*Conclusion*

Overall, we consider this extruder to be worthwhile not only financially, but also for its sustainability benefits. The extruder successfully creates filament out of regrind from plastic bottle waste, allowing Vanderbilt students to create 3D printing filament using waste from other Vanderbilt students. The process of creating the extruder was iterative, with multiple versions of most CAD and 3D printed components. Our team was focused on safety at every step of building, including features such as cooling fans and an emergency stop button. As chemical engineers, we learned about electrical and mechanical assembly from this project in order to do all of the wiring and assembly ourselves with the supervision of our mentors. We hope that future Vanderbilt students build on our project, and we have identified the following areas for possible improvement:

* Integrate more process control elements
  + Interlock systems
  + PIDs that control the screw speed
  + Pressure gauges
  + Additional temperature sensors for extruder temperature
* Consider conical or grooved barrel for improved throughput
* Automate and scale up regrind creation process
  + Try using dishwasher to remove label glue from bottles
  + Acquire a reclaimer that could accept whole bottles without preliminary cutting
* Increase mass percent of bottles used
  + Acquire reclaimer that can accept the tops and bottoms for plastic bottles as opposed to only the middles
* Optimize material properties
  + Experiment with different fractions of regrind vs. virgin pellets, testing the strength of each result
  + Test the effects of multiple thermal degradation cycles