

# Overview of Paper Recycling Machine

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**Abstract**— Paper is one of the most important products ever invented by man. Invention of paper means more people would be educated because more books would be printed and distributed. For making paper trees are cut and brought into the factory. Bark is removed. Remaining is cut into small wood chips which are then mixed into water and cooked into paste. This paste is bleached and other chemicals are added to give the finished paper more strength. This paste is flattened. Water is squeezed out to get paper. In this paper we are focusing on various processes of paper recycling machine like: Pulping, calendaring and drying (with hot rolling). Ellora Paper Mills Limited in Tumsar is a paper plant promoted in the year 1979. The company produces writing and printing paper of various grades. It also manufactures News Print and special grades of Kraft paper. The range of products of the company include various qualities of Cream Wove, color wove, news print, typing and duplicating paper, security paper etc. from 44 GSM to 70 GSM.

**Key words:** Paper recycling machine, pulping, hot rolling

## I. INTRODUCTION

According to Vrushabh R. Rathod, Saurabh R. Rathod and Nitin H. Wankhade :“Desining manually operated small scale paper recycling plant, which can be used in schools and colleges, ensure that a cheap and non-complex method of production of paper product is guaranteed.”[1]

According to R. Raghuchandra, Discussion paper on collection and recycling of waste paper in India, Ministry of Environment and Forest notification, 12th May 2011 on e-waste (management and handling) rules, 2011[2] “Paper is made up of cellulosic fiber sourced from plants. After consumption it often makes its way to trash bins and thus termed as “waste paper”. This waste paper when recovered becomes the reclaimed cellulose fiber base suitable for paper making. Today the term “recycled fiber” is used to refer to the post consumer paper that has been collected and reused to make paper. Use of recycled fiber for paper making has become picking up the world over, including India. The Indian paper industry uses wood, agricultural residues and waste paper as raw material. In the early 70’s, the share of waste paper used as raw material was only 7%, where as now it constitute major raw material base for paper industry with 47% share in total production”.

According to Guang-yu Xiong, Gang Xiong and Timo R. Nyberg in “Information Integration in the Modern Pulp and Paper Industry”:[3]“Information integration is one of the important technologies which is considered as the higher level of Modern Pulp and Paper Industry. At the same time, it is core of management system, control system and information system of Modern Pulp and Paper Industry (MPPI). Clearly, Information integration is tightly connected with the role defined all production management, decision making, scheduling, planning, etc. in MPPI. Therefore, CIMS-oriented Information integration is

requirements of MPPI needing to fulfill customers’ with quick time, quality, cost and service.”

According to Mehmet Mercangoz and Francis J. Doyle III in “Model-Based control in the pulp and paper industry”: “Paper products are an indispensable part of modern daily life, ranging from books and newspaper to stationary products and food packaging, with such diverse uses as filters, coatings, and insulation. The production of this essential commodity is a critical part of the global economy with annual revenues of US\$500 cillion from sales of over 300 million tons of products.[4]

According to Chuangui Wang, Shuangyan Zhang, Honggan Dong, Heng Wu of School of Forestry and Landscape Architecture, Anhui Agricultural University, Hefei, Anhui, 230036, China in the paper “Characteristics of fiberboard manufactured from recycle paper sludge” published in 2013 Fourth International Conference on Digital Manufacturing and Automation:

“Fiberboard panels are one of the most commonly used furniture and building materials, and the consumer demand for fiberboard panels has been increasing over the years. In view of this situation, some efforts have been made to use paper sludge in wood-based panels.”

The Indian paper industry uses wood, agricultural residue and waste paper as raw materials. In the early 70’s, the share of waste paper used as raw material was only 7%, whereas now it constitutes the major raw material base for paper industry with 47% share in total production (Table 1).

Year	% Share		
	Wood	Agro residue	Waste Paper
1970	84	9	7
2000	39	31	30
2011	31	22	47

Table 1. Shift in Raw Material Consumption Pattern

## II. SEQUENCE OF OPERATIONS

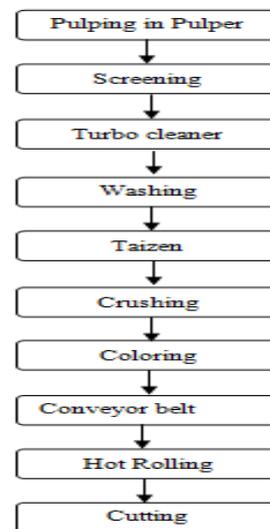


Fig. 1:

### III. RAW MATERIALS

Note books, flyleaf shavings, Hard white Shaving, Envelop cuttings, Sorted office paper, Sorted white ledger, Manifold white ledger, Computer printout, Coated book stock, Wet strength papers, News and pams and LCC.

### IV. INPUT OF INDUSTRY

Consumption per unit production i.e. per metric ton is:

Electricity: 798KW

Coal: 0.05 M. T.

Rice Husk: 0.54 M. T.

### V. PROCEDURE

**Pulping:** Pulp is a lignocellosic fibrous material prepared by chemically or mechanically separating cellulose fibers from wood, fiber crops or waste paper. Chemicals such as bleaching powder, silicate or de-inking chemicals are added in pulper.

For making newspaper:

Newspaper waste: 80%

Other (books, bills etc.): 20%

For good quality paper (40-70 GSM):

Books and bills (used): 80%

Other (newspaper waste):20%



Fig. 2: Pulper

**Screening:** The pulp is separated from the unwanted things (such as stapler pin).

**Turbo Cleaner:** Turbo cleaner is used for the purpose of cleaning the pulp.

**Washer:** Excess chemicals along with waste(ink) is washed away.

**Taizen:** It performs the operation of dehydration, kneading and rubbing fibers by the vanes and replacing with fresh water. It does not allow clogging and insufficient washing due to fluctuating concentration, as the waste paper stock is kept constantly agitated.

It has high washing efficiency and high removal ration of ink and ash.

A wide range of pulp consistency can be applied, inlet: 0.5-5%, outlet: 5-10%.

Easy and low maintenance-clogging prevention system and wearing free drum.

It has high versatility- washing of waste paper, fiber recovery from white water floss and dewatering drainage water. Its installation is easy even in small space.



Fig. 3: Taizen

**Coloring:** colors are added as per requirement of the customer.

**Hot rolling:** In this process the pulp is rolled into paper by passing it between hot rolls.

**Cutting:** Required size of paper is cut as per the customer's requirement.

Cycle timing: 30 min (approximately)

#### A. Advantages

- 1) It reduces wastage of paper.
- 2) Saves trees.

#### B. Disadvantages

- 1) Costly Process.
- 2) Collection of Waste paper is difficult.

### VI. FLAWS IN THE INDUSTRY

- 1) Rollers get damaged (wear out) easily and needs to be completely replaced.
- 2) There are marks on the paper due to use of fabric felt conveyor.
- 3) With some advancement it can manufacture tissue paper.

### VII. SUGGESTION / ADVANCEMENT

- 1) Rubber coating the roller for good surface finish (quality/ smoothness) of paper.
- 2) Employing synthetic felt conveyor for better removal of water and good quality paper.
- 3) Use of vacuum pump at conveyor for sucking paper sheet in between the rolls.

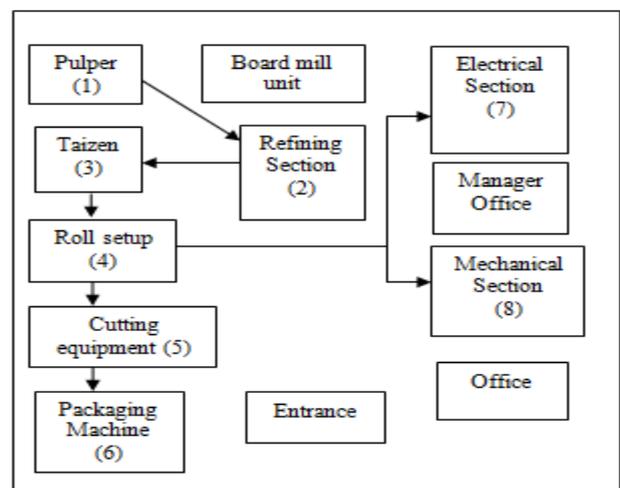


Fig. 4: Flow Diagram

Where,

- 1-2: Pulping process
- 2-3: Refining (cleaning) of pulp
- 3-4: Dehydrating, kneading and rubbing fibers
- 4-5: Rolling (pressing) operation
- 4-7: Maintenance or repair of electrical equipment like pump and motor.
- 4-8: Maintenance or repair of mechanical equipment like roller.
- 5-6: Cutting of paper into desired size
- 6: Packaging and dispatching of products

#### VIII. CONCLUSION

- 1) This industry is running efficiently and effectively.
- 2) Maximum amount of waste paper is being recycled.
- 3) Maintenance time is reduced due to presence of electrical and mechanical repairing sections in the industry itself.
- 4) Maintenance cost is also reduced.
- 5) Due to automation in the Industry, numbers of employees are reduced.

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