3D printing lab equipment from recycled plastics

Project description

Plastic pollution is one of the most severe and rapidly growing environmental issues, with an increasing amount of plastic accumulating in the environment, due to its centuries-long degradation times. While scientists represent only 0.1% of the global population, by consuming large amounts of single-use plastics every day, we are responsible for 2% of the plastic waste produced worldwide every year, highlighting the urgent need to develop sustainable science programs to deal with plastic waste in research institutes.

Within the Green Labs Netherlands initiative, in the Dream3D lab we conducted a pilot study, concluding that up to 1000 kg of non-contaminated, recyclable thermoplastics can be collected each year within the Princess Máxima research department. In collaboration with the company 3devo, we set up a pipeline to recycle clean lab plastics into 3D-printed lab equipment. This pipeline consists of four steps: Collection/sorting of plastics, shredding, filament production and 3D printing (Figure 1). 3D printing is a valuable tool to generate customized lab ware from simple everyday items (racks and holders) to specialized equipment such as bioprinters. Therefore, we have created a multitude of handy objects that are being used in the lab on a daily basis (Figure 2). With our recycling pipeline we are aiming to give used lab plastics a second life to improve sustainability.

While preliminary experiments have confirmed the huge potential of a lot of plastic items from the lab to be recycled in this manner (Figure 3), many steps along the way still need optimization. We are therefore looking for an enthusiastic, hands-on student for a 6- to 9-month internship.

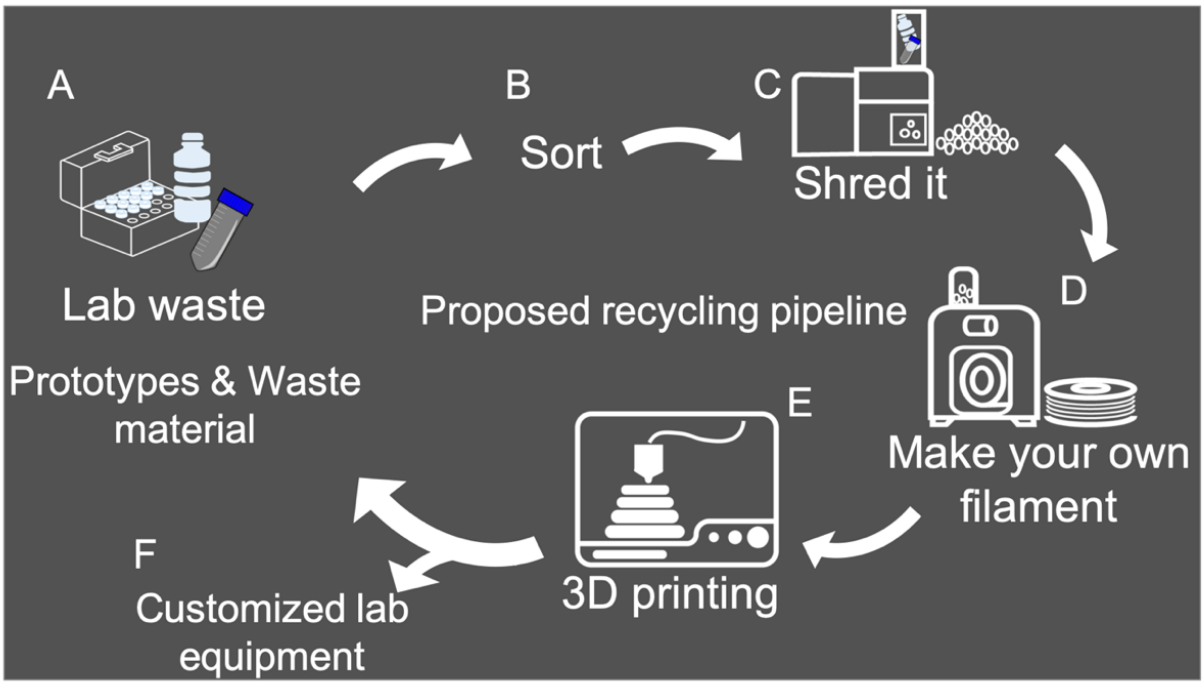

Figure 1. Recycling pipeline: Clean lab waste is collected (A), sorted by material and color (B) and shredded into 4 mm granulate (C). Using the 3devo filament maker we are making 1.75 mm filament (D). This can be printed using our Prusa MK3S FDM printer or Creality Treadmill printer (E) to generate new lab equipment (F). Iterations of 3D printed labware can re-enter the recycling circle (F-A).

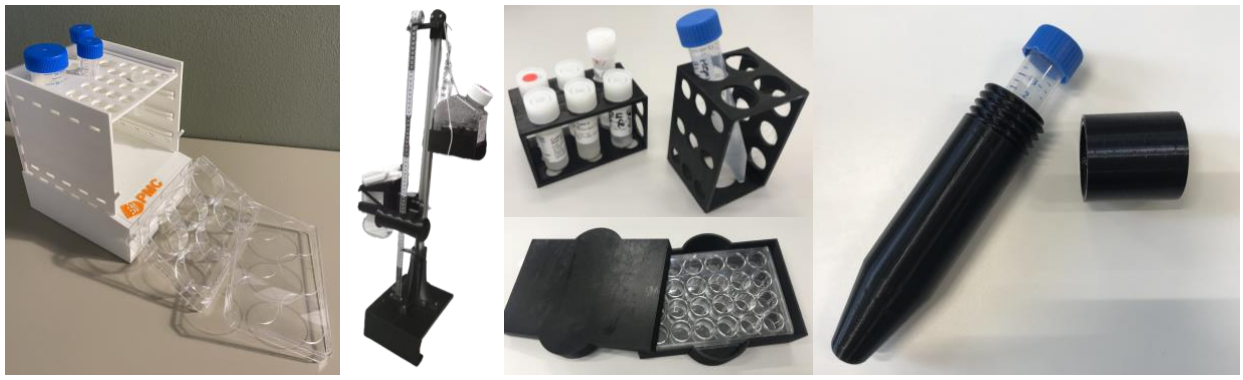

Figure 2. Examples of 3D printed lab equipment. Modular rack (left). Fluorescent camera holder (middle). Multi-function racks and dark equipment for fluorescent staining (right).

Who are we looking for?

Are you creative and do you have a problem-solving attitude? Do you care about sustainability? Are you interested in technologies, such as 3D printing? Then you might just be the right fit for this project!

What skills should you bring:

- Knowledge of 3D printing (bonus: knowledge on CAD design)
- Basic knowledge of electronics
- Basic knowledge on thermoplastic polymers

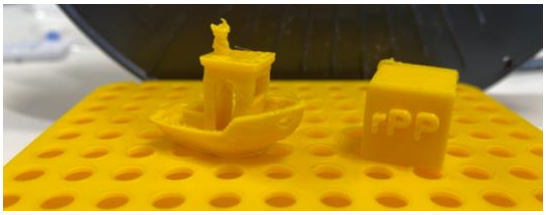

Figure 3. Recycled 3D prints. 3D printed objects (top) derived from filament made from yellow pipette tip box inlets (bottom).

What will you do?

Within the project you will work in close contact with the material specialists from 3devo, who are sharing their experience with plastic recycling. You will optimize specific steps of the pipeline and will be involved in a sustainable science publication. The following aims apply for the internship:

- Optimization (and potentially automation) of the shredding procedure
- Production of filament from different lab plastics
    - PLA (3D printing waste)
    - PP (pipette tip boxes and inlets)
    - PET (media bottles)
- Optimization of print settings for recycled filaments
- CAD design of custom lab ware; potentially creating an open-source online product catalogue

Optional

- Building of a respooling machine to generate 3 kg spools
- Establishment of a decontamination pipeline to increase the range of usable plastics
- Development of an injection molding pipeline in parallel to 3D printing

Would you like to apply for the project?

Please contact Maj at: M.B.Buchholz-2@prinsesmaximacentrum.nl