Surface Colouring and Whitening

SHAH SUMAN M.*

SUMMARY

With the ever increasing cost of production therefore the necessity for achieving maximum economics, a thought has been given to surface colouring and whitening with an objective to permit a number of colours to be run in quick succession with a minimum of machine down time as well as production loss due to the changeover.

Secondly, the present day need for abatement of water pollution created by the industries and the increasing attention paid by concerned sectors of the society, additional impetus is provided to studies aimed at achieving the objective by surface treatment rather than by adding chemicals at the wet end. Surface treatment generates less pollution because of minimum drainage of the chemicals to the sewer.

It is hence obvious that the technique of paper surface/treatment/colouring/whitening needs development to overcome the problems in order to have (i) uniform and non-patchy coloured surface free from colour peel, (ii) proper fixing of dyes to provide adequate water fastness and (iii) fairly uniform shade of the final paper/board.

Surface colouring/whitening can generally be carried out by two processes namely (i) sing e side or double side colouring at the calenders and (ii) both sides colouring at the size press.

The experiments carried out on laboratory scale with regard to colouring/whitening at the calenders have been discussed along with salient features of the process in this paper.

Colouring at Calenders :

Colouring at the calender stack is generally preferred for heavy weight paper and board, especially the cheaper grades. Tne main advantage of this process is low cost especially in heavy weight varieties where the ratio of surface area to unit weight is low If proper care is not taken and proper additives are not used, the major disadvantage is that the colour surface does not become water fast and in case of hard sized paper/board, the colouring might be uneven too.

Application of colour is given in regular water boxes, one or two for each surface. Best results are obtained by having the boxes equipped with overflow return of colour solution to the circulating tank from where it is pumped back to the boxes. A separate tank for dissolving the dye is necessary. A heating arrangement is also desirable in the circulating tank since an even colouring is obtained when the temperature of the solution in maintained at 70 to 80°C.

Only dyes with good water solubility are suitable for surface colouring. Acid dyes are most widely used but there are several basic dyes and even a few direct dyes which give satisfactory results. A few acid dyes which cannot be used otherwise for beater dyeing because of poor retention give excellent results in surface colouring. These include Bimacid Pink 2G, Bimacid Scarlet BS, Bimacid Tartraflavine GL and Bimacid Safron Yellow RL etc.

To help the dissolution of acid colours, small quantity of mild alkali such as Soda Ash is often used. With basic colours, a small quantity of Acetic Acid helps to make a good solution. In case of direct colours, small quantity of Sodium Tripoly Phosphate or Sodium Hexametaphosphate helps to make a good solution.

Surface active agents or solvents such as denatured spirit and Butyle Carbitol etc. help to give more even penetration resulting in a high level uniform dyeing especially when the paper is hard sized. Use of Hydrolyzed starch, foamed starch, natural gums, Methyl Cellulose, Carboxy Methyl Cellulose and Urea Formaldehyde resins along with

*M/s. Bhagvandas Maganlal Shah, Calcutta.

colour solution is possible as it imparts better printing surface and/or increase oil/water resistance.

Colouring at size press :

Size press application of colour reduces two sidedness which otherwise is high in case of beater application. The discussions above for colouring at calender apply equally in this case also. Usually, the quality of colour added in this case is much less than for calender colouring.

Whitening at calender/size press :

The problems encountered in case of surface colouring at the calender are not faced in case of surface application of optical whiteners. This is probably because any non-uniformity in application is non-visible to the human eye and the flaws, if any, can only be detected under ultraViolet illumination. It is observed that this method has got increasing acceptance mainly due to development of improved quality of optical whitening agents, greater stability of surface applied optical whiteners to pH fluctuations and low cost of whitening as the optical whitener is applied only to the surface unlike wet end addition where it is lost in the thickness of the sheet.

A process that is used more and more and is somewhat different than regular calender colouring is the application of a fluorecent whitening agent to the surface of the paper or board at the size press or the calender stack. The use of this material is somewhat similar to calender colouring except that the object is to produce a brighter white paper sheet instead of a coloured one and the quantity of optical whitening agent used much less than the dyes used in surface colouring. For reasan of economy, it is desirable to keep these products on surface. That is why it is advisable that they are used with sodium alginate and hydrolysed starch etc.

General Formulations :

High degree of solubility of these products in water is desirable and hence it is advisable to select a product that possesses good solubility in water.

In case of size press application to produce high degree of optical brightness (both sides) :—

400–500 liters of 3% thin boiling starch solution.

3–5 kgs. of SupraWite 2BL Conc or any other equivalent whitener.

In case of calender application on one side to produce moderate degree of optical brightness on carton stock or other grades of paper :

400-500 liters of 1.5% thin boiling starch solution.

5 kgs. of Suprawite 2BL Conc. or any other equivalent whitener.

In case of calender treatment, about 450–500 gms. of Suprawite 2BL Conc. is consumed per tonne of finished paper. It is, however, obvious that the quantity of solution applied to paper will govern the quantity of optical whitener to be used. The optical whiteners can be applied in any type of equipment suitable for applying aqueous solutions.

There has been a latest development at the laboratory stage. In case of White Duplex or Mill Boards for achieving better varishability, the following formulation can be adopted.

For 100 liters of sizing liquid make two solutions.

(1) Royal Finol 260 Solution :

Take 1 kg. of ROYAL FINOL 261. Add 10 lit. warm water gradually with stirring. Add 40 lit. cold water and mix well.

(2) Starch Solution :

Take 4 kgs of Thin boiling starch.
Cook in 20 lit. of water.

Dilute with 30 lit. of cold solution of 1–1.25 kgs. of Suprawite 2BL CONC or any equivalent optical whitener.

Mix solutions 1 & 2 after sieving through a fine cloth or wire mesh.

The above formulations have given encouraging results at the laboratory scale and the author expects similar results at the plant scale too. It is felt that the system can work satisfactorily at slow machine speed facilitating uniform application of colours/whiteners, resulting in an uniform quality over a longer period. Process adjustments, if any, can easily be made. However, the extent of success will depend upon the condition of the calenders which should be maintained in perfect condition with proper setting of doctors. Besides, a carefully controlled moisture profile in paper is desired for uniform and even absorption of colours/whiteners etc. With regard to size press application, no major problem is envisaged. However, plant trails, yet to be undertaken will confirm the findings and also expose us to the process problems, if any.