Problems of Dying & Colouring of Wood Free Recycled Fibers and Their Remedies at M/s. Saurashtra Paper & Board Mills Ltd.

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ABSTRACT

Problems faced for manufacturing of White & Coloured papers with the use of different dyes have been highlighted in this paper.

Dyes which were troublesome were changed and new dyes were used to overcome the problems, has also been mentioned.

INTRODUCTION

Types of dyes generally used in paper industry are:

Basic dyes : They are hydrochloric acid salts of colour bases. They show great affinity for unbleached fibres and may be used to obtain, at low cost, deep and brilliant shades. These dyes are characterised by their extreme brilliance and high tinctorial power, but as a class they possess poor fastness to light acids, alkali and chlorine. They are particularly sensitive to alkali and hard water. These are to be avoided whenever basic dyestuffs are used. Any free alkali will cause the formation of colour spots and calcium and magnesium salts, when present in amounts approximately 50 ppm may cause difficulties. It is for the reason that when making up basic dyes, equal quantity of acetic acid should be added to the dye to make a paste before the water is added. These colours should never be boiled because of the tendency to form the base of hydrolysis. The temperature of water should never exceed 200°F and in case of Auromine, Chrysodine and basic browns the temperature should be kept below 160°F.

The absorption of these dyes by unbleached fibres is more rapid and more complete than by bleached fibres. Therefore in straight furnishes of unbleached fibres, these dyes often cause "Mottling" becuase they are more rapidly absorbed by the more lignified fibres. Even in straight furnishes of bleached fibres this condition appears. The mottling is accelerated if the dye is added in too hot or too concentrated solution. This effect may be avoided to some extentent by adding the dye cold and in very dilute solution. Tannic acid may be used in conjuction with basic dyes to increase the retention by forming an insoluble lake with dyestuff which is the compound precipitated on the fibre. This treatment also increases the light fastness of some of the dyes but it dulls the shade.

As a rule, basic dyes are little affected by change in pH within the range of 4.5 to 6.5 (i.e. pH of machine tray water). Their retention is poor at the neutral point and they cannot be used successfully on unsized bleached fibre for heavy shades.

Basic dyes when used in mixed furnishes of unbleached and bleached pulp present problem of preferential dying as unbleached pulp will attract more dyes and undesirable mottled fibre may appear on

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paper sheet. To avoid such occurrence, bleached pulp should be dyed up first followed by unbleached pulp. Basic dye should not be mixed with acid or direct dyes is same container. These dyes can be used even on unsized paper if made with unbleached pulp only.

Acidic dyes: Acidic dyes are mostly sodium salts (rarely potassium or ammonium) of colour acids. As a class, acid dyestuffs are characterised by good fastness but lower tinctorial or colouring value with no affinity for cellulose than the basic colours. As a group, these dyes have straight affinity for fibre and require the addition of size and alum for their retention with an excess of alum generally advisable. An exception of this in case of Metanial Yellow with which an excess of alum should be avoided in order to bring out the full brilliance of shade. The exact mechanism of this process of mordenting is not known but the addition of size does not help the retention of colour while the addition of alum will increase the retention considerably. The mordenting is probably a combination of chemical, physical and colloidal reactions combined together.

The dyestuffs are in general characterised by poor fastness to acid (below pH 4.4), alkali & chlorine. These dyes are extremely soluble and since they do not exhibit preferential affinity for any particular fibre, they produce even dying and may be used to good advantage in surface colouring and in mixed furnish in the beater. They may be made practically free from bleeding on surface coloured sheet by the use of casein and an after treatment of formaldehyde alum solution.

Direct dyes : Direct dyes, called as substantive dyes are sodium salts of azo dyes which dye cotton in a neutral or alkaline both without the aid of a mordant. They posses a strong affinity for cellulose and consequently do not require a mordant. This renders them of great use in the manufacture of all types of water leaf papers when used for deep shades. The addition of 5 to 10% of common salt of weight of pulp will improve the colour value. Heating of the stock at 120°F. to 150°F will increase the depth and brilliance of shade but in paper industry this much warming is not practically possible as it destroy the sizing.

As a class, the direct dyes have less tinctorial value than the basic dyes, but nearly in all the cases their light fastness is much superior to the basic dyes and in some cases to the acidic dyes. However some of the direct dyes, when used with size and alum form aluminium flocks, which are generally of somewhat lesser fastness than the dyes themselves. The addition of some copper sulphate to some of the direct dyes before addition of size and alum will better their light fastness though changing the shade somewhat. No general statement can be made concerning the fastness of these colours as a group to acid, alkali or chloride.

Direct dyes are fairly resistant to bleaching. Dyes must be cooled and diluted before addition to stock. Solubility is not very high. In cold water some varieties may produce colloidal gels.

Because of their nigh affinity for cellulose in mixed furnishes, dyes may produce "granite effect - molted appearance" with hairy fibres. If added in very concentrate solution even in plain furnishes of bleached/unbleached pulp, mottling may occur becuase the fibre coming in contact with dyes at first may retain the undue share. So diluted solution must be used. The trouble is rare with yellow dyes but more frequent with orange, red or blue. Most of the dystuffs of this class may produce shades of highest degree of non-twosidedness possible to obtain under present mill operating technique.

MILLS PROBLEMS & THEIR REMEDIES

While producing white papers with recycled waste paper furnish and acidic sizing, "Mottling" problem was faced very frequently. During this period the basic dye methyl violet was used for giving the tint to the papers. The problem was sometimes very acute and lot of rejection of paper due to some fibre change with waste paper as raw material. Now the problem is completely solved by using, direct dye "PERGASOL VIOLET BN LIQUID" supplied by M/s. Ciba Speciality Chemicals (India) Ltd., Mumbai, Shade obtained by this dye has been very well accepted in the market. This dyes is also being successfully used after conversion of mill from acidic sizing to alkaline sizing. Consumption of dye is about 0.2 kgs. per tonne of paper.

During the earlier days of acidic sizing, making of green color papers (only basic dyes out of four colours) was not very difficult. But with present alkaline sizing making green colour with combination of brilliant green and Auromine was very difficult to maintain shade. There was roll to roll variation in shade and sometimes due to lignified fibres coming with recycled waste paper, acute mottling problem occurs.

To sort out this problem, Ms/. Ciba Speciality have developed a new dye named as SHAKUNTALA GREEN. With this dye we have obtained good looking shade though different than basic dyes - has been widely accepted by the market. Consumption of this dye is approximately 1 kg./tonne of paper.

RESULTS & DISCUSSIONS

As there are every chances of presence of mechanical (lignified fibres) fibres in the furnish, which results mottling, methyl Violet being used previously was absorbed more rapidly by lignified fibres.

Basic dyes do not fix properly at neutral or alkaline pH (pH of tray water) hence we had to switch over from alkaline sizing to acidic sizing for production of green colours. Tray water pH during acidic sizing was kept between 6.0-6.5 while in case of alkaline sizing 7.5-8.0.

CONCLUSION

Paper producing from 100% recycled waste has to depend on raw material input without knowledge of source of virgin-fibre. Use of "Pergasol" and "Shakuntala Green" have completely eliminated the problem of mottled paper irrespective of any recycled waste paper as input raw material and have provided good looking shade to our final products.

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