

Waste Paper Utilisation and Aid to the Growth of Paper Industry

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ABSTRACT

Waste paper recycling from the view point of raw material and energy conservation. Its highest contribution, however, will be in facilitating the setting up of new units with lower capital cost, low energy and water demand, lesser pollution control measures and considerably reduced magnitude of solid wastes handling and disposal, which otherwise would be a difficult proposition in the present context. On a broader prospective, this will help in a big way for the growth of the industry to meet the ever increasing demand of paper and board in future.

With the progress of civilization, the consumption of paper and boards has increased tremendously and shall continue to do so. Today, the paper industry in India has been well established with an installed capacity of about 2.4 million tonnes. It has been visualised that by the turn of the century, the demand will go as high as 3 million tonnes as compared to 1.5 million tonnes today. However, over the last decade, the growth and the capacity utilisation have shown a declining trend. Various factors responsible for such a sad state of affairs could be high capital investment, low profitability resulting in too long a pay back period, lack of adequate and sustained supply of fibrous raw materials, shortage of power, coal and water etc. Over and above, a static level or a very slow development of technology in the country and lack of timely adoption to change in technology, machinery and equipments have a negative effect on the already deteriorated situation. In certain cases, there may be valid reasons.

The point of growing concern for the industry, since long, is the fast depletion of bamboo forest and non-availability of energy. Of late, the industry has started using various non-conventional raw materials and hardwood has emerged as the major alternative to bamboo. High yield technology and decrease in basis weight with an aim to conserve fibrous raw materials will positively contribute to improve the raw material situation.

Though the above measures are definitely welcome as they will undoubtedly serve the industry in a big

way, recycling of waste paper is no less important not only from the stand point of raw material conservation but also for various other benefits as discussed. However, its biggest contribution will be in facilitating the setting up of new units with lower capital investment, low energy and water demand, lesser pollution control measures and considerably reduced magnitude of solid wastes disposal, which otherwise would be difficult in the present situation.

SETTING UP OF NEW UNITS

With regard to the use of nonconventional raw materials and agricultural residue, the scope may be limited for many of existing units for lack of processing facilities. High transportation cost of agricultural residues may also become prohibitive for its economic use. However, the waste paper, whether procured indigenously or imported, can easily be accommodated in the existing process without bringing about a major change in the process, the machinery or the quality of the product. At the same time, it is also felt that the full advantage of waste paper recycling cannot be had due to under capacity utilisation of the existing pulp and recovery plants and the power block in an existing mill for which a higher capital has already been invested, in case waste paper has to substitute virgin pulp.

Therefore, an exercise has been made in this article for setting up of new units based on partial use of

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waste paper and taking into consideration the various aspects like capital investment, raw material demand, energy consumption pattern and pollution load etc. and the proposal has been compared with an integrated paper mill of equivalent capacity but without waste paper. For practical and result-oriented illustration, an existing integrated unit, has been taken as an example.

BASIS

For the purpose, the furnish composition has been taken as 60% mill pulp from conventional raw materials like bamboo and hardwood and 40% waste paper of indigenous and/or imported origin. Keeping in view the manufacture of writing and printing grades of paper, the waste paper comprises mainly of white cutting, press cuttings, computer printouts of American origin for easier dispersion of printing inks without going in for a full fledged de-inking process. The processing of waste paper would then mainly consist of manual sorting, slushing and de-fleking with mild refining to get the pulp of desired quality.

Production capacity has been aimed at 45,000 T/annum or 130 T/day. The basis for raw material demand, energy consumption, water requirement pollution load and solid wastes disposal etc has been derived from the actual data of an existing unit of similar capacity.

COMPARATIVE ANALYSIS

Various advantages in setting up of such a mill are discussed in detail as under. While arriving at the figures for the proposed mill, the consumptions have been intentionally taken slightly on higher side in comparison to existing figures in view of low production. It is, however, not necessary that consumptions in such a case increase. Only to arrive at the minimum possible reductions, this aspect has been kept in view.

(a) Raw material demand

Ref. Table-I.

The pulp requirement of 117 TPD, after supplementing 40% with waste paper reduces down to about 70 TPD. This results in a cutdown on raw

material demand by about 140 TPD. Conversely, the raw material requirement per tonne of paper comes down to 1.62 T. as against 2.7 T. without waste paper supplementation. This, besides conserving useful raw material may bring down its cost as a result of avoiding trouble and incurring additional cost to get the raw material from a longer distance and at times from the interior forest or outside the State.

TABLE - I
REQUIREMENT OF RAW MATERIAL

Sl. No.	Particulars	Unit	100% mill pulp	60% mill pulp + 40% waste paper
1.	Mill pulp	T/D	117	70.2
2.	Waste Paper	„	Nil	46.8
3.	Bamboo+Hardwood (Gross) @ 3 T/tonne of pulp.	„	351	210.6
4.	Fibrous raw material/ T of paper.	„	2.7	1.62

Reduction in raw material consumption by 40%

(b) Consumption of water.

Pulp and paper industry being a water intensive industry, water can be considered as one of the major inputs. Ref. Table-II, pulping itself draws about 65% of the total water requirement. Obviously, due to lesser pulp production as a result of waste paper utilisation, the overall demand will reduce by about 24%. This, in itself, is a big advantage, particularly where the scarcity of water is encountered as is the case with the mill under illustration. At times, the production is affected due to inadequate availability of water during lean period. Besides, this has become a major constraint for any future expansion of the mill.

TABLE - II
WATER REQUIREMENT (M³)

Sl. No.	Particulars	100% mill pulp		60% mill pulp + 40% waste paper	
		per tonne	per day	per tonne	per day
1.	Pulp Mill	182	23660	205	15990
2.	Recovery & Power Block	36	4680	45	3510
3.	Paper M/c	54	7020	56	7280
4.	Total water/day		35360		26780
5.	Water consumption/T. of paper.		272		206

Reduction of water by 24%

(c) Power demand

The power situation in our country is quite pathetic. On one hand, the availability is inadequate and on the other the cost escalates each day. Saving of power, however, meagre may be, will be beneficial to any industry.

40% use of secondary fibre will bring down the power consumption by about 13% (Table - III) in spite of marginal consumption for processing the secondary fibre due to.

- (i) less pulp production
- (ii) less power requirement at recovery and power block and
- (iii) less consumption of water.

TABLE - III
POWER CONSUMPTION (KWH)

Sl. No.	Particulars	100% mill pulp		60% mill pulp + 40% waste paper	
		per tonne	per day	per tonne	per day
1.	Pulp mill	460	59,800	500	39,000
2.	Recovery & power block	200	26,000	240	18,720
3.	Paper Machine	700	91,000	750	97,500
4.	Water Supply & E.T. Plant	140	18,200	150	14,820*
5.	Total		1,95,000		1,70,040
6.	Power per tonne		1,500		1,308

Power reduction 13%

*in view of reduction in water consumption per tonne of paper by 24%

(d) Steam consumption :

There will be a reduction of about 25% in steam requirement (Table - IV). As against demand of 11 tonnes of steam per tonne of paper with mill pulp, the consumption goes down to about 8.3 tonnes/tonne of paper. This in turn requires lesser capacity boilers, both LF and CF, and also a lesser capacity demineralisation plant resulting in an appreciable cut down on the capital investment in this regard. In addition, steam economy is likely to be better due to less consumption of medium pressure steam at the digestors which aspect has not been considered.

TABLE - IV
STEAM CONSUMPTION (MT)

Sl. No.	Particulars	100%		60% mill pulp + 40% waste paper	
		Per tonne	Per day	Per tonne	Per day
1.	Pulp mill	2.0	260	2.0	156
2.	Recovery & Power Block	5.5	715	6.0	468
3.	Paper Machine	3.5	455	3.5	455
4.	Total		1430		1079
5.	Steam/tonne of paper		11.0		8.3

Reduction in steam consumption 25%

c) Coal consumption :

Obviously, due to less steam demand, lesser quantity of coal will be required. The overall saving works out to be around 14% (Table - V) associated with other advantages like

- i) mill may afford to go in for selective grades to improve upon the boiler efficiency and
- ii) easing out the transportation difficulties to some extent.

TABLE — V
COAL CONSUMPTION (MT)

SI. No.	Particulars	100% mill pulp	60% mill Pulp + 40% waste paper
1.	Steam consumption/tonne of paper	11.0	8.3
2.	Steam requirement/day	1430	1079
3.	Steam generation from LF Boiler (40% of total steam)	572	343
4.	Steam generation from CF Boiler	858	736
5.	Coal required/day @ 5 T. steam per tonne of coal.	172	147
6.	Coal requirement/tonne of paper	1.32	1.13

Reduction in coal consumption by 14.4%

f) Solid Waste disposal

Disposal of solid waste in paper industry has been a long standing problem and a suitable solution is yet to be found. The cost of disposal is bound to go up as the mill grows older resulting in the wastes to be probably disposed off at far away places to avoid pollution hazard. The mill under illustration has been able to dispose off the solid wastes in the nearby ravines since its inception. They are filled up by now and presently the wastes have to be transported to longer distance incurring a much higher cost.

Any new mill must think of ways and means for solid wastes disposal in advance to avoid likely future complications, especially in view of stringent regulations now. With the use of 40% waste paper, percentage of solid wastes (Table—VI) will reduce by about 35% which will go a long way to prevent pollution of land and improve economy for the mill.

In this exercise, the solid wastes have been confined to lime sludge and coal ash only. However, a substantial reduction in bleach liquor sludge

will also be there. Bamboo dust, which is also a problem for many of the mills is being burnt in a specially designed dust boiler and hence this waste has not been considered. The solid wastes in the effluent have not been considered as not much of a change is envisaged.

TABLE — VI
SOLID WASTE DISPOSAL (MT)

SI. No.	Particulars	100% mill pulp	60% mill pulp + 40% waste paper
1.	Lime sludge/day (with 60% moisture)	225	135
2.	Coal ash @ 35% on coal	60.2	51.5
3.	Total ...	285.2	186.5
4.	Solid waste/tonne of paper ...	2.2	1.43

Reduction in solid wastes disposal by 35%

g) Pollution Load

Pulping contributes the major pollution load in a pulp and paper mill. Owing to lesser production of pulp, the pollutants in terms of B. O. D. and C. O. D, if not suspended solids, are likely to reduce considerably. Besides, due to lesser water consumption, the volume of effluent will also go down proportionately and thus the mill will require smaller capacity effluent treatment plant resulting in lesser consumption of chemicals and power etc.

In addition, this would also have considerably reduced on air pollution due to lesser consumption of coal and recovery of chemicals.

h) Capital investment

Ref. Table VII, the capital investment for a 130 TPD paper mill based on 40% waste paper is lower as compared to a mill based on 100% mill pulp from conventional raw materials. The investment reduced by about 16% and this itself may work as an incentive for a new entrepreneur.

TABLE -- VII
CAPITAL INVESTMENT

BASIS

- a) Rs. 24,000/- annual tonne of paper for a new integrated mill of 130 TPD.
- b) Rs. 25,000/- annual tonne of paper for a new integrated mill of 80 TPD.
- c) Rs. 14,000/- annual tonne of paper for a new mill based on secondary fibre.
- d) Rs. 13 000/- annual tonne of paper for a mill based on secondary fibres where infrastructural facilities are already available.

For a new integrated paper mill based on 60% pulp mill and 40% waste paper, investment has been worked out combining (b) and (d)

Sl. No	Particulars	100% mill pulp	60% mill Pulp + 40% waste paper
1.	Integrated paper mill	45,000x24,000 =Rs.108 crores	45,000x0.6x25,000 =Rs 67.5 crores
2.	Mill based on 40% waste paper	--	45,000x0.4x13,000 =Rs.23.4 crores.
3.	Total investment	Rs.108 crores	Rs.90.0 crores.
4.	Capital investment/annual tonne of paper.	Rs.24,000/-	Rs.20,200/-

Reduction in capital investment by 15.8%

CONCLUSION :

Keeping in view of various aspects as discussed above, it is concluded that new units based on 40% utilization of waste paper can derive multiple benefits. Primarily, this will bring down the capital investment by about 16% i.e. Rs.20,200 per annual tonne of paper as against Rs.24,000/- for a mill based on 100% mill pulp. Substantial reduction in the consumption of raw materials, water, energy etc. will prove highly advantageous for the entrepreneurs for obvious reasons and beneficial for the industry as a whole. It is also worth mentioning that in case the waste paper

utilization is further increased to 50% and above, benefit of a sizable amount of revenue can be had by way of relaxation in excise duty for using non-conventional raw materials. The paper, however, does not dwell on this aspect keeping in view that the present advantage might be temporary and may change any-time in future. A comprehensive and comparative state of savings is presented below :

PER TONNE OF PAPER

Sl. No.	Particulars	Unit	100% mill pulp	60% mill pulp + 40% waste paper	reduction %
1	Raw materials consumption (Bamboo + hardwood)	T.	2.7	1.62	40
2	Water	M ³	272	206	24
3.	Power	KwH	1,500	1,308	13
4.	Steam	T.	11.0	8.3	25
5.	Coal	T.	1.32	1.13	14.4
6.	Solid wastes disposal	T.	2.2	1.43	35
7.	Capital investment Rs./annual tonne of paper.	Rs.	24,000/-	20,200/-	16

However, a few hurdles are likely to crop up on account of non-uniform quality and consistent supply of waste paper, problem in its collection, sorting and segregation of foreign material etc. Though it is beyond the scope of this paper to discuss measures to overcome the aforesaid constraints, it is strongly felt that with constant endeavour on the part of all concerned, the hurdles can be overcome and the waste paper market will get organised systematically to serve the nation.

With the advent of computers and their constantly growing use, a lot of paper is being used and will be used which necessarily needs recycling. The only

difficulty in the way is with the printing ink particles which adversely effect the surface characteristics of the paper products whenever used. Of course, the strength and other characteristics are comparatively better. It is strongly felt that printing and paper technologists should have a co-ordinated approach to develop the printing inks which shall be less intense in colour and can either be made soluble or removed easily with a mild chemical treatment in a conventional mechanical processing system. The idea is to do away with de inking process for several of its demerits, especially with regard to water pollution enabling the paper industry to confine itself to the mechanically processing of waste paper.

It is strongly emphasized that necessary efforts by all agencies concerned should be initiated and strengthened to make the waste paper available to the paper industry to meet its demand—either from indigenous resources and/or from abroad. This is in the interest of our country.

ACKNOWLEDGEMENT :

The authors are grateful to the management of M/s. Straw Products Ltd. for their kind permission to present this paper.