From transporting the Roman Emperor’s ice to bota bags full of a favorite beverage, from pipelines to a paper envelope, packaging has been a part of human existence since we felt the need to bring “stuff” along with us, or send “stuff” to someone else.

Packaging might be described as the layers (as seen in Figure 1) of material added to protect and contain contents for end use - for a specified time and distance. It might also serve to protect the environment from the contents. It generally also provides information about the contents, and must occasionally promote those contents. Some packaging, as in the case of the humble Pez dispenser, also adds a measure of enjoyment.

All that convenience is the good news. But, there is the accompanying bad news. There are mountains gathering of discarded single-use packaging [1], and although we don’t know for sure, estimates are that some packaging will take hundreds of years to biodegrade [2]. In most parts of the US, there is little aftermarket for recycled plastic, resulting in even our sorted plastic ending up in the landfill [3]; and some packaging, including certain medical packaging, cannot be recycled for safety reasons. Some packaging costs more than the contents [4], while some packaging, when it fails (as in the case of leaking oil tankers), can have consequences amounting to the billions of dollars [5]. And, who of us has NOT had a fit of “wrap rage” - where the packaging may have protected the contents from theft, but has sent tens of thousands of us to the emergency room each year [6]. Damaged goods due to inadequate packaging increase costs to manufacturers which are, in turn, passed on to the consumer [7].

And these are just some of the problems associated with packaging. For instance, when was the last time meat packaging was revised? With new technologies, are there better food safety and hygiene options? Can zero-waste designs be implemented in a cost effective manner?

We are seeking novel solutions rooted in engineering and/or science that will improve any of the packaging or distribution systems: the safety, effectiveness, sustainability, costs, ease-of-use, or any aspect your team determines is important: in a sustainable, aesthetic, user-friendly way. This exploration can tap into any technical field: electrical, mechanical, civil, environmental, computer science, chemical, geological, materials, mining, industrial… you name it.
The solution your team creates should **be your own idea** and represent a **new and novel approach** to this challenge. We encourage you to explore existing solutions so that you might materially improve upon them, but steer clear of custom-built, one-off uses. Your solution should be repeatable and scalable, and fulfill a need felt by a significant number of people, while making a meaningful impact on our world.

**Solution Requirements**

- The solution should be designed with a specific stakeholder group in mind, and evidence of incorporating the feedback of this group must be abundant. This includes considering the original design’s purpose.
- The proposal, while showcasing and quantifying positive impacts, must also quantify the costs and identify negative impacts, including a risk-mitigation plan.
- All prototype testing must be safe to students, and the final solution should be safe to any potential users.
- The cost of your working (final) prototype should not exceed $100, and must demonstrate key functionality and features of your final solution.
- There is no cost limit to the final proposed solution, but your final proposal must demonstrate that the solution is commensurate to the value offered.
- Your team’s working prototype may not exceed 2’ in any dimension, and should be “portable.” It **may not be left on the Engineering Annex premises**, other than in the Digger Design Lab storage bin claimed by your team.

Final proposals will be demonstrated in poster sessions in class on either April 29 & 30, best-in-class teams will compete for school account credit prizes in the final competition on Wednesday, May 1st.

**Bibliography:**


**Other Useful Overviews:**

- The Technology Student: [http://www.technologystudent.com/despro2/packfn1.htm](http://www.technologystudent.com/despro2/packfn1.htm)
- The Role of Packaging in Operations Management: [https://www.intechopen.com/books/operations-management/the-important-role-of-packaging-in-operations-management](https://www.intechopen.com/books/operations-management/the-important-role-of-packaging-in-operations-management)
• And there’s always Wikipedia (see Packaging and Labeling) for a starter overview full of more sources.