

Package Drop Challenge

www.info.sonomaedb.org/mfg-month

What is MFG Month?

The goal of MFG (Manufacturing) Month is to expose students to the exciting, innovative, high-paying, careers available in manufacturing and engineering.

MFG Month 2021 provides Sonoma County classes the opportunity to participate in a manufacturing design challenge throughout the month of October 2021. **The top two classes will each receive a grant to fund new materials or equipment for their classroom.** This project was designed by a group of engineers at Keysight Technologies to put a modern and more environmentally conscious twist on the classic egg-drop challenge. This project can be completed by an entire class, or a subset of students within a class (one project submission per class).

The Prizes

- **1st Place:** \$750 for new class equipment or materials.
- **2nd Place:** \$250 for new class equipment or materials.

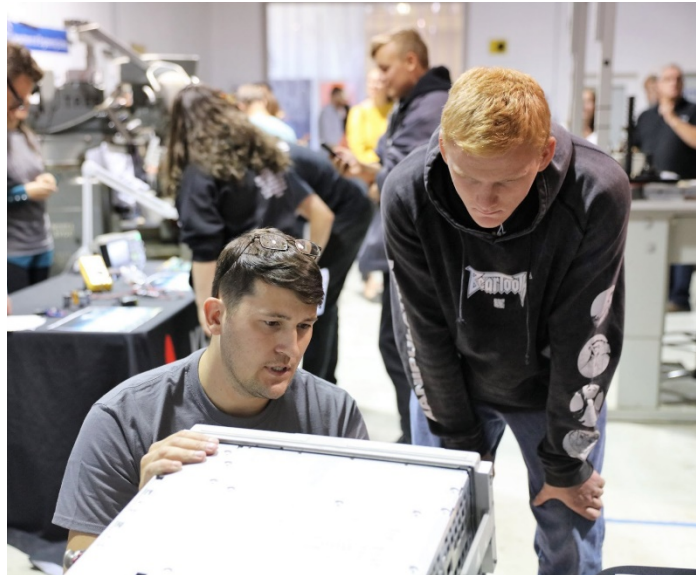
Grants are provided by the CTE Foundation.

Who Should Compete in this Challenge?

Any class that helps students build skills in manufacturing and engineering. If your class is not yet registered to participate in MFG Month 2021, please [Register Here](#).

Who's Involved?

MFG Month is a collaborative effort between the Sonoma County Economic Development Board (EDB), Career Technical Education (CTE) Foundation, and Sonoma County Office of Education (SCOE). The project was designed by engineers at Keysight Technologies, one of Sonoma County's largest technology manufacturers.



The Challenge

This is a packaging engineering challenge designed by several engineers at Keysight Technologies. The project puts a unique real-world twist on the classic egg drop challenge by including real-world packaging materials and considering the costs and sustainability of the packaging materials used. For more information, visit the [MFG Month webpage](#) and watch the “Project Overview” video.

Project Goals

1. Design a way to package a single Ecoegg filled with five pennies so that it will survive a one-story drop. If the egg cracks or separates at all, the package is considered broken.
2. Use materials that are as cost-effective and environmentally friendly as possible while still protecting the Ecoegg. Each piece of packaging material provided in the kit has a point value based on its environmental sustainability and cost. Using materials that cost more and have a bigger environmental impact will result in a lower score.
3. Have fun! Test out different ideas, use a variety of packaging material, and don't be afraid to get creative.

Evaluation

Each team will be scored based on a presentation to judges, the ability of the package to keep the Ecoegg safe, and the materials used.

1. Materials:

Each material has a cost and environmental impact, which will be reflected in the scoring. Teams should try to use materials that are more cost efficient and environmentally friendly, while still ensuring the Ecoegg can survive a one-story drop. Using materials like foam may protect the Ecoegg better, but will receive a higher deduction of points due to its high cost and high environmental impact (as shown in the “Costs and Environmental Impact” section below). Teams must show a list of materials used when presenting to the judges.

2. Virtual Presentation to MFG Month Judges:

Each teacher will select a group of 3-6 students to virtually present to a panel of judges to explain 1) how the team came up with the design, and 2) how the team tested the design. Use of visual aids such as video, photos, and/or a slide deck are encouraged. A MFG Month committee member will work with each teacher to schedule the presentation at the end of October.

3. Drop Test:

Following a team's presentation, an MFG Month or Keysight representative will collect the design to be tested onsite at Keysight Technologies.

4. Final Score

The presentation, drop test at Keysight Technologies, and the cost and sustainability of the materials used will all factor into the final score. The two classes with the highest scores will win. Winning classes will be notified via email and also posted to the MFG Month webpage.

The Product

In this challenge, the product is a single Ecoegg filled with five pennies (provided). Teams must keep it safe from cracking open when dropped from a one-story high.

Packing Materials

Below is a list of materials provided in the MFG Month kit. When designing the package, teams can only use materials provided. Teams must use at least one Keysight Box. Use of any other materials in the kit is optional.

Description	Detail (in inches)	Quantity	Real-World Cost
Keysight box, large, double ply	11.25 x 10.5 x 4	1	\$5.22
Keysight box, small, double ply	7 x 4.5 x 3	2	\$3.68
pink foam piece, large	10 x 10 x 2	2	\$6.54
pink foam piece, small	6 x 3.5 x 2	4	\$2.62
brown paper, machine crimped	28 x 6 (approx)	1	\$0.18
brown paper, single	36 x 24 (approx)	1	\$0.15
bubble wrap	10 x 13	1	\$0.15
cardboard piece, single ply	11 x 6	1	\$0.26

Costs and Environmental Impact

Each item provided has a cost and environmental impact. In a real-world application, a company must balance their need to ensure the safety of a product during shipping, while trying to keep costs low and environmental impact at a minimum. Participating classes must also find a balance by designing different packaging options and putting each through a series of drop or impact tests.

For this project, each packing material (besides the tape) has a negative point value, meaning that any items used to package the Ecoegg will take points away from the team's total presentation and drop test scores. Try to use materials that are more cost efficient and environmentally friendly to receive less of a deduction. Test different options! Be creative!

Item Description	Cost	Environmental Impact		
		Recyclable	Compostable	Reusable
Keysight box, large, double ply	-7	-1	0	-1
Keysight box, small, double ply	-5	-1	0	-1
pink foam piece, large	-8	-2	-3	-2
pink foam piece, small	-4	-2	-3	-2
brown paper, machine crimped	-1	0	0	-2
brown paper, single	-1	0	0	-2
bubble wrap	-1	-1	-3	-2
cardboard piece, single ply	-1	-1	0	-1

Safety

Safety should be the number one priority at all times! Classes should test the durability of their package in a way that does not put anyone in danger and should be conducted under direct supervision of a teacher. Students should not climb buildings, equipment, or stand on rooftops. Only use tools designed for climbing (such as a ladder) or use a safe second story balcony or window to test drop the package. Always have someone on the ground a safe distance from the drop zone to ensure the area is free of people while testing is happening.

Recycling the Materials

Do not dispose of any materials provided in the kit, even if cut or damaged. All unused materials will be picked up when a MFG Month or Keysight representative takes the final package design. These materials will be taken back to Keysight to be recycled or reused. For more information of this process, visit the [MFG Month webpage](#) and check out the “Recycling the Materials” video.

Considerations

- Only the materials in the MFG Month kit can be used.
- Teams must use at least one Keysight Technologies box.
- Tape is not calculated in the cost or environmental impact scores.
- Teams cannot use tape on the Ecoegg.
- Any crack in the egg counts as a break.

Tips

- Be creative!
- For larger classes, try splitting into teams and have a design and drop competition to determine the best design to send in for judging.
- There are three helpful videos on the [MFG Month webpage](#) designed to help you in this project:
 - The “Project Overview” video will help describe the project.
 - “The Mechanics” video will provide some insight into the mechanical engineering principles to consider when designing your package.
 - The “Recycling the Materials” video will show you how Keysight Technologies plans to recycle the materials used for this project.
- Record your progress along the way through note taking, pictures, and/or video. When presenting, show your data, pictures and video clips to walk the judges through your design, testing, and documentation process.
- Explain how the cost and environmental impact of the materials affected your choices in this process.
- Feel free to use partial units of the packing materials. When calculating the cost and environmental impact of the materials used, round up to the nearest .25 of a unit. For example, if you cut a piece of foam and used about 2/3 of it, put .75 in the spreadsheet and it will calculate the point deductions accordingly.