

# Change Over from Acidic Sizing to Alkaline Sizing - Our Experience

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## ABSTRACT

*Saurashtra Paper & Board Mills Ltd., Shapar is situated near Rajkot, an area of Saurashtra (Gujarat) region which has extreme water scarcity. It is a zero effluent discharge unit and effluent generated is again and again used in the system for production of quality papers. Because of several recirculations, back water has very high hardness and TDS. Also bore well water, on which the mill is based has become very hard due to percolation of effluent.*

*When the mill is run with acidic sizing, lot of foaming occurs and tremendous deposition of scales of Calcium Sulphate (gypsum) takes place in the system. Efficiency of the machine gets badly effected and paper quality gets deteriorated.*

*Because of the above problems, it was decided to convert the mill from acidic sizing to alkaline sizing. Both ASA (Alkenyl Succinic Anhydride) and AKD (Alkyl Ketone Dimer) Sizes were tried successfully. By using alkaline sizing, efficiency of machine and paper quality have improved. The mill is presently running with alkaline (AKD) sizing.*

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## INTRODUCTION

Saurashtra Paper & Board Mills Ltd., Shapar, Dist. Rajkot is a 35 TPD plant which manufacture cultural papers viz; cream wove, premier, duplicating, copier and colour wove etc. Source of fibrous raw material is 100% imported and indigenous waste paper. The mill has most modern technology which consists of high density pulper with epurex screen, high density cleaners, pressure screens, primary deinking floatation cell, twin wire press, hot dispersion and secondary deinking floatation cell. All the equipments are from COMER S.p.A., Italy. Three stage battery of centricleaners from GL&V (Celleco) formerly known as Celleco Alfa Laval are provided in pulp mill to get more clean pulp.

There is provision of refining also but refiner is

rarely used (mostly in colour run). Only disperser is in operation.

Stock preparation has all the facilities for addition of different chemicals viz; alum, rosin, dyes, whitening agents and starch etc. The stock is further cleaned by three stage battery of centricleaners from GL & V (CELLECO) formerly known as Celleco Alfa Laval and pressure screen (perforated) before it enters to head box.

Paper machine is equipped with open head box. The wire part has bagally box, forming board,

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**M/s Saurashtra Paper & Board Mills Ltd.  
NH - 8 B, Shapar,  
Rajkot (Gujarat)**

hydrofoils, table rolls, suction boxes and dandy roll. Press part consists of 2 Nos., plain presses of which first press is double felted, second press is with Venta nip roll. There are eighteen dryers in three groups, three nip calendar and a Pope reel. The speed of the machine is 200-250 m/min. Deckle of the machine is 1.98 meters. The machine is equipped with ABB scanner for on line controlling of grammage & moisture.

The mill has facilities of rewinder and cutter and paper is sold in ream and reel form.

For drying of paper, steam is provided to machine by two Nos, FBC boilers having capacity 5 to 7 tonnes per hour steam- generation. Only one boiler runs at a time. Facilities of D.M. plant are there to provide treated water (soft water) to boiler house. Steam consumption is 3.5 to 3.8 tonnes per tonne of paper.

The mill has facilities to generate its own captive power upto 70% of requirement. It is used only during grid power failure. The average consumption of power is 900 to 950 units per tonne of paper.

The mill has four bore wells to meet its water demand. As most of the back water is recirculated in the system hence fresh water consumption is 20m<sup>3</sup>/tonne of paper only.

SPBML is a zero effluent discharge unit. Effluent generated is treated for suspended solids removal & colour stripping with the help of lagoons, krofta and lamella units. Treated effluent has 200-300 ppm suspended solids which is reused in the system. The mill is thinking to install a full fledged effluent treatment plant with activated sludge process to further improve the quality of treated effluent.

The mill does not have any size press in machine. Still SPBML feels proud to sell their product in comparison with 'A' grade mills manufacturing paper with virgin pulp.

SPBML's 25% products are exported to Tanzania, Kenya, Shrilanka & USA.

## **SIZING PROCESSES, PROBLEMS, ADVANTAGES & DISADVANTAGES**

### **ACIDIC SIZING**

Saurashtra Paper have practiced acidic sizing for number of years i.e. since year 1992 to 1997. Initially 'N' grade & 'WW' grade rosins were used after cooking and emulsification in the mill. Later on dispersed rosins

viz; DPC-30 supplied by M/s. Dujodwala Chemicals, Ivax-300 supplied by M/s. Ivax Paper Chemicals and Dynasol supplied by M/s. Arjun Chemicals were used. It was observed that consumption of these rosins goes down by about 1% if used after prior or on line dilution. Rosin and alum consumption to maintain desired Cobb value was 25-30 kg/t and 60-80 kg/t respectively. Back water pH was maintained 6.2.-6.7 PAC supplied by M/s. Grasim Industries was also tried in place of alum but the trials were not successful. Heavy skinning problem at second press top roll was faced during PAC trials.

Sulphuric acid trials were also taken alongwith alum. By using Sulphuric acid 5% on alum , alum rosin consumption is reduced to some extent.

Problems faced in acidic sizing were heavy deposits of scale (Calcium Sulphate ) in paper machine area & very high foam generation because of high hardness of water (2000-3000ppm) and presence of high Calcium Carbonate in the imported waste paper.

Above problems resulted slow drainage and presence of foam spots in paper which ultimately resulted low production and poor quality of paper.

Retention figures maintained during acidic sizing were as below:

Ist Pass retention	:	75-80%
Filler retention	:	30-35%
Fibre retention	:	82-84%

Retention - aids supplied by M/s. Pidilite India and M/s. Di-ichi Chemicals were used. consumption of retention -aids was 150-250 gramme/tonne of paper.

Cost of Acidic sizing was Rs. 900-1000 per tonne of paper including retention -aid. Brightness gain from pulper to paper was 9-10 degrees.

## **ALKALINE SIZING**

### **A. A.S.A. (ALKENYL SUCCINIC ANHYDRIDE)**

Ist trial of ASA sizing was taken in the month of August 1998 for ten days and regular run was started since September 1998 and continued upto the month of February 1999.

ASA emulsion was prepared at the mill site with the chemicals supplied by M/s. Nalco India Ltd. A

feeder was also provided by them for the preparation of emulsion.

Nalco - 7542 Nalsize and Nalco - 7541 emulsifier were mixed together in soft water (hardness -5-10 ppm) with the help of feeder. Ratio of both the chemicals was maintained about 1:1.1 to 1:1.2. Concentration of the mixed solution (emulsion) was maintained 10-12 gpl total solids.

Emulsion prepared as above was used as sizing chemical to fix the desired Cobb value in paper. Emulsion was dozed after pressure screen in the thin stock. The flow was monitored with the help of rotameter supplied by Nalco-India. Consumption of the above chemicals was 2.5-3.0 kg/t of paper of each chemical.

To fix the size properly in ASA sizing, it is essential to remove all the anionic trash present in the system. This was done by addition of Nalco 7607, the highly Cationic Coagulant. Coagulant solution of 50-70 gpl concentration was prepared and dozed in the inlet of the fan pulp in the thick stock with the help of metering pump. Consumption of Coagulant was 1.0 to 1.5 kg/t of paper.

Also retention is the key to success in alkaline sizing. Higher will be the retention, better will be the results in terms of quality of paper and runnability of the machine. In case of ASA sizing, Nalco - 8873 retention-aid supplied by Nalco India was used. A solution of Nalco - 8873 was prepared. Concentration of solids was kept around 5-6 gpl. The solution was added just before head box in the approach flow line with the help of metering pump. Arrangements for further on line dilution were also done to have better mixing with pulp. Consumption of the retention chemical was 0.8 to 1.0 kg/t of paper. Back water pH was maintained 7.5-8.0. Retention figures in the ASA sizing were as below:

First Pass retention	:	86:88%
Fibre retention	:	90-92%
Filler retention	:	50-55%

Major problem faced in the ASA sizing was slime for which biocide supplied by Nalco - India, Nalco - 7647 was used (after slight dilution) in the back water tank or after blending chest. Consumption of the biocide was 80-100g/t. of paper.

Another problem, which was faced during ASA

sizing was skinning (press picking ) at second press. This problem was specially faced during furnish blend of 60% Indian & 40% imported waste paper with lower grammage of paper.

Because of better retention and low degrees SR in head box, drainage was improved and we could speed up the machine by 7.5% . Formation of the paper was good as compared to acidic sizing. There was no foam in the system and we could make the paper without foam spots. Efficiency of the machine was improved substantially.

Although there were several advantages of ASA sizing, however we could not continue it because of higher cost. Sizing cost was Rs. 1400 - 1500 per tonne of paper (including coagulant & retention - aid).

Another major draw back was observed that brightness gain from pulper to paper was 6-7 degrees only. This was because of retaining the micro type ink present in back water.

## **B. A.K.D. (ALKYL KETONE DIMER)**

AKD. trade name Basoplast -2030 was supplied by BASF India alongwith Coagulant (Catiofast SF) and retention-aid (Polymine KE-78). First trial of one week of AKD sizing was taken in the month of March 1999 which was followed by a fifteen days trial in the month of April 1999. It is being used regularly since June 1999 to till now.

To obtain desired Cobb value in paper, Basoplast is diluted in soft water (200 gpl concentration) and added in the inlet of the fan pulp through a metering pump. consumption of Basoplast is 10 to 11 kg/tonne of paper. Catiofast S.F. is diluted (20 gpl concentration) and added in the chest (after blending chest) to remove the anionic trash. Its consumption is 0.6 to 0.7 kgs per tonne of paper. Polymine KE-78 is also diluted (5 gpl concentration) and added just before head box in the approach flow line through metering pump. Its consumption is 1.0-1.2 kgs. per tonne of paper.

Retention figures in the AKD sizing could be maintained as high as they were in ASA sizing with the above mentioned consumption values of Coagulant and retention-aid.

Cobb value in the paper is fixed within 24 hrs., however regular monitoring can be done by drying the paper in the oven at 125°C for 5 minutes followed by cooling for 5 minutes and then Cobb checking by standard ISI or Tappi method. The Cobb obtained in

this way is generally matching with the Cobb obtained after natural curing of 24 hrs.

Major problem in AKD sizing is that on machine Cobb is around 100. Actual Cobb can be known after oven curing for which we have to face production loss sometimes.

Problem of slime was also faced in AKD sizing which was overcome addition of biocide in the blending chest after slight dilution at the rate of 50 gramme per tonne of consumption and system boilout in regular interval. The biocide named as 'Protectol' was supplied by BASF India.

Problem of dryer deposits was also faced in the AKD sizing which was overcome by strict monitoring of FPR by which excess consumption of AKD is controlled and proper doctoring arrangements with initial dryers.

Skinning (press picking) problem was also faced which was controlled by running the machine at higher FPR.

Brightness gain from pulper to paper is less (6-7 degrees) in AKD sizing also which is one of the major disadvantage for us. Back water pH in AKD sizing remained 7.5-8.0.

Sizing cost in the AKD sizing is Rs. 1100-1200 per tonne of paper (including Coagulant & retention-aid).

As machine runnability has become smooth and chronic problems of foam and scaling have been eliminated with alkaline sizing, we are continuing with AKD sizing.

## RESULTS & DISCUSSIONS

Papers made by alkaline sizing are stronger than the papers produced by acidic sizing. We did not observe loss of strength and loss of tint of paper even at 20% ash content in the paper after six months to one year. Also there was improvement in the formation, smoothness and opacity.

Number of fillers were tried during alkaline sizing viz; talcum power, GCC (Grounded Calcium Carbonate), PCC (Precipitated Calcium Carbonate) and dolomite powder. Fillers used were of above 90% brightness and 300-500 mesh size. Retention was less in case of PCC as particle size in this case is less. Presently the cheapest filler i.e. dolomite powder is being used in the mill.

Nalco-India recommends use of cationic starch and alum alongwith their chemicals for charge

balancing as well as to solve skinning problem however BASF India does not recommend these chemicals. We are not at all using presently starch and alum. We have solved the problem of skinning by maintaining very high FPR (85-87%).

It is well known to all that with the help of alkaline sizing drainage is improved, dryness is improved and corrosion is less. We could speed up our machine by 7.5% with additional 10-12% efficiency improvement of machine.

Because of the better retention, fibre losses are also less in alkaline sizing as compared to acidic sizing.

It is our observation while AKD is used-machine back water has got a tendency to become pale yellow. This yellowishness is controlled by perfect dosing of oxalic acid in back water at the rate of 400 to 500 gms per tonne of paper depending on the intensity of yellowishness.

## CONCLUSION

If the mill has problem of hard water and there is lot of input of Calcium Carbonate through raw materials, it is worth to use alkaline sizing instead of acidic sizing. This will improve efficiency of machine & paper quality.

## REFERENCES

Literature received from Nalco-India & BASF India.

## ACKNOWLEDGEMENTS

- I) Authors are extremely thankful to Mr. S.S. Mehta, Director of M/s. Saurashtra Paper & Board Mills Ltd., Shapar who allowed us to publish this paper.
- II) To Mr. Rajesh Sundrani and Mr. Bharat Rattan, representatives of M/s. Nalco-India for providing us valuable guidance for successful run of ASA.
- III) To Mr. Vivek Bapat, representative of M/s. BASF India for providing us valuable guidance for successful run of AKD.
- IV) To Mr. Shivshankar Mahto (Pulp Mill Superintendent) and his team for strict monitoring of Chemicals in stock preparation area.
- V) To Mr. Ehtisham-UI-Hye (Paper Machine Superintendent) and his team for stick monitoring of Chemicals in paper machine area.
- VI) To Quality Control Chemists for frequent checking of Cobb in paper