

Pink Newsprint Utilization - An Alternative Recycled Fibre for Manufacturing of Newsprint

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ABSTRACT

Increased ratio of Pink newsprint in recovered ONP posing problems for colour stripping and bleaching in an economical way in conventional deinking plants. In order to establish the economic ratio of pink newsprint in wastepaper for manufacture of newsprint, laboratory experiments were carried out for optimisation studies. It was observed that upto 6% of pink newsprint in the furnish can be used without incurring any additional costs for deinking and bleaching. This was established by plant trials and regular use of ONP containing pink newsprint in RNPL Conventional washing deinking system.

INTRODUCTION

Secondary fibre has become valuable commodity for paper industry and has become a major furnish for wide range of products. Due to scarcity of deinkable grade secondary fibre option is left to utilise available ONP in the market. The domestic consumption of newsprint is estimated around one million tonnes and two third of it is produced domestically and balance of requirement fulfilled by imports. Waste paper recovery in the year 99' was around 6.5 lakhs tonnes and the consumption was 11.5 lakh tonnes (1) recycle mills require around 1.2 to 1.6 ratio of waste paper for producing one tonne of product depending upon the quality of the waste paper and finished product.

Systems are developed in USA, England and European Countries etc. for collection, segregation, grading as per requirement of the customer. In India waste paper classification is under progress and not yet fully developed. Domestically procured waste paper cannot be used directly in the process because of its heterogeneity in terms of pulp quality, colour of the paper, printing process, dyes and ink used, contaminants and outhrough etc. before processing it

has to be segregated. Segregation requires facilities, manpower, and expertise.

Pink newsprint is a part of ONP in India around 35,000 tonnes of pink newsprint is used per year. 2-3% of pink newsprint finds its way in the recovered ONP. For the manufacturing of newsprint pulping, flotation, washing followed by reduction and oxidation bleaching etc. or vice versa can eliminate the problems posed by the heterogeneity of furnish, however in conventional deinking systems generally washing deinking followed by oxidation bleaching or flotation deinking followed by reduction bleaching practices are in use in India. ONP containing pink newsprint pose problems like colour and shade in pulp. If colour stripping was not done in a controlled manner resulting brightness and shade variations in the newsprint especially in the washing deinking followed by oxidation bleaching with hydrogen peroxide.

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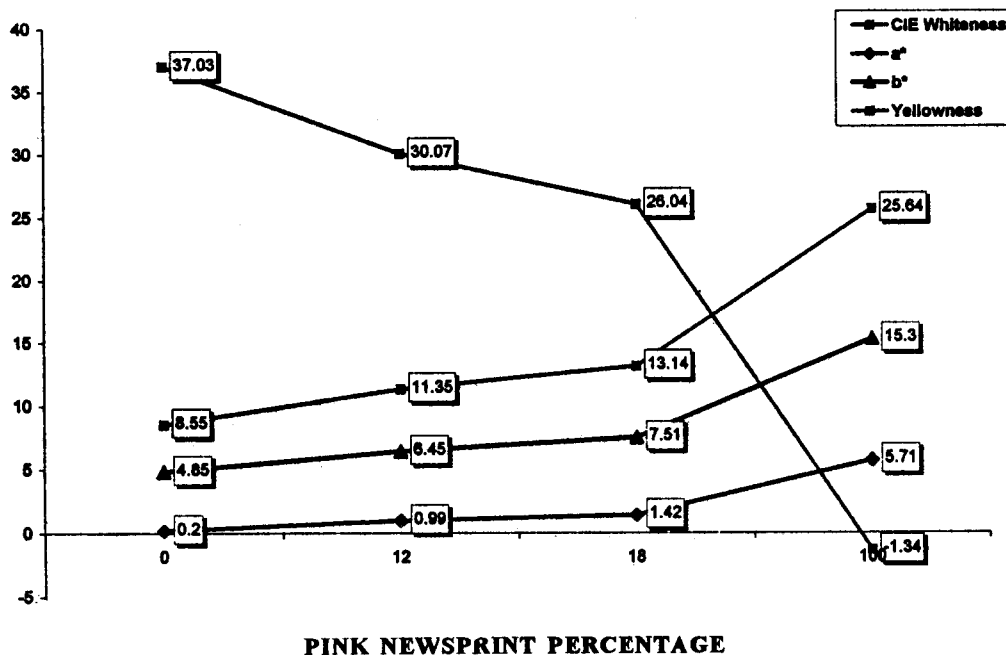
EXPERIMENTS:

Indigenously available pink newsprint papers like economic times, financial express, business standard etc. collected and mixed with ONP in various ratios and pulping experiments were carried out in laboratory pulper simulating the conditions of washing deinking plant. Non-Ionic surfactant was used alongwith alkali. The pulping conditions are given in Table-1. The slushed pulp is diluted to 1% consistency and washed through 60 BSS mesh. The washed pulp was taken for brightness pads. The brightness pads were prepared as per TAPPI-t-218. The optical properties were measured using Technidyne colour touch ISO. The optical properties are given in Table-1 and the graphical presentation was given in Annexure-1.

From the above results it was observed that increasing the ratio of pink newsprint, the whiteness values are decreased from 37 to -1.34%,. The yellowness values are increased from 8.55 to 25.64%, a^* and b^* values are increased substantially this indicates that the deinked pulp the redness and yellowness were more or less intact. Even at 12% pink

TABLE-1
PULPING CONDITIONS

1) Pink newsprint, % on ONP	:	0	12	18	100
2) Consistency in the pulper, %	:	5	5	5	5
3) Na_2CO_3 on waste paper (OD)	:	0.3	0.3	0.3	0.3
4) Surfactant,% on waste Paper (OD)	:	1	1	1	1
5) Retention time, min.	:	20	20	20	20
6) Temperature during pulping $\pm 2^\circ\text{C}$:	48	48	48	48
7) Optical properties of pulp	:				
A) CIE whiteness %	:	37.0	30.1	26.0	-1.34
B) Yellowness %	:	8.55	11.35	13.14	25.64
C) Colour CIE (1) L^*	:	79.77	79.18	78.97	78.35
(2) a^*	:	0.2	0.99	1.42	5.71
(3) b^*	:	4.85	6.45	7.51	15.29

ANNEXURE-1 OPTICAL PROPERTIES (AFTER PULPING)


newsprint ratio was not economical in deinking and bleaching as it will further increase the cost of bleaching chemical.

In order to estimate the lower bleaching costs

deinking experiments were carried out with zero percent and 6% pink newsprint maintaining the same pulping conditions. The pulp pads were prepared and the optical properties were measured. Optical properties of both results were given in Table-2. The optical

TABLE-2

PULPING STAGE		
Pink newsprint %	Nil	6
Brightness % ISO	47.98	48.0
L*	77.2	77.3
a*	0.36	0.56
b*	4.46	4.64

TABLE-3

BLEACHING EXPERIMENT		
1) Pink newsprint % on OD furnish	Nil	6
2) Consistency %	10	10
3) Temperature °C	75	75
4) Na ₂ SiO ₃ % on OD furnish	1.5	1.5
5) Mg SO ₄ %	0.05	0.05
6) NaOH %	1.0	1.0
7) H ₂ O ₂ %	1.5	1.5
8) Intial pH	10.6	10.6
9) Final pH	9.2	9.2
10) Residual H ₂ O ₂ PPM	104	116
11) Brightness % ISO after washing	54.3	54.9
12) L*	81.8	82.2
13) a*	-0.63	-0.73
14) b*	5.9	6.01
15) Dye removal index after pulping	26.56	26.89
16) Dye removal index after bleaching	52.87	51.92
17) Colour stripping index after bleaching	21.18	21.23

properties of both furnish are comparable. It means the bleaching costs are also similar. In order to ascertain the above hypothesis bleaching was carried out with oxidising agent rather than reducing agent. The oxidative bleaching chemical used is H₂O₂. The deinking and washed pulp of both ratios were thickened upto 10% consistency and bleaching was carried out. The bleaching conditions are given in Table-3 The bleaching pulp was diluted to 1% consistency and washed through 60 BSS mesh and the brightness pads were prepared. The optical properties were measured. The details are given Table-3.

To measure the efficiency of colour removal, the dye removal index (DRI) and colour stripping index (CSI) were calculated by the formula developed by Sharp and Lowe (2) these indices are based on CIEL L*, a*, b* measurements (4). The L, a, b system is based on the idea of colour opposites. Therefore L is the measure of lightness and varies from 100 for a perfect white to 0 for absolute black '+a' indicates redness and '-a' indicates Greenness. '+b' indicates yellowness and '-b' indicates blueness. CIE tristimulus values for illuminant 'C' was measured on Technidyne colourimeter and Spectrophotometer. The CIE L*, a*, b* conversion equation for illuminant 'C' are (3)

$$L^* = 116 (Y/YO)^{1/3} - 16$$

$$a^* = 500 [(X/XO)^{1/3} - (Y/YO)^{1/3}]$$

$$b^* = 200 [(Y/YO)^{1/3} - (Z/ZO)^{1/3}]$$

where 1) X, Y, Z are tristimulus values

2) XO, YO, ZO are tristimulus values for perfect diffuser for illuminant used. Dye removal index (DRI) (5) is based on the square of the distance

Colour values for unbleached pulp L₁, a₁, b₁

Bleached pulp L₂, a₂, b₂

$$DRI = 100 \Delta R^2/R^2$$

$$\text{Where } R_1^2 = (100 - L_1)^2 + a_1^2 + b_1^2$$

$$R_2^2 = (100 - L_2)^2 + a_2^2 + b_2^2$$

$$\text{and } \Delta R^2 = R_1^2 - R_2^2$$

Colour Stripping index (CSI) (5) is defined as

$$CSI = 100. \Delta E / \Delta E_{MAX}$$

$$\text{Where } \Delta E = (L_2 - L_1)^2 + (a_2 - a_1)^2 + (b_2 - b_1)^2$$

$$\Delta E_{MAX} = [(100 - L_1)^2 + a_1^2 + b_1^2]^{1/2}$$

RESULTS AND DISCUSSION:

After deinking of ONP with pink newsprint 6% and without pink newsprint it was noticed that brightness, L^* , a^* , b^* values are comparable. Bleaching of the above deinked pulps with hydrogen peroxide the brightness, L^* , a^* , b^* values are more or less same.

This was confirmed by that both unbleached and bleached pulps dye removal index are similar however, the dye removal index of 6% pink after bleaching is slightly lower may be due to slightly high residual peroxide present in the pulp. However the colour stripping index for both pulp are similar. Slight deviations may be due to experimental error.

CONCLUSION

- 1) As per Table-1 the colour values with alkali and surfactant are not able to remove the base colour of the pink newsprint but it can help to remove the ink portion.
- 2) Colour values of a^* , b^* increases with the increased ratio of pink newsprint. Increase in a^* , b^* values indicates more bleaching chemical requirement.
- 3) L^* values indicates the base paper lightness and deinking with alkali and surfactant have lesser impact on L value.
- 4) Comparative colour values of zero and 6% pink newsprint pulps after deinking indicates that the pulp can be bleached with oxidative or reductive bleaching and the chemical requirement for both pulps are same.
- 5) a^* values of both pulps in pulping stage in+side indicates redness and after bleaching with H_2O_2 its colour turns to greenish and the increase in b^* values during bleaching indicates that yellowness has increased after bleaching.

yellowness may be due to alkali darkening and can be reduced by neutralising excess alkali with sulphuric acid treatment.

- 6) Hydrogen peroxide can be used for colour stripping upto 6% of the pink paper in the furnish without incurring any additional costs.
- 7) It shows that upto 6% pink colour furnish can be possible to process by oxidative bleaching and can avoid reductive bleaching.
- 8) On plant scale also it was tried and up to 6% pink newsprint is used without any noticable adverse effects in the quality as well as cost.

ACKNOWLEDGEMENT

The Authors are very much thankful to the management of M/s. Rama Newsprint and Papers Ltd., Barbodhan, for giving permission to present this article and thanks to the staff members of laboratory for carrying out these experiments.

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