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Classification and Contribution of Pulp & Paper Mills

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ABSTRACT

The paper mills use mainly raw materials which includes woody (both softwood and hardwood) and agro residues such as bagasse, wheat straw, rice straw, grasses, sarkanda, jute, cotton linters etc which are available seasonally and are stored usually in open yards. Agro residues are bulky in nature and difficult to handle. The bagasse is stored in bales and cleaned by wet/dry depithing. Straws, sarkanda, jute are chopped before pulping while waste paper is used as such or after manual sorting. Wood is chipped, screened and cleaned off before pulping in the digesters.
The present paper makes an attempt to look at the various parameters of classification and contribution highlighting the process used during types of waste generated and treatment issues available for improving the quality of Pulp and Paper Mills.

Keywords: Efficiency, pulp, low cost, softwood, hardwood.

1. INTRODUCTION

In spite of the fact that the presence of Indian Pulp and Paper Industry is around two hundred years of age, the little scale factories have been in presence for the last 30 - 35 years as it were. Today the aggregate quantities of mash and paper processes in the nation are evaluated to be around 625 identical to an introduced limit of more than 7.5 million tones which is probably going to increment to 14 million tones by the year 2020. Out of the total installed capacity about 1.26 million tonnes is idle (not in operation or closed). The present level of paper consumption in India is around 6.7 million tonnes which makes the per capita consumption of the country a meager 5.5 kg as against 332 kg in USA and world average of 54 kg.

2. PAPER CONSUMPTION IN DIFFERENT COUNTRIES

A comparative account of per capita paper consumption of some other countries is given in Table 1.1. With such lower per capita consumption, the industry has a greater scope of further growth. The business offers work to more than 0.3 million individuals straightforwardly and

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around 1 million individuals in a roundabout way. At present the agro residues & recycled fiber based mills are contributing around 60-65% of the total paper production in the country (Kukreja, 1996).

3. CLASSIFICATION AND SEGREGATION OF PULP & PAPER MILLS

The classification of Indian paper industry is given in Table 1.2.An expected isolation of the aggregate factories on the premise of crude material utilize is shown in Table 1.3. As demonstrated in the table, each of the classes is contributing about equivalent rate to the aggregate paper generation. Be that as it may, under 10% of the aggregate Indian factories (for the most part huge plants) are utilizing woody crude material.

Table 1.1: Paper consumption in different countries (Per Capita)

S.No.	Name of country	Consumption, kg
1.	USA	343
2.	Sweden	247
3.	Japan	242
4.	UK	206
5.	Korea	159
6.	China	29
7.	Thailand	32
8.	India	05
9.	World Average	54
10.	Asian Average	27

Table 1.3: Classification of pulp & paper mills

S.No.	Crude material used	Scale of operation	End items
1.	Wood based	Large (Over 24,000 TPA)	Writing & Printing, Newsprint, Rayon review pulp
2.	Agro residues	Small (Beneath 24,000 TPA)	Writing & Printing, Newsprint, Bundling paper and so forth
3.	Reused Fiber based	Small to expansive (10-600 TPD)	Writing & Printing, Newsprint, Bundling paper and so forth

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Table 1.3: Segregation of Indian mills

Raw material	Mills	Scale of operation in 100	Contribution to installed capacity in percentage
Wood	34	1-7	39
Agro Residues	116	0.3 –1	33
Reused Fiber	387	0.05- 4	31

In present scenario, a distinct classification of mills under above categories has become difficult as:

- Mills are mostly using mixed fibrous raw material furnish depending upon the availability. Some mills are using wood, agro residues (bagasse, sabai grass etc) & recycled fiber or imported pulp together to meet the raw material shortage.
- A significant number of small scale mills in recent years have expanded their pulp mill capacity to around 100 TPD and above. However, most of them except very few mills do not have chemical recovery system.
- The mills are producing multiple end products as per market demand.

4. DISTRIBUTION AND CATEGORIZATION OF PULP & PAPER MILLS

Around 178 agro based and 418 recycled fibers based small and medium scale pulp and paper mills are estimated to exist in the country. A preparation of complete and authentic inventory list of these pulp and paper mills (agro based and recycle fiber based) is a tough task as there are many mills which are not even registered or member of any small mills association while some existing mills have already closed down due to various reasons. Most of these agro based mills use mixed agro residues as raw material depending upon their availability. In recent times increasing number of mills have started using recycled fiber (RCF) in their fiber furnish along with agro residues to reduce the overall environmental impact.

Based on raw material usage and end product these pulp and paper mills may be categorized into following category:

- Agro based mills making bleached variety of paper.

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- Agro based mills making unbleached packaging papers.
- RCF based mills.

As indicated in literature, maximum number of agro residues based mills are located in U.P., followed by Maharashtra, Punjab and A.P., while maximum mills based on RCF are located in Gujarat, followed by Maharashtra, U.P and Punjab. A unique feature of these categories of mills is that they are usually located or established in cluster, *i.e.*, on an average 3-5 mills are usually found in close vicinity of each other within a radius of few kilometers. The major factors governing their location are primarily the availability of resources such as water, raw material, land, transportation etc.

5. DIFFERENT STAGE OF PULP & PAPER MILLS

A brief account of the various process operation followed in these small pulp and paper mills is discussed as under:

5.1 Raw material handling

The paper mills use mainly raw materials which includes woody (both softwood and hardwood) and agro residues such as bagasse, wheat straw, rice straw, grasses, sarkanda, jute, cotton linters etc which are available seasonally and are stored usually in open yards. Agro residues are bulky in nature and difficult to handle. The bagasse is stored in bales and cleaned by wet/dry depithing. Straws, sarkanda, jute are chopped before pulping while waste paper is used as such or after manual sorting. Wood is chipped, screened and cleaned off before pulping in the digesters.

5.2. Pulping

Almost all paper mills employ soda process for producing variety of paper. Most of the mills use multiple batch digesters of low capacity. Recently some mills have installed continuous digester. These mills normally produce pulp of high kappa number as high as 30- 35 and in some cases 45-50 due to some economic reasons as well as depending on end product. The mills producing bleached variety of paper, major part of lignin is removed in during bleaching stage by using high level of elemental chlorine and hypochlorite resulting in generation of high level of AOX in effluents. However, the mills having chemical recovery system are normally producing pulps of kappa number 20-22 for production of writing and printing paper. The RCF based mills do not practice complicated pulping and exhaustive bleaching process. The main steps involved in processing of waste paper include removal of ink, glue, grits and debris. Recycled fiber is usually processed in hydrapulper followed by deinking in some cases.

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5.3.Pulp washing

Most of these mills are having 2-3 stage brown stock washers for pulp washing but in most cases these washers are overloaded as the mills have increased its pulp production capacity without corresponding increase in handling capacity of these washers. These washers are usually designed for processing of pulp produced from hard wood/soft wood which requires less surface area for washing but agro residues require more surface area for washing due to poor drainibility of pulp from agro residues. Some mills are still using potcher washing system which requires large volume of water compared to BSW. Since most of the agro based mills are not equipped with chemical recovery system, so the concept of counter current washing system is not strictly followed, which results in generation of high volume of black liquor at very low concentration some time below 1-2% solids. Recently some mills installed twin drum washer prior to brown stock washer to extract the black liquor to the maximum extent. The performance of these twin drum washers have been found satisfactory as endured by high level of total solids in black liquor.

5.4. Bleaching practices

Most of the mills are employing conventional bleaching process, *i.e.*, CEH/CEHH or only hypochlorite in two or three stage. The consumption of chlorine in this category of mills is comparatively higher and varies from 150 to 260 kg/ton of pulp. The reasons for higher consumption of chlorine in these mills are:

- High kappa number of unbleached pulp.
- High carryover of black liquor along with pulp going to bleach plant.
- Low efficiency of processing equipments
- The recycled fiber based mills use mild bleaching conditions usually employing peroxide or hypochlorite.

5.5. Stock preparation and paper making

Stock preparation is an important and integral part of paper manufacturing which influence the quality of finished paper. Around 10-15% of various chemicals are used in combination for development of physical and optical properties of paper product. Most of the mills are having fourdrinier paper machine except newsprint which use twin wire machine. These mills have one - three machines of low capacity. New mills have usually less number of machines with higher production capacity. The paper making process uses huge amount of water. However, the general trend is to reuse/recycle the paper machine filtrate after clarification within the internal process. Most of the mills use indigenous or second hand imported paper machines.

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5.6. *Chemical recovery process*

At show the greater part of the factories are not having synthetic recuperation framework, the real requirements being - little size of operation, high capital venture, and nature of dark alcohol (i.e. high silica content, low strong, high thickness and so on).As such most of the mills discharge their black liquor as such resulting in loss of valuable biomass and chemicals along with discharge of high pollution load. In recent times, with increasing environmental pressures some of the agro based mills having pulp mill capacity about 80 -100 ton/day have installed chemical recovery system.

5.7. *Utilities*

Most of the mills are meeting their power requirement totally from grid or in some cases where there is shortage of power through own DG sets .The boilers being used by the mill are mostly indigenous and use agro residues such as rice husk, ground nut shell etc as fuel.

6. CONCLUSION

The mathematics solution of the adsorption of solutes from fluids and gasses on solids in beds is confounded to the degree that numerous instruments can be envisioned; all have some physical premise contaminate. The scientific arrangement of issues of adsorption of a solute by a strong from an answer relies on the system thought to control in the bed. The general transient mathematical model for a rotary vacuum filter used for pulp washing, was developed using phenomenological principles. The main steps involved in processing of waste paper include removal of ink, glue, grits and debris. Recycled fiber is usually processed in hydra pulper followed by deinking in some cases. Aim for zero discharge wherever feasible. Hence a uniform analysis is the need to decrease pollution load.

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