Wet End Additives And its Role in Manufacturing Newsprint With Recycled Fibre

Reddy J.V.R. & Karmakar G.R.

ABSTRACT

Drainage and retention aids and its effects on manufacturing of newsprint using recycled fibre from typical washing and deinking system was studied. A brief description of charges at various places in wet end section and the influence of charges during the manufacturing process. The advantages and limitations of the chemical additives were briefly discussed, keeping in view the prevailing conditions of a given mill.

INTRODUCTION

There is increasing use of recycled paper to provide furnish for the production of newsprint and other types of paper not only in the developed nations but also in the developing countries due to various influences. Before manufacturing the final product the knowledge of surface chemistry of recycled paper is essential to over come the basic problems encountered during the processing. The wet end chemistry i.e. the chemistry of dilute aquous solutions of fibre, fillers and additives are to be known for prepare the stock as well as to predict the retention of additives, drainage characteristics, charges of pulp etc. is essential. The paper making system consists primarily of pulp fibre, mineral fillers, chemical additives and water. Pulp fibre may of virgin or recycled fibre. Broke is a part of furnish which is generated during the process. Additives are materials used to improve the finished paper itself or aid in the process of paper making. Wet end chemistry of virgin fibre is well known and practised for long time. The wet end chemistry of recycled fibre furnish may vary from the virgin fibre.

The technology needed to collect and then recovered paper in to pulp has been available for some time. But for decades the use of deinked pulp has been restricted to newsprint and tissue due to varius problematic substances. These are particulate contaminant like pitch, stickies which are inbuilt in the furnish, even though the paper for recycling is generally sorted out before further processing. The high level variability in the furnish, in which the dissolved substances like gases, surfactants additives, the bacteria etc. which may create problems like foam, slime, precipitates and complexes. The recycled furnish may contain chemical, mechanical pulps, various types of fillers, retention aids, sizing chemicals etc.

All these components bring to the system substances which accumulate in the white water circuit

Rama Newsprint and Papers Ltd.
Village : Barbodhan, Tal. Olpad
Dist. Surat - 395 005 (Gujarat)

and interact with paper manufacturing process. High yield mechanical pulp which may contain significant amount of wood extracts and lignin derivatives. Additives originally present in the paper may potentially carried over to the recycled fibre. The additives from the paper or additives used in the process have a beneficial effect as well as have detrimental effect. Dyes, sizing agents, wet strength or dry strength additives, fillers etc. are called as functional additives which are used to impart certain qualities of the final product. Biocides, retention aids, drainage aids, pitch control agents, defoamers etc. are called as control additives which are to be carefully selected after thorough evaluation its advantages and disadvantages.

From the paper maker point of view consistency between batches of deinked pulp is vital if the resultant paper is to be uniform contaminants such as dirt, ink, stickies, fluff etc. pose challenge to the paper maker that require significant operating adjustments. In order to adjust the operating conditions one should have a understanding of the wet end chemistry to estimate the ionic balance which affects the retention of fines, fillers, drainage, drying, formation and strength properties which in turn influence the production rate, economics and quality.

WETEND-CHARGE

The cellulose fibre surface is slighty anionic fibres and fillers are normally negatively charged so they repel each other. Adding a positively charged chemical will help bring them together. (1) In paper manufacturing, the 'OH' group can form hydrogen bonds not only with cellulosic fibre but also with the interfering small molecular weight anionic carbohydrate compounds thus facilitating the elimination of these detrimental substances from the white water circuit. The change from acid to neutral process decrease the possibilities to use alum in neutralising the effects of anoinic trash. Anionic carbohydrates form the main part of anonic trash. Anionic dissolved or collodial compounds is one of the main sources of wet end problems in paper machine. Fibre, rosin, fillers etc. contribute to the anionic trash. Peroxide and TCF pulps have high charge. (2) If the dissolved substance have built up in high concentrations which may cause various problems depending upon their chemical character. Virgin pulp is an important source of such substances in the form of various changed semi celluloses, such as glucuronoxylans. During kraft pulping these substances is converted partially to hexeneuronic acids which are degraded during chlorine and chlorine dioxide bleaching. (3) However, they are not degraded during TCF bleaching with oxygen/peroxide, although they are by TCF bleaching that includes ozone stage.

The charge influence the so called the hornification of fibre. (3) High charge minimizes hornification. The chemistry of recycled fibres varies from that of virigin pulps due to the chemicals remain with original papers and the residues of chemicals introduced during deinking (4) The dissolution from the recovered paper is minimised under neutral rather than alkaline deinking conditions.

The quantity of interfering substances are often measured by COD, turbidity and anionicity of the system. COD of a white water is a sum parameter of all dissolved or colloidal organic matter present in a system. Cationic demand has a good corelation to the amount of anionic materials (1). Turbidity has been found to corelate linearly to the concentration of anionic trash and offers a quick and practical routine method for continuous measurements. Alternatively the following instrumental methods (5) were used for the surface charge.

1) Micro electrophoresis.

2) Streaming potential.

3) Colloid titration method.

PLANT TRIALS

Charge demand of the system was determined by using mutek particle charge detector. The principle of this method is the cationic charge of a polymer may be consumed either by anionic fibre surface or by anionic dissolved and colloidal substance. Chemically different polymers have different affinity to the cellulosic fibre and anionic trash. The preventing levels of charges in the samples were measured with the help of the chemical suppliers. The neutralization of sample charge done by dosing a standard product the charge of which is known already in terms of mgeq/gm. The standard product consumption to neutralize the given samples noted and then the charge in mgeq/1 of stock is obtained. The soluble poly electrolyte titrable charges of pulps determined after filtration. Studies were carried out at various levels of cationic demand. High cationic polyethylenimine added for neutralising anionic trash and various dosage

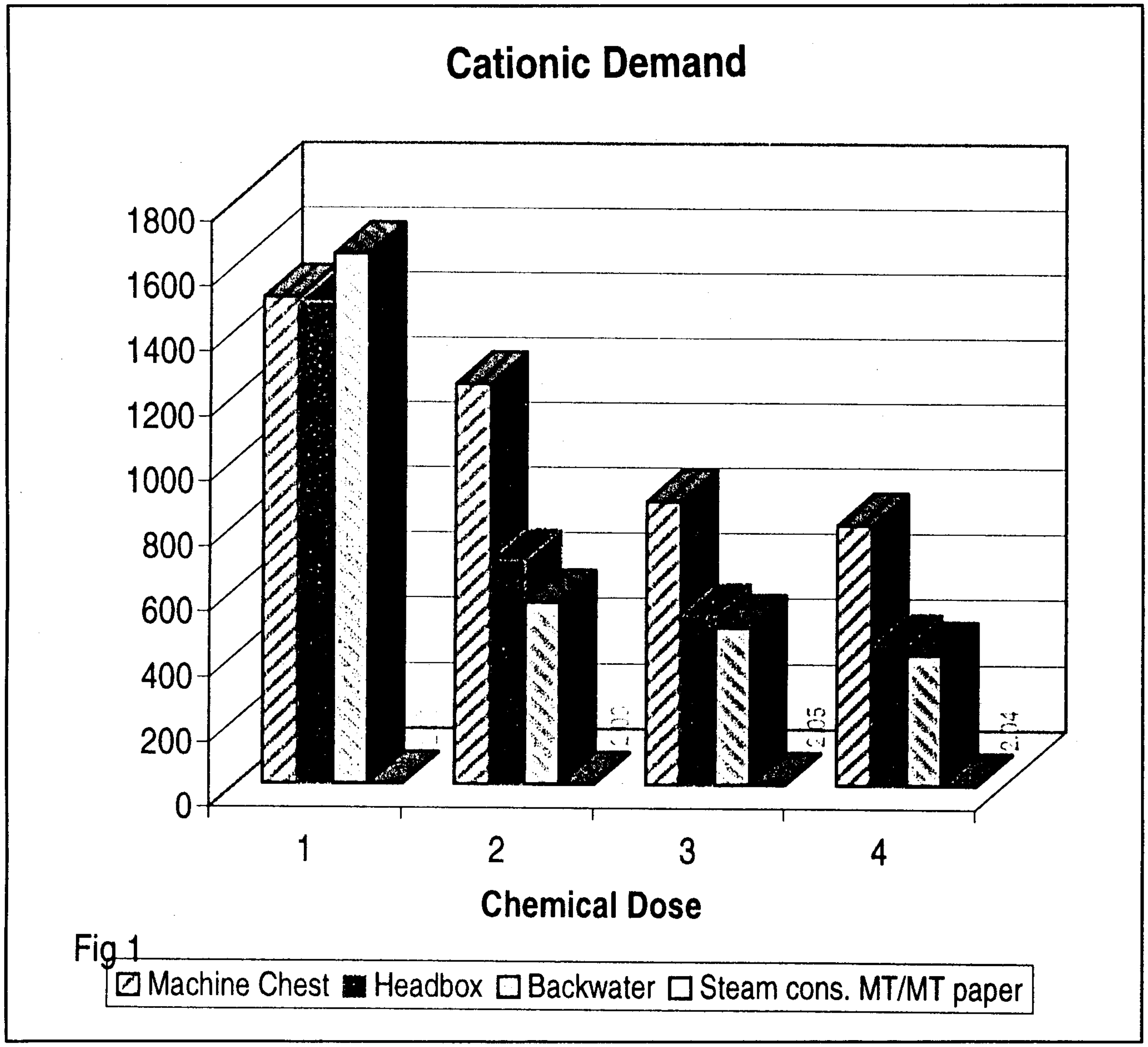

Fig 1

levels of retention aid was added. Both these combined solutions were added after the screens. Various parameters were monitered during the trial. During the trial cationic demand, turbidity, freeness, first pass retention, drainage time, steam consumption physical and optical properties of newsprint were measured. The results are given in Table-1. The relation between cationic demand charts were given in Fig. 1.

OBSERVATIONS

1. The cationic demand shows that there is high amount of anionic trash in the system.

2. When the anionic trash was reduced with cationic polymer the reduction in turbidity was noticed in all the sources.

3. Improved freeness in head box shows that the drainage time was reduced considerably.

4. Opacity has increased from 94.2% in blank and 97.9% in the optimum condition.

5. First pass retention was increased from 59.2% to

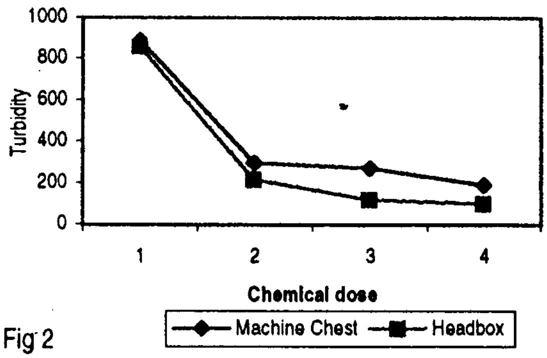

Fig 2

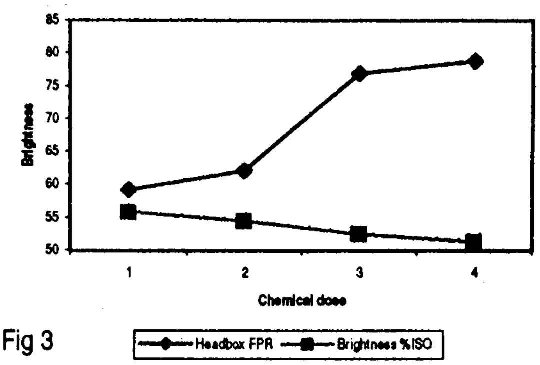

Fig 3

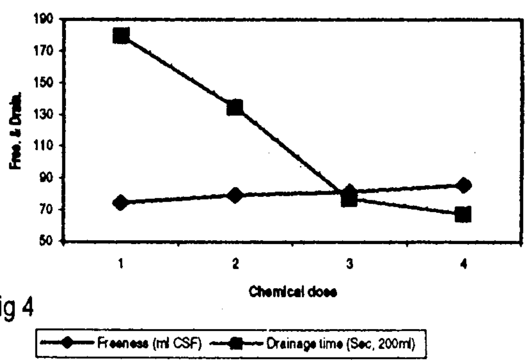

Fig 4

78.8% due to fixation of fines and fillers.

6. Steam consumption reduced from 2.38 to 2.04 T/T of paper.

7. However there was a drop in brightness from 56% to 51.4%

8. When reduction of cationic demand the reduction of turbidity, drain age time, improvement in canadian standard freeness (CSF) was noticed as per the Figures 1, 2, 4.

9. Cationic demand reduction can have the advantages like increase in first pass retention, reduction of steam consumption as per Figure 3.

10. It was noticed during the trial it was possible to maintain stable and constant cationic demand and can overcome the fluctuations due to furnish variations.

11. The wire and felts did not get dirtier and remained same.

CONCLUSION

1. Recycled fibre furnish stock has high cationic demand and the demand fluctuations may be depends upon the contaminants like ink, dirt, specks and dissolved matter.

2. Neutralising the anionic trash can results the advantages like less steam consumption, high retention, less drainage time and less fines in the back water etc.

3. Cationic demand influence turbidity, first pass retention etc.

4. Excessive dosages of retention aid can result drop in brightness due to retention of low brightness ground wood fines, micro contaminants like ink, pitch, which was carried over alongwith the paper.

5. However it is a question of optimising the chemical dosages in order to get maximum benefits out of loss in brightness. A break even point may be fixed for dosing the retention and drainage aids in recycled furnishes.

ACKNOWLEDGEMENT

The authors are grateful to the RNPL management for giving permission to publish this paper and also grateful to the representatives of BASF..

REFERENCES :

1. Tapio Vinervaara & Marikka Paakanen-Polymer for controlling wet end chemistry-world pulp and paper technology 1994 p 185, 186.

TABLE-1

SN.	PARAMETER	1	2	3	4
1.	**Chemical Dosing**				
	(a) Polymer Cat. Neutralizing aid (g/MT)	0	150	580	780
	(b) g/MT of Retention Aid	0	850	2360	1850
2.	**Machine Chest**				
	(a) Cationic Demand (mgeq.P/l)	1497	1230	870	798
	(b) Tubidity (NTU)	890	295	270	188
3.	**Headbox**				
	(a) Consistency (%)	0.68	0.63	0.61	0.59
	(b) pH	7.5	7.5	7.6	7.6
	(c) Freeness (ml CSF)	75	80	82	86
	(d) Cat. Demand (mg.eq.P/l)	1480	686	520	430
	(e) Turbidity (NTU)	860	217	120	100
	(f) Drainage time (sec, 200 ml)	180	135	78	68
4.	**Backwater**				
	(a) Cationic Demand (mgeq.P/l)	1630	560	484	404
	(b) FPR (%)	59.2	62.1	76.9	78.8
5.	**Steam Consumption T/T paper**	2.38	2.08	2.05	2.04
6.	**Machine Speed m/min**	500	500	500	500
7.	**Opacity % ISO**	94.2	95.2	96.7	97.9
8.	**Brightness % ISO**	56	54.6	52.6	51.4

Milli eq. P/l = Milli Equivalent of Polymer/litre

2. Chemical capers at the wet end, leslie webb-pulp and paper international Jan '99 p50.

3. Laine and Stenins-paperi ja puu-1997, 79.4, 257.266

4. Kays and Zhee, progress in paper recyling 1997 Feb. 59-63.

5. Reference source : Wetend chemistry literature of HLL/National starch and chemical corporation.