



Department of Chemistry
Report on the
Three Day Hands on Demonstration Program
on
Waste paper recycling

**Organised by the Department of SCSTE,
Meghalaya**

Venue: Shillong Science Centre, Nehu

Date: 18th ,19th & 20th May 2022

Contents

- 1. Introduction**
- 2. Raw materials for Paper recycling**
- 3. Machines required for paper recycling**
- 4. Working principle of each machines**
- 5. How paper recycled: A step by step process**
- 6. Conclusion.**

Introduction

The department of Chemistry, Shillong College attended a three-day hands on demonstration program on Waste Paper recycling organised by the Department of SCSTE, Meghalaya at NEHU Science Centre from the 18th -20th May 2022. The three-day demonstration program imparted hand on training to the students on recycling of waste paper right from the initial stages of collection of raw materials up to the final recycled product.

Waste paper recycling pertains to the processes of reprocessing waste paper for reuse. Waste papers are either obtained from paper mill, paper scraps, discarded paper materials, and waste paper material discarded after consumer use.

Examples of the commonly known papers recycled are old books, old newspapers and magazines that we have finished reading, or those diaries five years back that are no longer relevant, they are suitable scraps.

Other forms like corrugated, wrapping, and packaging papers among other types of paper are usually checked for recycling suitability before the process. The papers are collected from waste locations then sent to paper recycling facilities. The step-by-step detailed process of waste paper recycling undertaken by the sixth semester students of the department of chemistry, Shillong College is discussed in this report.

Raw Materials required for Paper recycling:

- Waste paper
- Jute/Fibre
- Water
- Heat/Power

The waste paper should be free from plastic.

The Jute/fibre (jute bag) is used in order to hold the paper together.



Fig: Jute bag



Fig: Waste Paper

Machines Required for Paper recycling:

1. Beater Machine
2. Uni-Vat Machine
3. Screw Pressing Machine
4. Calendering Machine.

Working principle of each Machines:

1. Beater Machine

The Beater machine is pentagonal in shape, consisting of a motor to run the machine, a turbine which helps to beat the paper pulp into tiny particles.

It does not have a flat surface, but slope towards the edge.

It requires a heat of about 3HP (horse power).



Fig (a): Beater Machine

2. Uni-Vat Machine

A Uni-Vat Machine is rectangular in shape, and consisting of a moulding tray, two hand pulleys to pull the tray, one-foot brake to push the tray upwards for releasing the remaining water.

The Uni-Vat Machine is use to mould the paper into sheets.

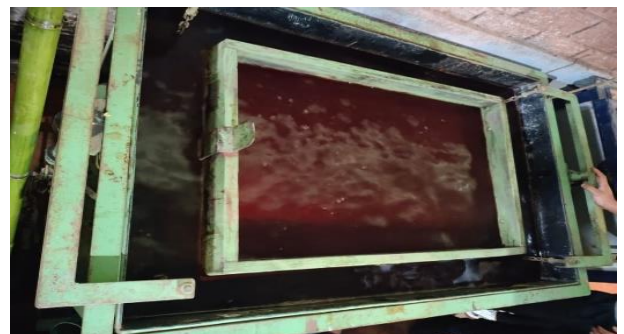


Fig: Uni-Vat Machine

3. Screw Pressing Machine

A Screw Pressing Machine is a type of machine press in which the ram is driven up and down by a screw. The screw shaft can be driven by a handle or a wheel. It works by using a coarse screw to convert the rotation of the handle or drive-wheel into small downward movement of greater force.

It is use for de-watering of the handmade sheets that is formed in the Uni-Vat. A uniform pressure is exerted on the pulp sheets, placed between the platens, mounted on the sturdy base.



Fig: Screw Pressing Machine

4. Calendering Machine

The Calenders employ two or more steel rolls that close under pressure to smooth, compress, and some cases partially bond a non-woven, plastic, paper, or another substrate.

The Calenders machine imparts a smooth touch to the papers by improving the opacity.



Fig: Calendering Machine

How Paper is recycled: A step by step process

1. Collection:

This is the first process in the paper recycling process. This significant step involves the collection of recyclable papers. It entails gathering paper waste from various outlets like your home, offices, and schools and colleges.

Recyclers and paper merchants collect the paper materials from collection points such as trash bins, paper stores, paper scrap yards, and commercial outlets that generate paper waste.



Fig: Collection of Waste Paper

2. **Sorting:**

After collection, the papers are sorted and separated. This process helps to identify the papers that would be recycled and those you need to discard. At this stage we also remove all the external material from the paper collection.

Once accepted at the recycling facility, the papers are further sorted based on the quantity and paper value by assessing the materials that were used to make the paper.



Fig: Sorting and removal of the external material

3. **Shredding and pulping:**

Once sorting is finished, the next step involves shredding followed by pulping. Shredding is done to breakdown the paper materials into small bits. After the materials is finely shredded to bits, it is mixed with water to break down the paper fibre materials.



Fig (a) Shredding of jute



(b) Mixing the waste paper with water



(c) Pulp

4. Beating Process:

The beating process involve the following steps;

- a) The beater is filled with water.
- b) Beat the fibre first and wait until the water rise.
- c) After 30-45 minutes the fibre will turn into sponge like particles.
- d) The soak paper is transfer into the beater.
- e) Allow for mixing by multiples rotation.
- f) Followed by addition of alum (to prevent the flow/to hold the paper clay together)
- g) Boiled starch (3%) is poured into beater (to prevent stiffness of the Paper).
- h) Resin is added thereafter (act as water resistance).
- i) Addition of colours as per your preference.

N: B – *The rotation should be continue at all times to prevent the accumulation of the pulp.*



Fig: Beating Process

5. Moulding:

Materials required for moulding are-

- Moulding Tray
- Table
- Cotton cloth

After beating the pulp is transfer into the Uni-Vat for moulding into sheets. The steps are as follows-

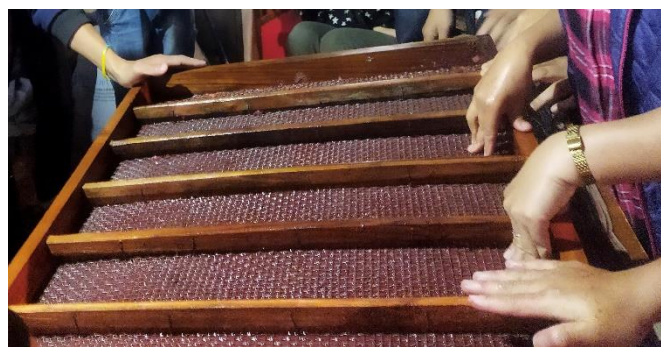
- a) The Uni-Vat is filled with water
- b) Inserting of the moulding tray.
- c) One cup of the pulp is poured into the tray.
- d) Spread the pulp with your hands to avoid accumulation.
- e) Release the tray and then it is carried for making into sheets.



Fig(a): Pulp to be transfer into the Uni Vat



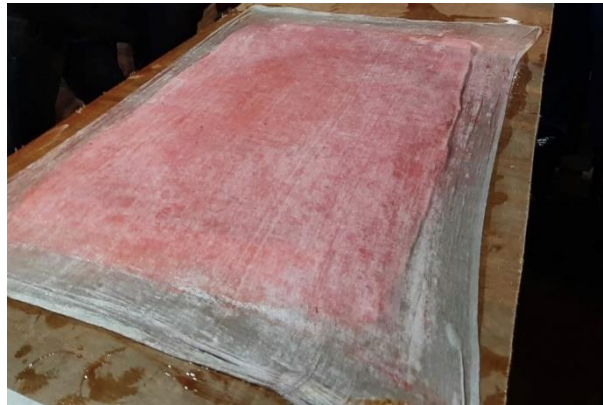
Fig (b): Spreading of the pulp



Fig(c): Moulding tray for making into sheets



Fig(d): A Table to place paper sheets



Fig(e): A cotton cloth to separate the sheets



Fig(f): Paper sheets

6. Drying:

Drying involves two steps-

- By Screw Pressing Machine
- Drying in the presence of air.

After moulding, the paper is taken for drying in a screw pressing machine. This process involves de-watering of the handmade sheets that is formed in the Uni-Vat. A uniform pressure is exerted on the pulp sheets, placed between the platens, mounted on the sturdy base.

After screw pressing, the paper is taken for drying in the presence of air. Drying in air is a slow process depending on the weather condition. It usually requires 2-3 days or even weeks to completely dry.



Fig: Drying in Screw Pressing



Fig: After Screw Pressing



Fig: Drying in the presence of air



Fig: Dried Paper

7. Calendering:

This is the final process of paper recycling, after drying the paper is taken for Calendering process. This process involves smoothening of the paper, one sheet at a time. The time taken for Calendering process depends upon the thickness of the paper.

The purpose of Calendering is to get a smooth and fine paper for used in multi-purpose such as file cover, greeting cards, paper bags etc.



Fig: Calendering Machine



Fig:Paper under Calendering process



Fig: File Cover (Final Product)

Conclusion:

After working on this project, we conclude that paper recycling is very important in our daily life because it helps to save energy about 70%, it is also environmentally friendly. When you decide to recycle paper, you avoid dumping papers which pollutes the air with the production of various toxic gas. Waste paper recycling also helps reduce greenhouse emissions.

On the other hand, recycling takes less energy which in turn, ensures there are less methane and carbon dioxide in the atmosphere.

Recycling also preserves trees and lessen deforestation; it provides jobs opportunities and improves the economy.



Fig: Teachers & Students of BSc 6th Semester (Day 1)

List of all students' participants as well as the teachers accompanying in these three days workshop on Waste paper recycling are given below-

Teachers

1. Shri. Kenneth Umdor (Head of Department Chemistry)
2. Dr. Cheerful Masharing
3. Dr. Badaker Laloo
4. Dr. Barisha Wahlang
5. Dr. Lathewdeipor Shadap
6. Shri. Sumarlin Suting

Students Participants	Roll Nos
1.Sngewbhalang Mary Rymbai	S1900543
2.Phinnangbet Pyngrope	S1900556
3.Ubilis Lyngkhai	S1900547
4.Lapdianghunshisha Majaw	S1900550
5.Enika Nongkynrih	S1900551
6.Bathymmailang Marbaniang	S1900546
7.Haphibanri Sohtun	S1900553
8.Angel Lamin	S1900549
9.Iardaris Marbaniang	S1900533
10.Cordially Rose Nongrem	S1900544
11.Richard K Khongjoh	S1900540
12.Wiltenson Marngar	S1900537
13.Riewdamut Siangshai	S1900536
14.Robinstone Nongrang	S1900529
15.Iaidbor Jana	S1900534
16.Mebanker Rani	S1900548
17.Bonnison Lyngdoh	S1900530
18.Mosting Mynsong	S1900539
19.Kitbok Kharsahnoh	S1900538
20.Banpynbiang Rieng	S1900552
21.Samshngain Dkhar	S1900555
22.Lianzading Dingte	S1900554
23.Remiwell Kharkongor	S1900532

A Glimpse from the Three Days Workshop







Acknowledgement from Students

First of all, we would like to express our heartfelt gratitude to the college, Chemistry Department, **Head of Department Sir Kenneth Umdor**, for giving us all an opportunity to explore new ideas and to learn new things outside the syllabus and also to all our dearest teachers who accompanied us since day 1 till the end of the workshop.

Secondly, we are deeply thankful to **SCSTE** and **Shillong Science Centre, Nehu** for welcoming us with joy and enthusiasm and for also allowing us to feel like home for three days and to our **Project Coordinator** and **instructor** for the knowledge being impart to us about the 'Waste Paper Recycling'.

Lastly, we are grateful for our parents whose been there always to support us financially, and to everyone who involve in making this project successful.