of the team's goals, and is an ideal solution to the posed problem.