# Acid and Neutral Paper Sizing Practices for Production of Quality Paper

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**Paper mills in India use various types of Raw materials including recycled fiber in the production of various grades of paper ranging from cultural to packaging paper. Internal sizing is a basic requirement of paper. It is done to impart a hydrophobic surface which resists water penetration into paper. Conventional internal sizing of paper using gum rosin and alum has been in practice for a long time in Indian Paper Industry. Thereafter mills switched over to fortified rosin and the trend continued for few years. However, in acid sizing process with either gum rosin or fortified rosin, stock pH of 4.3 to 4.6 is maintained which retards the affect of optical whitening agent. Thus paper brightness could not be increased to the desired extent. Further, due to lower paper pH, acid induced colour reversion takes place resulting yellowness development in paper in due course of time. In order to overcome these hurdles due to lower pH of stock, neutral sizing has been introduced by many paper mills in our country. However, Alkaline sizing using AKD and / or ASA with Calcium Carbonate as filler is the technology Indian Paper Mills need to adopt for competing in the international market. Continual research work in the arena of paper sizing is on going process. As a result, various additives have been recently developed which are added to surface sizing solution and reduce internal sizing chemical consumption at wet end as well as sizing cost of paper. This development is a radical change in the technology of paper sizing. The present paper discusses about sizing practices followed at JK Paper Ltd, Unit: Central Pulp Mills with special reference to a new additive which was used in surface sizing and reduced consumption of internal sizing chemicals at wet end.**

## INTRODUCTION

JK Paper Ltd, Unit: Central Pulp Mills is the largest integrated Pulp and Paper Mill in Gujarat. The mill was installed in 1968 by Parkhe Group of Industries, Pune. Originally the mill was manufacturing pulp and supplying to various paper manufacturing units. As a forward integration measure, two paper machines were installed for manufacture of paper. Due to financial and other constraints mill became sick and referred to BIFR in 1986. In the year 1992 JK group took over the mill and turned around within 3 years. Raw material furnish is 70% Bamboo and 30% Hardwood (mainly Eucalyptus). Bamboo has average fibre length of 1.4 mm which is longer compared to 1 mm average fibre length of Hardwood. Bamboo gives good strength properties and Hardwood gives good formation. Hence blend of 70% Bamboo and 30% Hardwood has been chosen as furnish which gives better sheet formation without affecting strength properties of paper. Our mill has conventional Sulphate Pulping and CEpHH bleaching process. In this process normal pulp brightness comes to 81% ISO. However due to competition in the market we had to increase brightness of paper as we have to establish our product in high bright segment of the market. Since heavy investment was not possible immediately in adopting new pulping and bleaching technologies, we had to adopt innovative technologies at minimum capital investment to make our paper more competitive in the market. Accordingly the quality was gradually upgraded by innovative technology of internal sizing for regular use.

Fortified Rosin and Non ferric Alum were used earlier and the pH was 4.3 to 4.6. Because of excessive Alum, yellowness used to develop in paper. After various laboratory trials and plant trials we established Neutral size.

## PLANT TRIAL WITH NEUTRAL SIZING CHEMICAL

In order to improve quality of paper and to enter in the

value added market Central Pulp Mill had taken up intensive programme to go for Neutral sizing in the year 2000. The consumption of Neutral size rosin was established in the range to 13-15 kg/Tn of paper and Alum consumption was 25-30 kg/Tn of paper. Use of Wax emulsion was eliminated and pH was maintained 5.8-6.0. At the beginning we faced alarming foaming problem but later on the problem was countered by use of Silicon based defoamer in place of ordinary defoamer. Since then the mill switched over to 100% production of Neutral sized paper.

Comparative consumption of size chemicals during Acid sizing and Neutral sizing is given in Table-1 and comparative paper properties with Acid sizing and Neutral sizing are given in Table 2.

**Table 1** : Comparative Consumption of Neutral Sizing Chemical and Acid Sizing Chemical

| **Particulars** | **Unit** | **Acid sizing** | **Neutral sizing** |
|---|---|---|---|
| Fortified Rosin | kg/Tn | 13-15 kg | - |
| Neutral size | kg/Tn | - | 13-15 |
| Non ferric Alum | kg/Tn | 40-45 | 25-30 |
| Wax emulsion | kg/Tn | 4 | - |
| Stock pH | - | 4.3-4.6 | 5.8-6.0 |

**Table 2** : Comparative Paper Properties with Acid & Neutral Sizing

| **Parameters** | **Unit** | **Surface sized Copier grade paper 70 gsm** | | **Surface sized Maplitho 70 gsm** | |
|---|---|---|---|---|---|
| Sizing | - | Acid sizing | Neutral sizing | Acid sizing | Neutral sizing |
| Bulk | cc/gm | 1.37 | 1.37 | 1.18 | 1.18 |
| Ash | % | 10.5 | 11.0 | 15.5 | 16.0 |
| **Brightness** | **% ISO** | **85.5** | **86.5** | **85.5** | **86.5** |
| Opacity | % | 91.5 | 91.7 | 94.5 | 96.5 |
| Smoothness (Bendtsen) | ml/min | 160/207 | 160/209 | 90/120 | 90/125 |
| Wax pick (TS/WS) | No. | 10A/11A | 10A/12A | 10A/12A | 10A/13A |
| Breaking length (MD/CD) | Meter | 4040/2830 | 4150/2900 | 3644/2696 | 3755/2700 |
| Burst factor | - | 18.4 | 20 | 17.8 | 21.8 |
| Double folds | No. | 8/6 | 9/7 | 16/11 | 18/12 |
| Tear factor | - | 57/63 | 57/63 | 55/61 | 60/67 |
| Cobb (one min) | | 19/21 | 19/21 | 19/21 | 19/21 |

Brightness of paper has increased 1% ISO in Neutral sizing.

## USE OF SURFACE SIZING ADDITIVE

The paper maker must strike an effective balance between internal sizing and surface sizing, weighing the benefits and drawbacks of each. To further optimize the consumption of neutral size we thought of developing water resistance of paper through surface sizing. Efficient method of achieving water resistance of paper is to use combination of low level of internal size chemical and controlled level of surface size. Moreover, size press additives are totally retained on paper surface compared to internal sizing chemicals and no retention mechanism is required. Over and above, size press additives do not interfere with wet end chemistry and fiber bonding. In view of the above, JK Paper Ltd, Unit: Central Pulp Mills conducted trial of the size press additive and successfully regularised its use.

The size press additive was added to the surface size starch solution in the service tank. After good mixing starch solution containing size press additive was delivered to surface of paper using a flooded nip of size press. This chemical additive forms a sealing on the surface of the paper web & helps in reducing consumption of surface size starch.

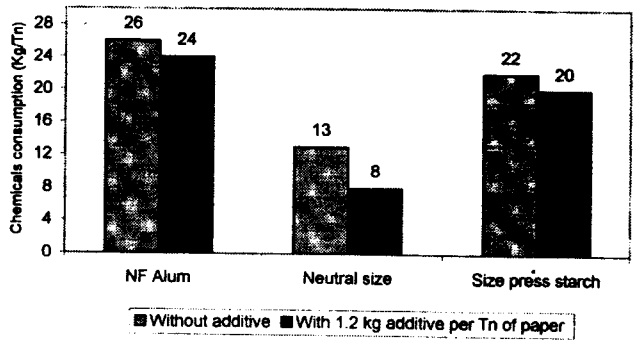


**Figure 1** : Consumption of Sizing Chemicals

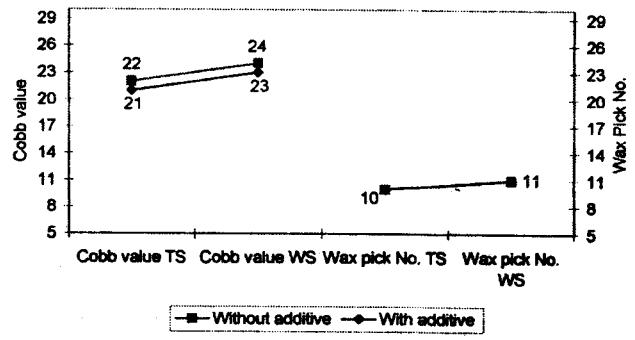


**Figure 2** : Results

Reduction in consumption of sizing chemicals and resultant cobb & wax pick values are shown in the graph.

## ALKALINE SIZING

We have conducted several trials of Alkaline sizing with AKD of various suppliers. During the trials we have experienced acute problem of fines accumulation in lump breaker, paper lead roll and press rolls which adversely affected runnability of the Paper machine resulting in production loss. Further, AKD consumption was high. By applying various retention aids & fixing agents of different suppliers, AKD consumption and fines accumulation at different rolls could not be reduced. We apprehend that the fines accumulation is due to higher consumption of AKD. With the help of this new additive at size press which has reduced Neutral sizing chemical considerably, we are optimistic that during AKD run we will be able to reduce AKD consumption and subsequently the problems of fines accumulation will be eliminated and we will be able to switch over to Alkaline size in near future.

## CONCLUSION

Paper industry has been steadily moving towards surface sizing as an addition and / or replacement for wet end sizing. Until recently, surface sizing technology was limited to improvement of surface strength of paper. Development of these surface sizing additives is revolution in size press technology which helps paper maker to reduce internal sizing consumption and to move majority of the sizing contribution to size press which is economically viable. As a result the paper maker enjoys a cleaner, more flexible wet end with minimum focus on size retention. This technology will help in switching over to Alkaline sizing also.


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