Project name: ***Paper to Infinity π (Pi)***

Team Members:

Vivianus Lam(20959128) nmlamab@connect.ust.hk ☆🤦🦇
Lambo Qin (20927278) zlqin@connect.ust.hk :) ✌🐗 =^● ㅅ ●^=🧜
Aatrox Deng (20960866) khdeng@connect.ust.hk 🌠🏳️‍🌈🥷
Alison Yeung (20949915) wlyeungag@connect.ust.hk 🤙☃🐢

Problem

HKUST has a well-developed paper recycling system that 3 million pieces of A4 paper were recycled on campus in 20/21. While the recycling work of A4 paper has been impressive, wouldn't the impact be more significant if we start developing innovative recycled paper products? Moreover, there is low transparency in how recycled paper is processed and utilized in HKUST as students are rarely involved in the paper recycling manufacturing process. These problems would in turn restrict students' imagination and interest in paper recycling and sustainability in general, which eventually lead to difficulty in reducing paper and other waste in HKUST in the long run.

Our Sustainable Solution

We wish to provide students opportunities to experience the comprehensive cycle of recycling paper waste into products and impact the lifestyles of students and even the global community.

1. Paper product innovation and manufacturing workshop (team workshop)

In the team workshops, we will focus on developing innovative pulp products. Our goal is to work with different organizations of HKUST and provide practical HKUST-made paper products. We believe, by applying innovative paper products to different campus settings, our project could influence students to live more sustainably, and promote a more innovation-friendly environment on campus.

2. Paper recycling and product development experience workshop (experience workshop)

Our experience workshops will provide opportunities for students to recycle paper into pulp, design, and create paper products to take home. We aim to educate students about how paper waste is recycled and applied in daily life so that they can be more familiar with sustainable products and make smarter decisions as citizens, consumers, and entrepreneurs in the future.

Process of Creating Pulp Products

This is the general process of how our paper products will be developed:

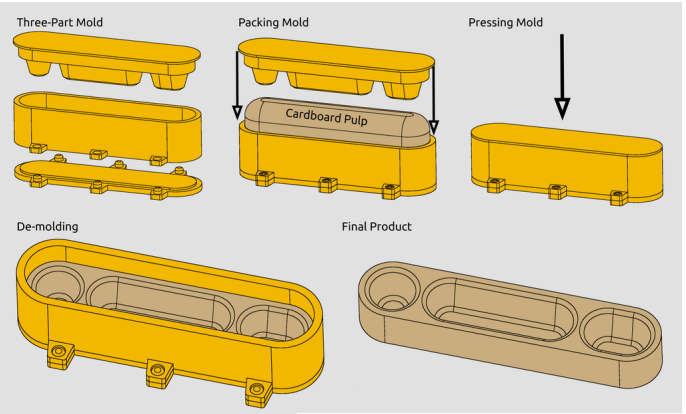
1. **Paper waste collection**

   Type of material and collection method: Pulp is made of cellulose fiber, which can be obtained from a wide variety of paper waste. This includes writing paper, newspapers, egg cartons, and cardboard boxes. However, only paper without coating will be used. All paper waste will be collected from the recycling bins on campus.

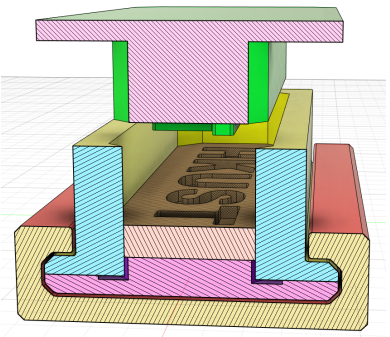
   Material pre-treatment: Any nonpaper material on the paper like labels or tapes should be removed in advance.

2. **Shred paper**: Use a shredding machine to shred paper into pieces. Different types of paper material can be mixed together, and it doesn't affect the quality.

3. **Making paper pulp: (1)** Put the shredded paper into a blender. **(2)** Add hot water to half the amount of paper. **(3)** Add fiber binder (glue). We can use PVA glue and also organic rice paste, which is an eco-friendly choice. **(4)** Blend it until it is a uniform paste. **(5)** Add dye to give pulp color (if needed)
4. **Mold pressing pulp**: The fundamental principle of mold pressing paper pulp into shaped products is shown on the right. We will design the mold based on the shape, size, and characteristics of the product. To be systematic, we will use this basic principle for all of our manufacturing methods. Our molds can be either 3D printed or CNC machined. More of our technical considerations are in the "Extra" section. Below are the procedures:



   1. Remove excess water from the pulp with a squeezing machine
   2. Insert pulp into pressing mold. The input volume should be around 150% of the final size of the product.
   3. Press the mold with a pressing machine. It would be better to use a hydraulic machine, but it is not required. Other cheap or free methods can be used compromising quality.



5. **Drying**: For highly compressed pulp, remove the compressed pulp from the mold. Leave it to dry for a few days or put it in an oven to dry faster. For Less compressed pulp, If we would like a less dense product or if the product is pressed with insufficient force, then the pressed product will be wetter. It is better to leave it in the mold for one day, and then take it out to dry.

Implementation

Workshop and Schedule

	Team workshops	Student Experiencing workshops
Participants	Team members only. We need around 10 team members	20-25 participants per session, and all students are welcome
Content	**Step 1:** Get product orders from HKUST organizations. **Step 2:** R&D: (1) Experiment with the paper molding process, document problems, and successes, and refine the production method for specific products **Step 3:** Manufacture products	**Session 1(online):** Online classes teaching students to design their custom mold press + 3D print mold press on Campus **Session 2(f2f):** Making paper pulp and shaping the pulp with their own molds or our prepared molds **Session 3(f2f):** Embellish and color their own dried pulp product + Summary
Schedule and Length	**Long-term team:** The schedule will be adjusted according to product supply needs	2-3 workshops/semester, 3 different sessions within 2 weeks. Flexibility for participants to join any 1 to 3 sessions. 2-3 hours per session.

Experience Workshop

Students will use Fusion 360 to CAD model their own designs. The structure of the mold press mechanism will be provided, so they only need to transfer the shape of their product onto the mold press mechanism. This will be a relatively simple task that students with no experience can achieve. For teaching, we will lead the workshops with professors. In the future, we can even collaborate with local external partners, such as Mill Mill, in organizing more diverse paper