FSU/FAMU College of Engineering
Department of Mechanical Engineering

Ice-Breaker Exercise Report

Team 2 – Cummins: Electric Vehicle Optimization

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Group two was given 20 spaghetti noodles, 1 yard of tape, and 1 yard of string. With these supplies and within a 20 minute time constraint, we had to build the highest structure capable of supporting a single marshmallow. [1]

Group two began brainstorming ideas where several important aspects were considered, primarily that a strong base was needed. This aspect was crucial to the design, as with a weak base the structure would topple over quite easily. The next concept was the possible use of a truss system. In theory this idea would produce the strongest structure, as the forces of gravity would be distributed amongst more members decreasing the chance of failure. In addition the use of cross supports would make the design very rigid, which is ideal for any structure. Despite these obvious benefits designing and assembling a truss system was not possible with the given time and material constraints. Instead, we decided that a tripod base would be used, as this was the simplest and geometrically strongest configuration to produce.

Construction began by making the three legs of the tripod base. Tyler and Jakob did this by taking three spaghetti noodles and taping them together to form a single leg. Repeated twice to produce 3 legs, Jakob lashed them together using a piece of yarn to create a teepee. While the tripod was being constructed Samantha constructed the vertical members that would be attached to the tripod. These members were also made from three noodles taped together. After the tripod was constructed, Tyler and Jakob added cross supports to connect the legs together for added rigidity and strength. During all of these processes the team members were in constant communication and any disputes on how to proceed were resolved by a majority vote. Following the completion of the base the first and second of the vertical members were added. Before adding the third and final piece

Jeremy recommended placing the marshmallow on top to ensure that what was already made could support the weight. The addition of the weight of the marshmallow caused the structure to deflect and would have resulted in it falling over had the marshmallow not been removed. Given this issue it was decided not to add the third vertical member since this would only worsen the problem. Instead the third member was used to reinforce the other two in order to limit the deflection of the structure. Despite this addition the design still leaned too far in one direction, however Samantha added an additional leg to the base, which corrected the problem. The completed structure stood 27.5” high.

The biggest problem encountered during the build was the deflection of the noodles. The deflection caused the marshmallow to extend over the boundary of the tripod base, which greatly reduced the stability of the design. Another problem encountered was the difficulties with the assembly of the final design. During construction we had to be careful not to break the noodles while we taped them together. Additionally due to the small diameter of the noodle it was difficult to tape them to one another. Despite all the care taken during assembly there were several instances of noodles breaking or noodles not being taped together securely enough. In both cases the solution was adding more tape either to reconnect the broken pieces, or to better secure the linkage between noodles.

In conclusion, group 2 built a sturdy structure capable of supporting a marshmallow. This fun exercise allowed the group to work together as a team and complete the task. Its relatively stress free environment made for a fun group project and helped the team become more acquainted with each other.

References:

[1] Gupta, Nikhil. "Marshmallow Challenge." 1 Sept. 2015.