Alkaline Sizing (AKD) in Recycled Fibre and Straw Pulp - A Mill Scale Experience

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ABSTRACT

To avoid foaming, scaling, machine breakages and other problems and to retain calcium carbonate present in imported recycled paper which we were losing by excessive acid dosing in acid sizing, it was decided to change over from acid sizing to neutral/alkaline sizing. In this work various sizing agents were tried e.g. Hiphase-35, Composize (Neutral sizing agent), Nalco 7541, 7542 (alkenyl succinic anhydride), Basoplast 2030 LC, Lipsol NL-20 (Alkyl Ketene dimer). After an initial failure of all chemicals, finally we established AKD sizing. Now alkaline sizing is running continuously and entire back water system is clean with absolutely trouble free run, consistant product quality, minimum finishing losses and improved equipment and chlothing life.

INTRODUCTION

Satia Paper Mills Ltd. have three paper machines. Paper machine no. 3 has a capacity of 100 TPD using recycled paper (imported and Indian) /straw pulp/ wood pulp. The mill has modern technology with high density pulper (SPB Comer made) with a capacity of 15 m^3 pulp having consistancy of 15±1%, Epurex screen, Drilled screen, Slotted screen, Primary deinking cell (L&T made), Krima hot dispersion, Secondary deinking cell (SPB Comer made), reverse and forward centricleaning system with F.D. washer. Back water system is totally controlled by DAF.

Paper machine is a high speed machine with a speed of 400 m/min where the slurry is passed through octopus, distribution step diffused head box. We are using the single layer synthetic wire of 34.66 m length. Hydrofoil boxes having ceramic tops followed by low vacuum box (wet suction box) 2 nos, Duoflow and trivac dry end boxes are before couch, couch is solid with FDR. We have three presses, 1st and 2nd presses are binip press, 9 dryer groups are there, 1st group is having unirun. Size press is also there.

Acidic sizing to alkaline sizing- first plant trial

First plant trial was conducted using following chemicals :-

Basoplast 2030 LC (AKD) and polymin KE, Polymin SK (retention aid)

Basoplast 2030 LC was added @15-16kg/t and retention aid chemicals were added @0.5-0.6 kg/t but our 80% production was found soft sized after 24 hrs. natural curing and overall costing was around Rs. 1800/- per tonne of paper.

The reason identified for the above problem :-

Low FPR i.e. 55± 1%

Fugitive sizing

At that time we were getting very low FPR and we were not using any coagulant (fixing agent) in the system. After consulting with supplier finally we concluded that because FPR was very low and no fixing agent was used, most of the AKD size drained into back water system with filler resulting in poor sizing.

This phenomena of AKD reacting with filler besides fibre and going to back water system is called "fugitive sizing". It was decided to discontinue the trial. It was decided that in next run we will use AKD with coagulant (fixing agent) to fix AKD size with fibre and also to improve FPR value.

Second plant trial

To establish AKD sizing the second plant trial was taken in the month of November 2001, however AKD was supplied by two suppliers i.e. M/s BASF (India) Ltd. and M/s Schill & Seilacher Ltd. The trade name of AKD of M/s BASF (India) Ltd. is Basoplast 2030 LC with another three chemicals

Catiofast SF, Polymin KE-2020 Polymin SK

Categorisation

Name	Charge	Specific gravity	
Basoplast 2030 LC	very week cationic	1.02	Alkyl Ketene Dimer
Catiofast SF	Cationic	1.07	Coagulant
Polymin KE-2020	Cationic	1.04	Polyacrylamide
Polymin SK	Cationic	1.06	Polyethylene amine

Basoplast 2030 LC was added in machine chest no. 2 through a chemical dosing pump @12-15 kg/t initially, catiofast SF was added in machine chest no. 1 @0.6 kg/t and polymin KE and polymin SK were mixed in equal ratio and added at pressure screen accept @0.6 kg/t.

The following conditions were maintained during the second plant trial.

Furnish : 1. Imported office waste - 70%
2. Virgin pulp (wheat straw & sarkanda) - 30%

Machine speed m/min	Head Box		Back water		First pass retention %	Filler retention %	Cobb (g/m^2)
	cys. %	pH	cys/ %	pH			
400	0.90 ± 0.05	7.3 ± 0.1	0.35 ± 0.02	7.5 ± 0.1	60 ± 2	30 ± 2	25

Cobb was tested after drying the paper sample in oven at 105±5 °C for 10 min. and finally assured by rechecking after 24 hrs. natural curing.

Problem faced during the trial

Cobb values after artificial curing and natural curing were almost matching but chemical consumption was on higher side and sizing cost was around Rs. 1500/ - per tonne of paper.

Optimization during the third plant trial by improving the first pass retention

To optimize AKD sizing we planned to improve first pass retention, conditions were as follows:

Furnish	
Imported waste paper (Coated book stock, plastic window envelop, office pack)	55%
Indian waste paper	15%
Virgin pulp	30%

First of all we tried to improve first pass rentention by increasing the dosing of polymin KE & SK from 0.6 kg/t to 1.0 kg/t and observed slightly gain in FPR from 63±1% to 65±1%.

In second step we changed the ratio of both polymers from 1:1 to 1.5:0.5 i.e. polymin KE is 1.5 and polymin SK is 0.5. This time polymin SK was used in machine chest in place of catiafast SF and its dosing was also increased from 0.6 kg/t to 1.0 kg/t.

After changing the conditions we achieved following parameters:

First pass retention - 70±1%

Filler retention - 44±1%

Total sizing cost Rs. 1100/- per tonne of paper

Further improvement in first pass retention by the addition of cationic starch

To improve strength properties and rattling we started cationic starch the trade name is Catonil-300 supplied by M/s Anil Starch @ 5 kg/t in mix chest. We got slight improvement in strength properties but the major achievement was noticed in first pass rentention, FPR value shoot up to 81±1%. Cationic starch is being used regularly @ 2kg/t.

A graph is plotted to represent first pass retention Vs AKD consumption (Fig. 1).

Tangible and Intengible gains

- Machine is running smoothly and machine efficiency has increased by 8-10%.
- Power consumption per tonne of paper is reduced.
- System is corrosion free.
- Less foaming is system.
- Slight improvement in paper brightness and less colour reversion.
- Strength loss after natural curing is reduced.
- Less $CaSO_4$ precipitation in system thereby no deposits in pipe lines.

Parameters

Machine speed m/min	Head Box		Back water		First pass retention %	Filler retention %	Cobb (g/m^2)
	cys. %	pH	cys/.%	pH			
400	0.9 ± 0.05	7.6 ± 0.1	0.33 ± 0.02	7.8 ± 0.2	63 ± 1	37 ± 1	25

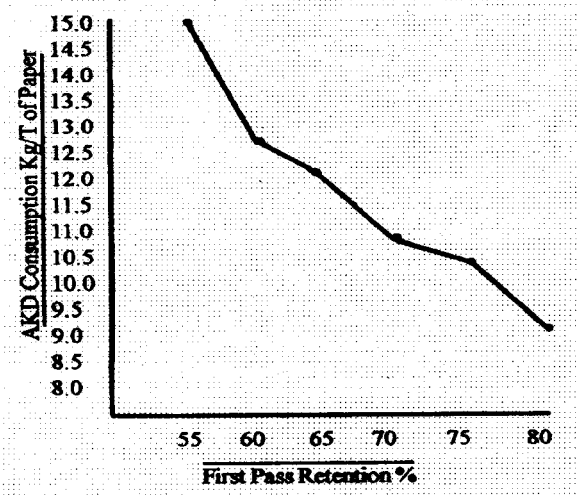

Fig. 1 Relation between First Pass Retehtion & AKD Consumption

Problems related to AKD sizing

Slime deposition in system

Problem of slime formation was also noticed during AKD sizing. The problem was due to unreactive size present in system. The problem was solved by increasing the dosing of bio-cide programm in mixing chest and back water.

Doses are - Busan 880 in mixing chest @ 28ml/min upto 45 min. in each shift

Busan 885 in B/W @ 15ml/min. upto 30 min.in each shift.

Back water colour

It is observed during AKD sizing that machine back water colour changes to pale yellow, which affects finished product brightness. In next run we will try using oxalic acid regularly in H.D. pulper with de-inking chemicals to avoid this problem.

CONCLUSION

AKD sizing has been found to be successful as per the mill trial taken.

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