

Warren J. Baker Endowment

for Excellence in Project-Based Learning

Robert D. Koob Endowment *for Student Success*

FINAL REPORT

- I. **Project Title:** Cal Poly Compost Chomper
- II. **Project Completion Date:** June 2nd, 2017
- III. **Student(s), Department(s), and Major(s)**
 - (1) Anthony Jungquist, College of Engineering, Mechanical Engineering
 - (2) Cory Parmenter, College of Engineering, Mechanical Engineering
 - (3) Joe McGill, College of Engineering, Mechanical Engineering
- IV. **Faculty Advisor and Department:** Sarah Harding, Mechanical Engineering
- V. **Sponsor:** Susan Deogracias, Captain Raymond Collins Elementary

VI. **Executive Summary**

Students in the garden program at the Captain Raymond Collins Elementary School spend excessive time and energy manually chopping garden leftovers to make compost. The students needed a safe, easy to operate, pedal-powered device which chops the material while encouraging a lifelong passion of gardening and engineering. Through the course of the project, the “Cal Poly Compost Chomper” team identified the needs of the garden program, turned those needs into engineering specifications, and used idea generation techniques combined with analysis to develop a final design. The team then purchased, manufactured, and assembled the parts necessary to create a final prototype. Testing was performed on this prototype and it was deemed satisfactory for implementation by the school garden. The Compost Chomper is expected to be put into use by the garden sometime in 2017.

VII. **Major Accomplishments**

Support Frame for Tandem Bicycle

The support frame (Figure 1) supports the entire machine and has its own wheels to allow for easy transport. It connects to the bike frame at three locations in a way that will allow the bike frame to be detached from the support frame. The support frame stands up against the loads from the operators and cutting action, easily accommodating for the weight of two adults.

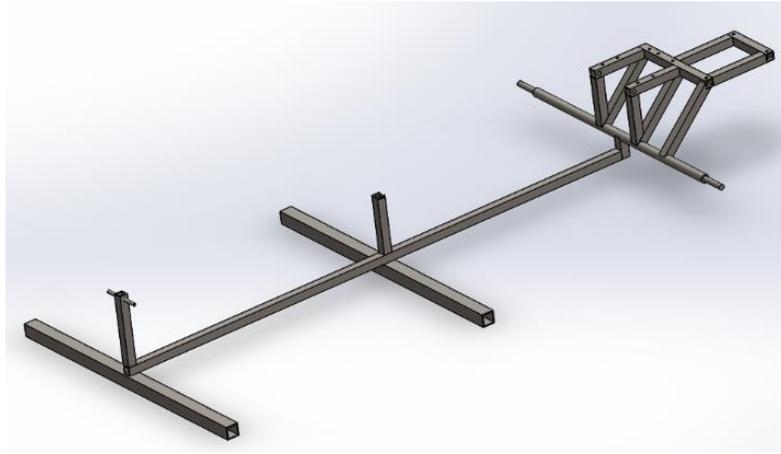


Figure 1. Support Frame

The support frame was fabricated at the Cal Poly machine shops entirely by members of the team. MIG welding was used as the primary tool for joining the sections of steel tubing.

Drivetrain and Cutting Mechanism

The team decided to purchase the Organic Waste Shredder from Filamaker (Figure 2) to use as our cutting mechanism. Buying the cutting mechanism drastically reduced the complexity of manufacturing the final product and guaranteed a certain quality of cutter that otherwise the team may not have been able to achieve through manufacturing.



Figure 2. Filamaker shredder.

To power the shredder, a drive train had to be designed. The goal was to allow for maximum cutting torque while keeping the device easy for the children to pedal. Using the tandem bicycle as a template, the drivetrain was assembled. A flywheel and gear reduction system (see Figure 3) were utilized to make pedaling smooth and easy for the children.



Figure 3. Assembled drivetrain.

Testing has proved that the power input requirements and shredded material size are satisfactory with this configuration.

Hopper and Safety Mechanisms

In the interest of keeping the children safe while they operate this potentially dangerous device, a hopper and other safety mechanisms were employed. The hopper is designed efficiently feed the material to the cutting device while also separating the children from the cutting blades while the device is in use. This is done by using a hopper lid which prevents the children from putting their hands near the blades. A braking mechanism was designed to stop the cutter from spinning when the lid is opened. Sheet metal guards were also fabricated, courtesy of Paladin sheet metal, to eliminate potential pinch points within the drive train.



Figure 4. Hopper and sheet metal safety mechanisms.

The hopper was constructed using transparent acrylic panels to allow the children to observe how the device cuts the material from a safe distance.

Final Design



Figure 5. Fully assembled Compost Chomper.

VIII. Expenditure of Funds

The Compost Chomper team was generously awarded \$2,000 from the Baker-Koob Endowment. This in addition to \$500 provided by the team's sponsor, Captain Raymond Collins elementary, comprised the total budget. The bulk of the funding was spent on parts acquired from McMaster Carr and Filamaker. Of the \$2,000 awarded by Baker-Koob, approximately \$325 is remaining. See Table 1 for an approximate expenditure report.

Table 1. Expenditure report for Cal Poly Compost Chomper.

Compost Chomper Cost Spreadsheet	
Total Budget	\$2,500
Baker-Koob Funding	\$2,000
Order 1 (McMaster-Carr)	\$381.51
Order 2 (McMaster-Carr)	\$202.63
Order 3 (McMaster-Carr)	\$183.47
Order 4 (McMaster-Carr)	\$54.67
Order 5 (McMaster-Carr)	\$26.00
Order 6 (McMaster-Carr and Amazon)	\$46.86
Organic Waste Shredder (Filamaker)	\$600.00
Travel	\$179.76
Amount Spent From Sponsor Card (Out of \$500)	\$280.00
Baker-Koob Remaining	\$325.10
Total Budget Remaining	\$545.10

IX. Impact on Student Learning

Thanks to the Baker-Koob Endowment, this project has been allowed to come to fruition. It has allowed us to experience the design process from start to finish; from designing, to building, to finally testing the final product. If we were not awarded this grant, we probably would have had difficulty turning our engineering drawings into a reality. Baker-Koob has given us the flexibility to create a product that works at its full potential. Being able to not only design our project on paper, but also manufacture it ourselves using real-world processes used in industry, has given us invaluable experience that can be applied to future projects throughout our careers. In addition to our learning as Mechanical Engineering students, this project will also benefit the learning of students in the garden program at Captain Raymond Collins Elementary. We are so grateful to have had the opportunity to work on a project that will help inspire future generations to live healthy lifestyles, practice sustainable gardening techniques, and maybe even find an interest in mechanical engineering! Baker-Koob has made this possible.