

MANUFACTURE OF COLOR PAPERS IN HIGH SPEED TWIN WIRE FOREMER WITH PIGMENT DYE – AN EXPERIENCE

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Article Received on 25/02/2016

Article Revised on 16/03/2016

Article Accepted on 07/04/2016

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ABSTRACT

Production of writing and printing paper of different shades like bluish, reddish, half white, pearl white, ivory white and natural shades are more of a norm than an exception in paper machine. Dyes used to get these shades are either direct, acid dye or pigment dyes. Except for

pigment dyes all the dyes are used to give high depth colour in the effluent and slowly phasing out from the use. Pigment dyes filled this place. Pigment dyes give much more appeal and good shade and it delays aging of paper. Pigment dyes reduce the effluent load of colour.

KEYWORDS: Acid dye, direct dye, pigment dyes machine production, finished production, finishing loss, concentration of dyes and soap stone powder (Talcum). Sizing chemical AKD, ATC & RDA.

INTRODUCTION

Paper is produced in white or shaded close to white colour in large quantity depending upon the end user requirement. The change from one shaded colour to another shade is very minimum and rejection is practically did not happen. Due to the closeness of the shade it is not as prominent as problem when changing from one shade to another.

Colour papers consist of deep depth shade like, blue, azure, green, yellow and pink. Colour papers are not made in high speed and high width machine, over 450 meters per minute. This was not tried in twin wire former.

In twin wire former machine, colour paper is produced in Mysore Paper Mills Limited, with following condition

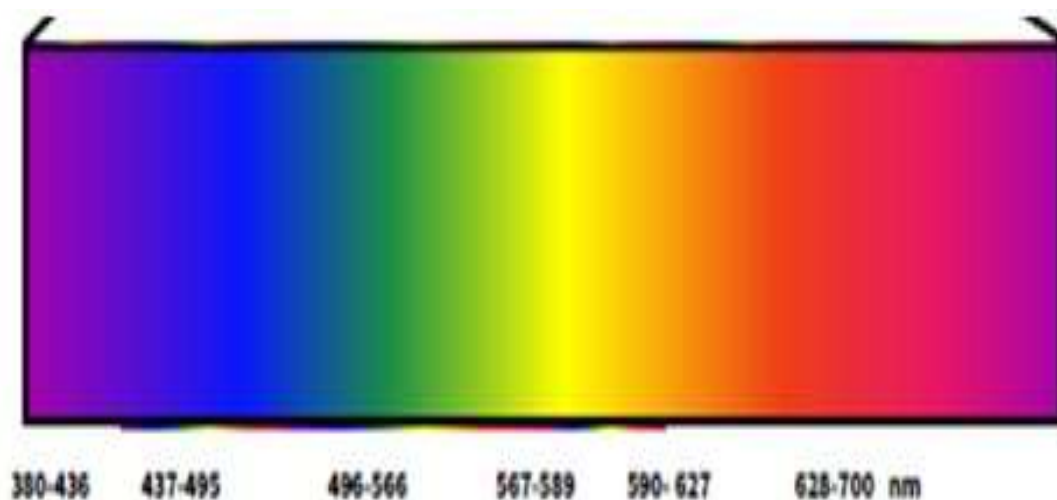
1. Pigment dye of blue, green, yellow and red is used.
2. Alkaline sizing is used from conventional acid sizing. (Water resistance of paper)
3. Soap stone powder is used as filler.
4. Pulp brightness is kept at normal level of 75% ISO brightness
5. Moisture of paper kept at 4.5%

The colour paper was tried for first time in twin wire former, the dye supplier was asked to depute their technical representative with sample dyes of different colour and asked to carry out laboratory test in the in house Laboratory of MPM to find the suitability of their dye and to arrive approximate consumption pattern for the pulp furnish in MPM in the ideal condition. The results were taken for bench mark in adjusting during machine trial run.

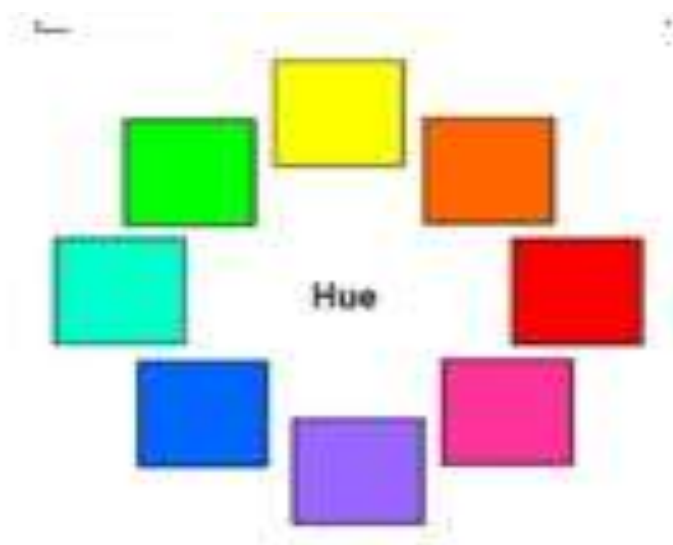
Colour paper made of normal dye used paper sample supplied by the paper customer was matched to the nearest shade and consumption of individual pigment dye value taken.

Two run of colour paper were produced in Paper Machine, in August 2015 and in September 2015. In the first instance colour sequence followed in order of Yellow, Azure, Green, Blue and Pink. This order has given lot of problem in adjusting the shade. As per the suggestion of dye supplier in the second run colour spectrum pattern was followed i.e Blue, Green, Yellow and Pink.

A simple colour spectrum is given below in the pattern of **VIBGYOR**



The hue cycle of colour spectrum is give a clear picture how the colour can be managed



In the first run in the Month of August 2015, the production in each colour gsm and pigment dye consumption is given below.

| Color Paper Production in Paper Machine in August - 2015 | | | | | |
|--|---------------|----------|------------------|-------------------------|----------------------|
| Color of Paper | Production MT | | Pigment Dye used | Dyes Consumption in kgs | Pigment Dye Kgs/ Ton |
| | Machine | Finished | | | |
| Yellow | 70 | 65.506 | Yellow | 420 | 6.41 |
| Azure | 14 | 12.459 | Green | 90 | 1.25 |
| Green | 62 | 59.544 | Green | | 1.4 |
| | | | Blue | 30 | 0.5 |
| Blue | 60 | 56.853 | Blue | | 1.51 |
| Pink | 151 | 143.667 | Pink | 210 | 3.69 |
| Total | 357 | 338.029 | | | |

The parameters achieved during the run in the August 2015 are given in below table.

| Shade | L | a | b | Brightness% ISO | Whiteness | Yellowness | Opacity |
|---------------|---------------|------------------|-----------------|-----------------|---------------|-------------------|---------------|
| Blue-47 | 80.9 - 81.05 | (-3.81 -4.83) | (-12.81 -13.89) | 70 – 71 | 101.6 - 130.3 | (-34.81 - -36.67) | 91.9 - 92.3 |
| Green-47 | 88.68 - 88.98 | (-15.92 - -17.6) | 4.93 - 5.57 | 55 – 59 | 36.3 - 38.29 | (-1.33 -4.24) | 91.03 - 92.39 |
| Yellow-47 | 88.7 - 90.5 | (-1.46 - 2.34) | 33.57 - 40.76 | 31 – 38 | * | 54.69 - 64.93 | 81.8 - 95.8 |
| Pink-47 | 74.30 - 74.86 | 26.62 - 27.15 | (-7.69 - 7.79) | 53 – 54 | 88.09 - 89.19 | 7.86 - 8.84 | 93.21 - 94.21 |
| Pink-60 | 73.5 | 24.89 | -9.27 | 52 | 95.5 | 1.89 | 97.1 |
| Pink-68 | 72.6 | 22.69 | -7.84 | 50 | 87.2 | 3.36 | 97.9 |
| Azure Wove-60 | 90.7 | -7.09 | 9.93 | 60.5 | 30 | 13.32 | 89.8 |

In the second run in the month of September 2015 the production in each colour gsm and pigment dye consumption is given below.

| Shade | Production MT | | Pigment dyes used | Dye used - kgs | Dye consumption - kgs/MT | |
|--------|---------------|----------|-------------------|----------------|--------------------------|------|
| | Machine | Finished | | | | |
| Blue | 160 | 140.671 | Blue | 270 | 1.92 | |
| Green | 149 | 134.077 | Blue | 210 | 1.57 | 2.91 |
| | | | Green | 180 | 1.34 | |
| Yellow | 306 | 291.624 | Yellow | 2040 | 6.99 | |
| Pink | 327 | 308.72 | Pink | 990 | 3.25 | |

The parameters achieved during the run in the August 2015 are given in below table.

| Shade | L | a | b | Brightness -% ISO | Whitness | Yellowness | Opacity |
|-----------|---------------|----------------|-----------------|-------------------|-----------------|-----------------|---------------|
| Blue-47 | 83.1 - 87.74 | -7.69 - -8.76 | -14.43 - -17.63 | 79 - 84 | 137.48 - 152.58 | -39.72 - -49.29 | 87.89 - 90.75 |
| Blue-68 | 83.71 | -8.97 | -15.48 | 82 | 141.87 | -43.97 | 97.54 |
| Green-47 | 81.5 - 81.88 | -15.48 - -17.9 | -0.73 - -0.95 | 60 - 62 | 63.45 - 67.78 | -14.54 - -16.42 | 89.22 - 94.56 |
| Green-68 | 81.88 | -17.03 | -0.73 | 61 | 63.47 | -15.94 | 96.61 |
| Green-75 | 84.47 | -13.69 | -1.38 | 65 | 71.67 | -14.28 | 96.65 |
| Yellow-47 | 87.16 - 88.88 | -3.54 - -4.61 | 33.08 - 43.59 | 31 - 42 | * | 57.01 - 67.27 | 84.1 - 89.49 |
| Yellow-68 | 89.65 - 89.69 | -4.1 - -4.42 | 33.96 - 34.1 | 38 - 39 | * | 53.4 - 53.82 | 91.81 - 92.88 |
| Yellow-75 | 88.98 | -4.01 | 34.38 | 38 | * | 54.57 | 93.67 |
| Pink-47 | 71.22 - 75.59 | 24.27 - 29.91 | -1.44 - -2.54 | 43 - 50 | 51.43 - 61.8 | 23.15 - 30.48 | 91.64 - 97.61 |
| Pink-68 | 74.51 | 28.37 | -3.2 | 50 | 65 | 21.19 | 96.25 |
| Pink-75 | 75.51 | 26.54 | -3.55 | 52 | 68.22 | 18.12 | 97.11 |

For the production of colour paper, normal furnish used for writing and printing paper was maintained. Optical brightening agent (OBA) was stopped as brightness in colour paper is not a requirement.

Dye Preparation

For shading of white paper, concentration of pigment dye used is around 1 to 2 gpl of pigment blue and pigment violet. For the colour paper yellow colour concentration is kept at 25 to 30 gpl, remaining blue, green, and pink kept at 20 to 25 gpl to get the required shade and colour.

The major advantages of using Pigment dye in different colour is

1. Good Fastness in colour and appeal.
2. Paper machine drain effluent is not stained with the dye.
3. Effluent load in terms of colour is less.
4. Shade was matched in short time and stability thereafter was good.

The major disadvantage of making colour paper in big machine

1. The quantity of water used in the system is huge all the water to be stained with pigment dye before getting the required / accepted shade.
2. Dye consumption in each shade is more compared to small machine.
3. After every colour paper is produced, the system need to drained and cleaned to get the next shade, which is time consuming and down time of machine.
4. Changing of colour in the machine running is totally not possible, as the shade will not be arrived even after 4 to 5 hours of run.
5. Usage of broke back into the system of one colour another colour is a problem and it affects the next shade
6. Alkaline sizing of paper has given good result achieving required level of COBB value but to the higher usage of sizing chemicals.
7. Achieving the regular brightness of white paper to value of 87 to 90 % ISO brightness is a problem after the colour paper production in machine.
8. The achieve the required brightness and shade of white paper after colour paper, it has taken 6 to 8 hours.
9. Change over period marketable different quality of paper is thought of to reduce the rejection of paper production.

CONCLUSION

Production of small quantity of colour paper in huge paper machine is not suggested. However, large quantity of single colour spreading over to one time of fifteen days time will be viable in controlling colour shade and usage of broke back into the system. The colour pattern followed should be strictly as per colour spectrum only to get the required shade at short span of time. Pigment dye consumption also likely to be less if the run of the machine long one. The dye of single colour in each one is followed except of green colour where green along with blue is used to get the acceptable shade of customer's requirement. There is no marked change in the paper strength, optical and surface properties of paper.

ACKNOWLEDGEMENT

I would like to thank the management for permitting me to publish the article and thank all those who helped me in preparation of this article.

ABBREVIATION USED

AKD – Alkyl Ketene Dimer

ATC – Anionic Trash Catcher

RDA - Retention Drainage Aid

COBB – Check for paper water repellence

ISO – International Standard Organisation

LITERATURE

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