Single-use plastics are one of the largest contributors to waste. According to the World Economic Forum, about 400 million tons of plastic waste are produced each year. Our project aimed to create an extruder which could convert plastic bottle waste directly into filament for 3D printing. We partnered with Vanderbilt Recycling to receive shipments of plastic bottle waste directly from students. Plastic bottles are made of polyethylene terephthalate, or PET. Our team inputted the material properties of recycled PET into a simulation software package called NEXTRUCAD, which allowed us to determine key parameters values for our extruder, such as the temperature and length of each heating zone, the internal pressure, and the throughput. Keeping these parameters in mind, we designed a full 3D model of our extruder in Fusion 360. Once the model was complete, we acquired all of the necessary parts to build our extruder. We machined parts such as the barrel, a flange to attach the barrel to, and a spacer to attach the flange to the base. We 3D printed parts such as a hopper to feed pellets into, shrouds to direct cooling fan airflow to the barrel, and a variable frequency drive (VFD) mount. We bought the remainder of the parts online. Parts such as the motor and gearbox were from McMaster-Carr, many electrical components such as the heaters, VFD, power converters, and wires were from Amazon. We ordered our screw and die from Filabot, which creates some of our competitor extruders. However, the total cost of building our extruder ended up being $5,489.65, whereas the competing extruder from Filabot, the EX6, costs $15,187.00. In an analysis of the payback period of our extruder, we found that the extruder would pay for itself in 3 years and 7 months when run according to a standard business model and considering the cost of the extruder to be a loan. When run in a more realistic setting, we found that the extruder will save the Vanderbilt Digital Fabrication Lab $776 per year on filament costs. We heavily considered safety in the design of our extruder, with cooling fans to prevent overheating, a hopper lid to avoid loose objects getting caught in the machine, an emergency stop button that cuts all power, and mesh over all ventilation holes in housing to prevent access to the inside of the machine. Additionally, we succeeded in creating a modular design, where any part can be switched out for another similar one. We hope to see future students build on our design by experimenting with different barrel types and additional feedback loops.