

Alcoa Sustainability Project Report:

Aluminum Party Cups



When asked by Alcoa to help incorporate aluminum into Penn State's campus in an effort to help sustainability, our group was eager to help. We brainstormed many ideas, narrowed down to concepts such as aluminum bottles, a cash incentive to recycle, aluminum pens and pencils, aluminum to-go boxes and aluminum party cups and settled on what we considered the best: the aluminum party cup. With Penn State's large student population, we figured that we could help reduce the plastic (Solo) party cup waste that parties leave behind. These cups are usually just thrown away after a party which is hazardous to the environment. Aluminum party cups are much easier to recycle, have an estimated unit cost of \$0.43 and can help improve sustainability at Penn State.

Group 8 | EDSGN 100.012 | 12/9/2013

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Project Website: http://sedtapp.psu.edu/design/design_projects/edsgn100/fa13/

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Introduction

In fall semester 2013, the EDSGN100 classes were approached by Alcoa to help them with a project. The problem was as stated, "Identify opportunities across the campus to take advantage of aluminum's intrinsic properties for the purpose of increasing the efficiency or sustainability of products and product systems." To help understand the problem, our group then defined sustainability as "the ability to have a minimal impact on the environment, the ecosystem, and to manage a limited pool of precious resources over a long period of time". As a class we also did a "Get Smart" assignment in which each group researched and then presented on different aspects of the aluminum industry. After all these steps our group was fully able to understand the problem and therefore able to start brainstorming answers to this problem.

Concept Development

When the Team 8 first started to brainstorm, we were guided by a number of criteria that our group had decided was important. Generally we tried to have ideas that would replace objects around campus that were often thrown away but not recycled. We also tried to brainstorm ideas that could have as much of an impact around campus and elsewhere as possible. With these guidelines in mind, members of the group would then propose ideas and the group would discuss them thoroughly. After some time of brainstorming, we finally had a sizeable group of good ideas. These ideas included aluminum party (Solo) cups, a cash incentive for recycling (get \$0.10 per can recycled), aluminum bottles (for soda, water, etc.), aluminum to-go boxes (for the cafeterias around campus) and aluminum mechanical pencils and pens.

The project called for only one idea however, so our group had to narrow down our pool of ideas to only two concepts. To do this we further considered the criteria we had already followed, impact and range of influence, but we also added other criteria we wanted to evaluate our ideas upon. Our group looked at creativity and feasibility to narrow down our group of ideas. We wanted an idea that wasn't also being done by another group and we wanted a concept that was feasible from an environmental, economic, and practical point of view. Eventually we decided that our two best ideas was the incentive for recycling and the aluminum party cups.

To elaborate on these ideas, the incentive for recycling is an idea that one of our members heard being implemented at other colleges/universities. The idea is that one would get money back for recycling, approximately \$0.10 cents a can, which is a number that could be adjusted depending on costs, profits, etc. This idea would motivate people to recycle correctly and frequently. The difficulty in this idea however is how the incentive would affect all of the stakeholders in this concept. While college students would benefit from the incentive program because they would be able to make some money, other stakeholders would be the ones paying out the cash for the program, such as Penn State recycling, the Office of Physical Plant,

and the beverage suppliers. How the cost of the program and the responsibility for the program would be split between these entities would be the true challenge in this concept. But because college students tend to be low on cash, Team 8 thought the incentive could be a great way for them to get some extra money while helping out sustainability around campus.

The other idea is of course the aluminum party cups. The idea is a simple one, which is to create aluminum cups to replace the commonly seen plastic cups (see Figure 1) seen at parties or other social functions. The stakeholders for this idea are largely the same as from the incentive; college students as well as Penn State recycling, the Office of Physical Plant, and the manufacturers of the cups. The aluminum party cup would sit well with the college students as it would allow them to improve sustainability around campus. Penn State Recycling and the Office of Physical plant both like the idea because aluminum is easier to recycle than plastic. The difficulty in this idea however lies within the costing of the cup, which affects most of the stakeholders. If the cost is too high, college students will not buy an aluminum cup over a plastic one. If the cost of manufacturing is too high, the companies that already make disposable cups will refuse to make it. But because of the large impact on sustainability the aluminum cups could have, Team 8 also thought this was a worthy idea.



Figure 1: a plastic party cup (<http://popdust.com/wp-content/uploads/2012/07/usa-olympics-slideshow-red-solo-cup.jpg>)

To decide between these two ideas, the group used two methods. The first method was to survey the target audience about both the incentive and aluminum party cups. We used two surveys, one for the incentive and one for the aluminum party cups (see Survey 1 and Survey 2 in the appendix), and then tallied the results (see Results 1 in the appendix). We received more results for the aluminum party cup survey which led us to believe that there was more interest and more of a market for the cups rather than the incentive. The other method we used to decide was a selection matrix. We listed attributes that we thought were the most important to score our ideas upon and then weighted the attributes in terms of importance (see Matrix 1 in

the appendix). The results with the matrix agreed with our survey results and the cups overall scored higher than the incentive program. Because of the results from the methods we used, our group decided to continue on with the aluminum party cups.

Detailed Concept Development

The majority of the detailed concept development for our group was through costing. A cup is not very difficult to design so we spent only a little amount of time thinking about the design of the cup which we created in Solidworks, a CAD program. As you can see in Figure 2, the design is fairly simple which helps keep production costs low.

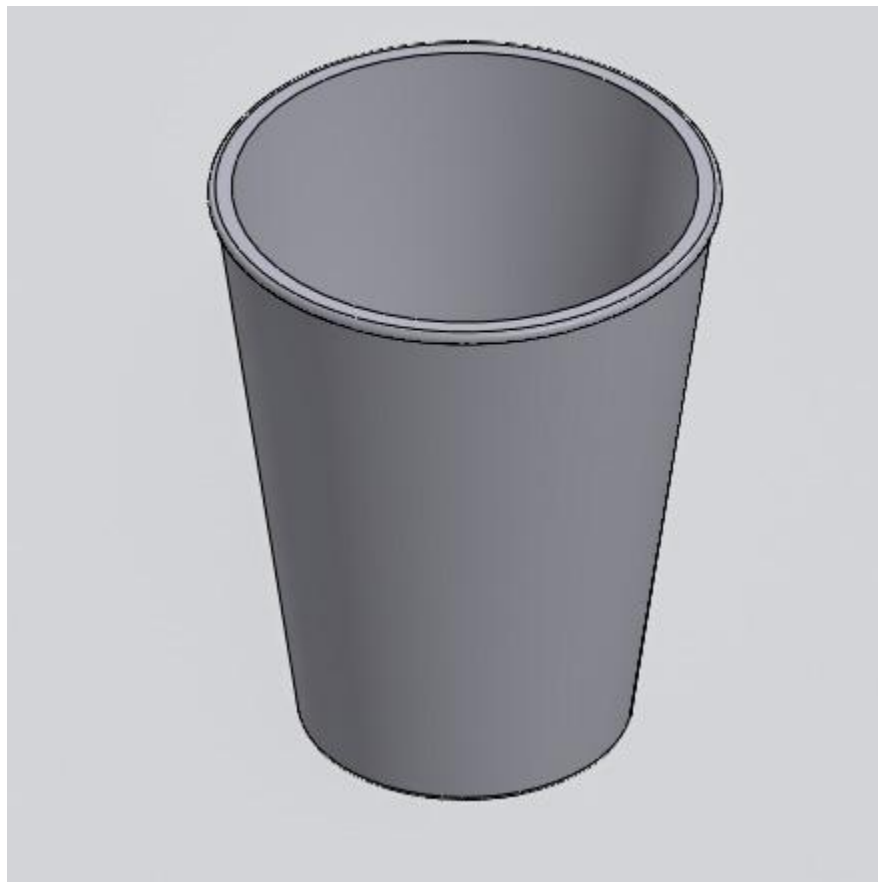


Figure 2: The aluminum party cup created in Solidworks

The development of cost estimates for manufacturing the cup was challenging. Costing is important because purchase price is the main reason people buy the plastic party cups. The plastic party cups cost about \$0.27 each, making them a popular choice for people strapped for cash, such as college students. Because the cost of what we are trying to replace is so low, time was needed to make the aluminum solo cups cost as little as possible. The main way to reduce costs

Conclusions

The aluminum party cup would contribute to improved sustainability at the Penn State campus if it could be manufactured for a cost closer to the cost of a traditional plastic party cup. In a very green campus, the plastic party cup is one of the only instances of large amounts of harmful materials not being recycled. The aluminum party cup could solve that problem, being a material that would be easily integrated into existing recycling (same recycling as soda cans, etc.). If combined with our other idea (the incentive) the aluminum party cup could possibly be even more popular. The aluminum solo cup might even be seen as a more “premium” material by some. However, despite all of these advantages, the majority of the stakeholders would not adopt our idea. This is because the cost of the aluminum party cup is too high for our target audience, college students. This is because college students do not have a lot of money and therefore will buy the cheapest possible option when shopping, which would be the plastic party cup, not the aluminum party cup. The cost of the cup would outweigh all of the benefits for college students, which is unfortunate. What it would take to make this design feasible is to somehow reduce the thickness of the cup even more so to a point where the cost is the same or less or the same as that of a plastic cup while retaining the structural integrity of the cup.

Team 8 learned a myriad of lessons from this project. The first is that surveying and researching the market before developing an idea is very important. In our case, we had a negative reaction from the market in our surveys that we managed not to see until after we had almost completed development. The negative surveys only reaffirmed that the cost of the cup was too high and should have been something we considered before development.

Another lesson we learned from this project is one of teamwork. No team is ever perfect, and we don't think our team was an exception to that. Our team should have had better communication and clearer guidelines as to how to handle situations that could and did occur. Overall we think we lacked teamwork that could of perhaps created a more comprehensive and polished project. While we certainly aren't ashamed of the aluminum party cup, we do think that we could have created a better design and project overall.

References

- <http://prezi.com/j5uc6pwagxki/infamous-red-solo-cup/>
- <http://www.dotmar.com.au/density.html>
- <http://education.jlab.org/itselemental/ele013.html>
- <http://www.ask.com/question/how-much-does-a-12-ounce-aluminum-can-weigh>

Survey 1- Aluminum Party Cup

1. What year are you?
 - a. Freshman
 - b. Sophomore
 - c. Junior
 - d. Senior
2. Male or Female? (circle one)
3. Do you live on campus?
 - a. Yes
 - b. No
4. Do you recycle?
 - a. Yes
 - b. No
5. Do you make it a point to use the correct recycling bins when the options are available?
 - a. Yes
 - b. No
6. Do you like to party?
 - a. Yes
7. Do you frequently use solo cups?
 - a. Yes
 - b. No
8. Do you recycle your solo cups?
 - a. Yes
 - b. No
9. Do you recycle aluminum cans?
 - a. Yes
 - b. No
10. Would you drink out of a solo cup if it was aluminum like cans if the option was made available?
 - a. Yes
 - b. No
11. Would you purchase aluminum solo cups if the option came available to you for a similar price as plastic solo cups?
 - a. Yes
 - b. No
12. Would you recycle solo cups if the option became available to you?
 - a. Yes
 - b. No

Survey 2- Incentive Program

1. What year are you?
 - a. Freshman
 - b. Sophomore
 - c. Junior
 - d. Senior
2. Are you Male or Female? (circle one)
3. Do you live on campus?
 - a. Yes
 - b. No
4. Do you recycle?
 - a. Yes
 - b. No
5. Do you make it a point to use the correct recycling bins when the options are available?
 - a. Yes
 - b. No
6. Do you feel that it is currently worth your time to recycle?
 - a. Yes
 - b. No
7. If there was a \$0.05 cash incentive per can to recycle would you do so?
 - a. Yes
 - b. No
8. If there was a \$0.10 cash incentive per can to recycle would you do so?
 - a. Yes
 - b. No
9. Would you recycle more with the incentive or the same amount?
 - a. More
 - b. The same

Results 1- Aluminum Party Cup Survey

- Question 1
 - Freshman- 16
 - Sophomore- 12
 - Junior- 1
 - Senior- 0
 - Graduated- 2
- Question 2
 - Males- 19
 - Females- 12
- Question 3
 - Lives on campus- 27
 - Lives off campus- 4
- Question 4
 - Recycle- 26
 - Don't recycle- 5
- Question 5
 - Uses right bins- 26
 - Doesn't use right bins – 5
- Question 9
 - Recycles cans- 28
 - Doesn't recycle cans- 3
- Question 10
 - Would drink out of an aluminum solo cup- 19
 - Wouldn't drink out of an aluminum solo cup- 12
- Question 11
 - Would purchase aluminum solo cups- 19
 - Wouldn't purchase aluminum solo cups- 12
- Question 12
 - Would recycle aluminum solo cups- 24
 - Wouldn't recycle aluminum solo cups- 4

Results 2- Incentives Program Survey

- Question 1
 - Freshman- 12
 - Sophomore- 13
 - Junior- 1
 - Senior- 0
 - Graduated- 1
- Question 2
 - Male-16
 - Female- 11
- Question 3
 - On campus- 25
 - Off campus- 2
- Question 4
 - Recycle- 19
 - Doesn't recycle- 8
- Question 5
 - Uses right bins- 21
 - Does not use right bins- 6
- Question 6
 - Feels it is worth their time to recycle currently- 21
 - Feels it is not worth their time to recycle currently- 6
- Question 7
 - Would recycle with \$0.05 reward- 24
 - Wouldn't recycle with \$0.05 reward- 3
- Question 8
 - Would recycle with \$0.10 reward- 25
 - Wouldn't recycle with \$0.10 reward- 2
- Question 9
 - Would recycle more with the incentive- 20
 - Would recycle the same amount with the incentive- 7