

Changing Furnish Mix for a Smoother & Profitable Paper Machine Operation

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ABSTRACT

Indian Paper Industry continues to suffer from non-availability of raw material, high power & labour cost coupled with low demand, which has plagued the industry in last decade.

Wastepaper has become important source of raw material, but its fluctuating quality through various unknown sources have been the cause of worry. At the other hand, fluctuating price of imported pulp & devaluating rupee pose several question marks on the very survival of the industry.

The paper deals with the various suggestive furnish options with addition of Polyester Staple Fibre with high ash content or options of entering high end market with cheaper furnish.^{1&2}

INTRODUCTION:

Paper industry - an industry that is the Barometer of industrial pace and literacy of a country that has suffered from various reasons in last decade.

High capital cost, massive labour force, high consumption of energy & water has been part of its operation. Last decade has witnessed problem for industry due to high pollution control norms demanding further capital investment without return in the form of extra production or quality.

Rising cost of energy, fluctuating cost of imported raw material, cheap imports of paper and fluctuating local demand has added woes to the bleeding industry.

The options are very limited. Pull up your socks or perish. In fact many mills have closed down & those who are surviving are finding it difficult to meet its both the ends. In changing Market Scenario, the sale is governed by the market forces hence option of increasing price does not exist. The only way of survival does depend on -

1. Reducing input costs (Raw Material)
2. Entering higher end Market

3. Reducing unit cost of production

REDUCING UNIT COST OF PRODUCTION

Every unit is trying its best to reduce cost of production but exercise at many mills has reached point of saturation. With increasing labour, power, freight cost the scope remains limited.

ENTERING HIGH END MARKET

Efforts by mills continue in this direction. Options have been -

1. To manufacture Newsprint - for better recovery
2. Manufacture lower gsm paper
3. Improve Tear, Burst, Tensile to cater Special requirement where Recovery is better.

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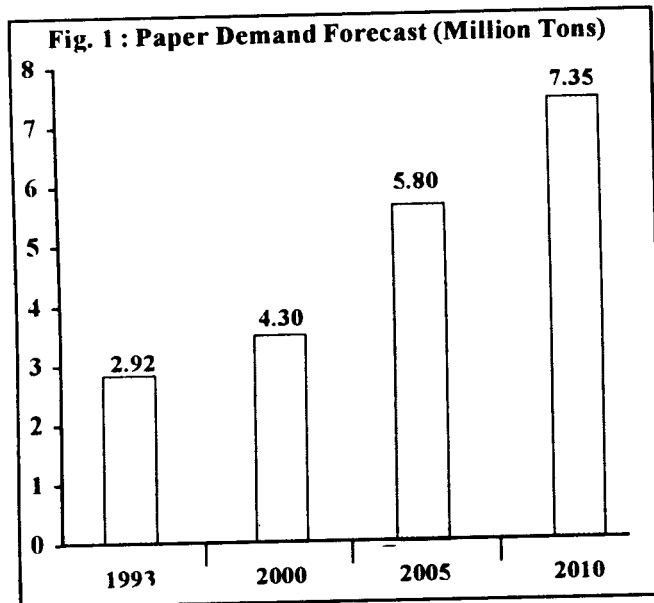
RAW MATERIAL

REDUCING INPUT COST - RAW MATERIAL CHOICE :

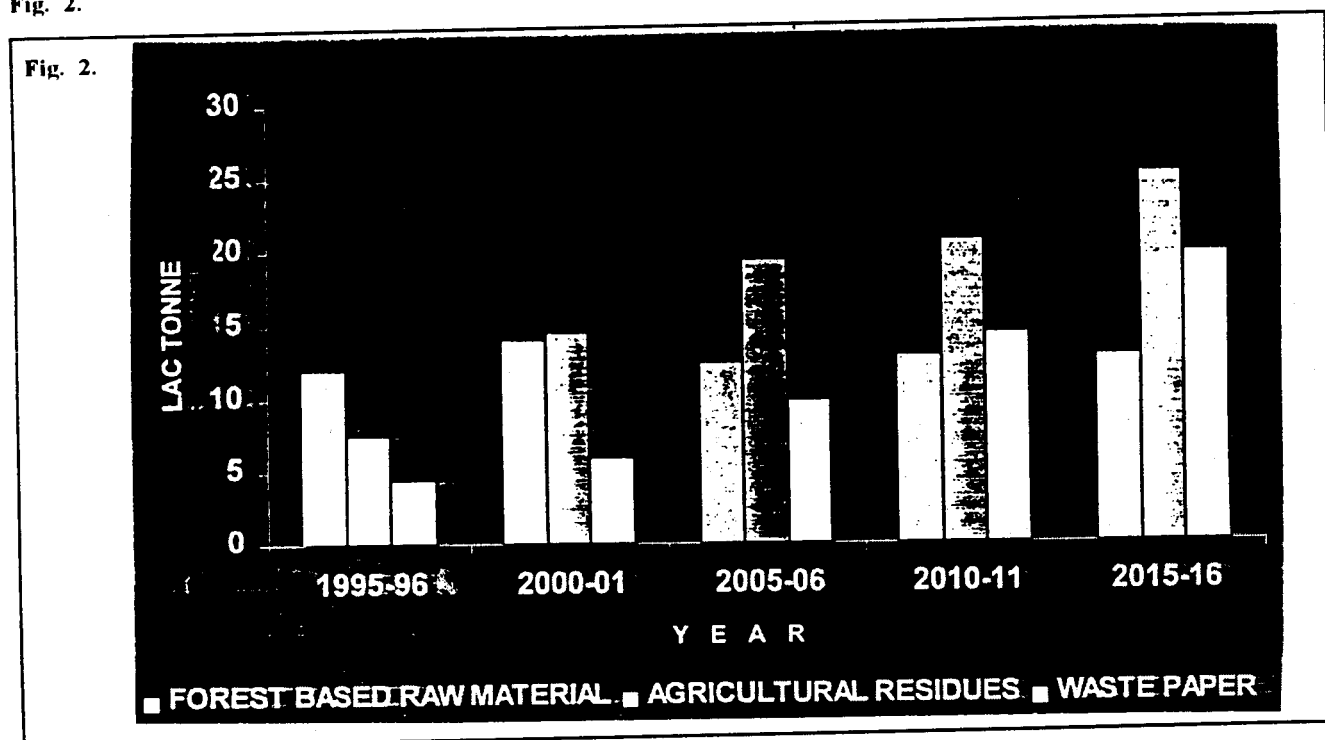
Likely demand of paper in next decade is given in Fig. 1.

PATH FORWARD

1. Reduce expensive long imported fibre in phases.
2. Totally eliminate cotton waste, jute caddy.



Availability of Raw Material in next 15 years is given in Fig. 2.



3. Increase filter to the highest level.

Table-2 : Comparison List

Particulars	Specialty paper	Good Quality	Medium Quality	Newsprint
% Softwood	25-50	10-20	Nil	Nil
% Long fibre	Nil	10-20	10-15	Nil
Cotton, waste, Jute				
% Agro-residue	Nil	80-100	90-100	50-100
% Waste paper	Nil	20-30	20-50	100
% Hardwood	50-75	70-80	70-80	0-50
% Ash content	5	8-12	20-32	5-11

SCALE OF ECONOMICS

OPTION 1:

Replace softwood by	10% (100 kg/T)	
Cost of imp. Softwood pulp		Rs. 2700/100 kg
Cost of own pulp @ 9% (90x17)	Rs. 1513/T	
Cost of staple fibre @ 1% (10x53)	Rs. 530/T	Rs. 2043/100 kg
Differential cost	Saving	Rs. 657/T
	Rs. 6.57/kg	

Characteristics of various Raw Material is given in Table 1:-

Type	Effect on Paper (Qualitatively)	Implication
Softwood Pulp	Good strength & other properties	Mostly imported
Hardwood Pulp	Has become basic raw material Medium strength	Imported as well as produced from various type of wood locally
Agro-residues	One of the largest indigenous sources low paper strength	Cost effective
Waste paper	One of the largest - some have low strength - some have high strength	Brings lot of foreign material in system Varying quality effecting quality of product
Cotton waste, Jute caddy, Hemp pulp	Good strength	Source of pollution, foreign material
Filters	Improves opacity Smoothness, & Printability, Reduces strength	Brings lot of Cost Effectiveness

Approx. Rs. 2.2 Lakh / Annum / Ton of daily production

OPTION 2: (Increase Ash by 7% - 8%)

Comparison -

Agricultural based mills	- 20%-32% ash
Large mills	- 8% - 12% ash
Waste paper based Newsprint mills	- 5% - 11% ash
If increased by 7 %	= Rs 80 /T
Cost of Fibre @ 8%	= 80 kg x Rs. 17 =Rs.1360/T
Defferential cost of fibres - clay	= Rs. 12 / kg = Rs. 960 / T
(-) Staple fibres cost @ 1 %	= 10 kg x Rs. 53 = Rs 530
Cost of clay for 7% ash addn. @ 10%	= 100 kg x Rs. 3.5 = Rs. 350 = Rs. 880/T
Savings	= Rs. 480/T

OPTION 3: ((Cater High End Market)

1. Detergent / Soap packing.

2. Toffee wrap.

3. High Tear Kraft paper for paper pkg.

4. High grade of writing & printing paper.

5. Low gsm of production.

OPTION 4: Get away with furnish which bring problem in process :

	Waste Paper	Jute/Cotton waste
● Raw Material	^	^
● Foreign Material	^	^
● Pollution	—	^
● Slime	^	—
● Inconsistent Quality of put	^	^
● Higher power Consume	—	^

To achieve all the above, one needs an alternative fibre, which offers high strength & cost effective. Polyester Staple Fibre has met most of these needs.

SPECIFICATION OF POLYESTER FIBRE

Particular	Value
Type	Polyester Staple fibre
Density	1.38 g/cm ³
Wet strength	equal to dry strength
Length	6 mm/4.5 mm
Shape	Straight or crimped
Dia	12.4 Microns
(against cellulose fibre	20 - 25 Microns)
Brightness	90 +
Melting point	250°C

The dispersibility of the fibre is Excellent and the fibre does not require any refining. There is no constraint to manufacture coloured paper.

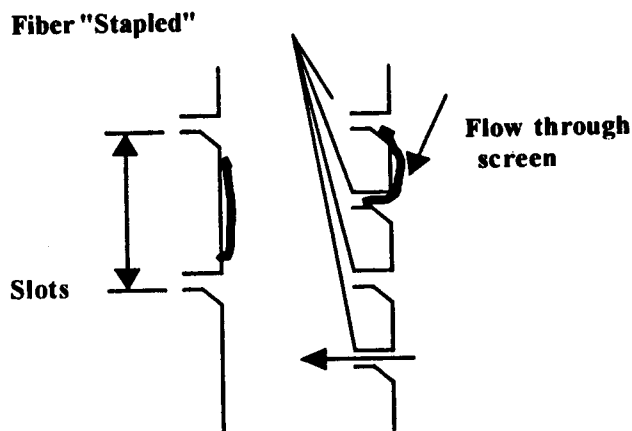
PROBLEMS FACED WITH USAGE OF PSF

1. Screen jamming

2. In very exceptional case bleeding on box
3. Gain in Tear mostly

Solution -

1. Screen jamming occurs due to stapling of fibres -



Wider spacing prevents stapling

Case 1 - Agro based Mill		(Table-2)		
Particulars	Control	With SC PSF	With Crimped SC PSF	
Basis Weight, gsm	60	60	60	
Furnish -				
- % Wheat straw	60	60	60	
- % Bagasse	25	30	30	
- % Jute caddies	10	Nil	Nil	
- % Imp. WP	05	10	10	
- % SC PSF	Nil	< 1	< 1	
Caliper, Microns	87.6	89.0	96.6	
Bulk, cc / g	1.46	1.48	1.61	
Tear Factor	32 / 37	38 / 46	41.50	
Burst Factor	14.0	13.5	15.8	
Breaking length - MD / CD	2582 / 1887	2708 / 1969	2809 / 2100	
Double Folds - MD / CD	7 / 4	5 / 3	8 / 4	
Case 2 - Wood & Bagasse based Mill		With SC PSF	With Crimped SC PSF	
Particulars	Control	60	60	
Basis Weight, gsm	60	60	60	
Furnish -				
- % Hardwood	50	50	50	
- % Bagasse	50	50	50	
- % SC PSF	Nil	< 1	< 1	
Caliper, Microns	118.9	120.6	126.0	
Bulk, cc / g	1.98	2.01	2.10	
Tear Factor - MD - CD	37.5 / 42.3	47.5 / 52.9	49.5 / 55.0	
Burst Factor	13.5	14.0	15.2	
Breaking length - Avg.	3025	2950	3358	
Double Folds - Avg.	5	4	5	

Reducing the length of fibre to 4.5 mm has solved this problem.

2. The bleeding has been checked with usage of crimped fibre as straight fibre used to pass through the mesh in select case.

3. With introduction of crimpe there is better bonding with in the paper & consequently tensile, burst have also shown encouraging result given in Table-2.

RESULTS : Crimped fibre has achieved +

- Tear (20% - 30% over normal furnish)
- Breaking length (15%)
- Burst (10%)
- Bulk (5%)

SUMMARY :

For improved bottom line :

1. Look for cheaper & controllable furnish
2. Increase ash content
3. Enter high end market
4. Improve productivity

These properties have been achieved by & large with minor variation at all the mills where trials were taken. In the depleting quality raw material scenario, staple fibre definitely offers silver lining for the industry.

REFERENCES

1. Evaluations at Reliance Technology Centre (RTC) Patalganga.
2. Trial at Eleven Mills in India conducted during 2001.