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EFFECT OF INK SEQUENCE ON DENSITY OF SHEET-FED OFFSET PRINTING INK

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Abstract: ***The aim of this paper is to explain the variation in the density of different colors in different ink sequence. The sequence of colors is very important for the print quality in the sheet fed offset. While CMYK and KCMY are the standardized sequences for offset lithography but there is possibilities of printing work carried out by five different color sequences namely CMYK, MYCK, YMCK, KCMY and KYMC. In order to identify the effect of ink sequence in sheet fed print quality, a master is prepared and printing is done in the local printing press of repute. Our aim is to find the effect of different ink sequence in printing and further to choose best out of them.***

I. INTRODUCTION

Ink sequence is the concept in which the process color inks are printed consecutively in the four-color printing process. It is also referred to as the Ink lay down Sequence. In four color printing, Cyan, Magenta, Yellow and Black inks are printed on the paper in very thin layers approx. (2-4 micron). Most of the press operators establish and maintain strict sequences for printing each of the colors at their establishments. The sequence is very important due to several practical reasons. Many printers prefer a substandard printing sequence of Black(K) ink in the first printing unit, Cyan(C) in the second printing unit, Magenta(M) in the third and Yellow(Y) in the fourth printing unit. In another system, Black(K) ink from the first printing unit is shifted to the fourth printing unit, if the press operator requires a high coverage of Black(K) ink. By study, it is found that ink sequence play a crucial role in achieving print quality in Flexography as discussed by Sachi Patel in her thesis. She determined the effect of ink sequence for process colos in Flexography. Out of the five sequences that were tested, no one sequence was better than another in all sequences. Out of the five sequences, four sequences (CMYK, YMCK, KYMC And MYCK) produced moire-like pattern in shadow or heavy ink coverage regions that uses Black and Cyan inks, while KCMY was the only sequence that trapped well and did not produce any moiré-like pattern. Therefore, in Offset Printing process also, the ink sequence can significantly affect print quality on different substrates. By studying different literatures we came to this conclusion that we will examine the effect of different ink sequences on print quality in Sheet-fed Offset printing on Art paper.

Mathematically, by using four process colors (Cyan, Magenta, Yellow, and Black), 24 different ink sequences are possible. In

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this study, five of these 24 sequences are tested. Opinions of four industry experts were taken about the sequence predominantly used by them for printing process colors. The next two sequences were selected based on this informal survey; they are YMCK and MYCK. The other two sequences (CMYK and KCMY) were selected because they are the standard sequences for offset lithography; hence, they were selected to make a comparison between the two processes. The fifth sequence, KYMC, was selected, as it was one of the two sequences suggested by the first, the other was YMCK. The order in which the press run was performed YMCK, MYCK, CMYK, KCMY, and KYMC, with the printing units interchanged to change the sequence of inks.

II. RESEARCH METHODOLOGY

For this study, first of all a suitable master was prepared. The printing work was carried out in Dora Offset Printing Press, Hisar. The press conditions were set. The design of master is such as in which the value of density and other values can be measured easily in effective way. After preparing the master, plate was prepared and then we took prints with five different sequences (CMYK, MYCK, YMCK, KCMY and KYMC) on Art Paper. Then the density of different samples were measured with the help of densitometer and this data are analyzed with suitable statistical, quantitative methods and tools.

Data collection & Analysis

In the printing industry the value of density plays an important role. Here, the data of density was measured, it is found that the value of density of violet color is lower in all (five) the ink sequences. No more variation can be seen in the value of density of violet color with different ink sequences. The density value of red is higher in YMCK sequence at 100%.

The density value of Red, Green and Orange shows some variation with different ink sequences. On the other hand Blue, Brown, Violet and Purple does not show more variation in the density. So, in this way, it is find that Blue, Brown and Violet color has no more effect with different ink sequences and Red, Green & Orange color shows variation in density with different color sequence.

Color	CMYK	MYCK	YMCK	KCMY	KYMC
Red	1.2	1.31	1.74	1.62	1.57
Green	1.21	1.19	1.56	1.52	1.45
Blue	1.38	1.4	1.5	1.59	1.41
Brown	0.57	0.59	0.73	0.7	0.68
Violet	0.3	0.38	0.38	0.43	0.31
Orange	1.27	1.25	1.63	1.58	1.53
Purple	0.85	0.92	1	1.09	0.76

Table 1.Density value at 100%

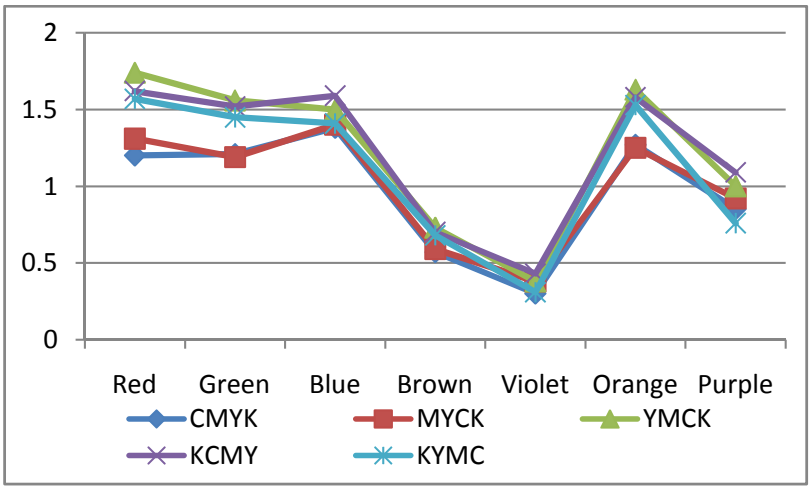

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Fig.- 1, Density value at 100%

Color	CMYK	MYCK	YMCK	KCMY	KYMC
Red	0.57	0.61	0.82	0.73	0.62
Green	0.42	0.39	0.68	0.51	0.53
Blue	0.61	0.62	0.67	0.7	0.62
Brown	0.27	0.24	0.31	0.36	0.3
Violet	0.18	0.2	0.17	0.19	0.19
Orange	0.51	0.56	0.79	0.71	0.66
Purple	0.39	0.44	0.49	0.42	0.37

Table 2.Density value at 70%

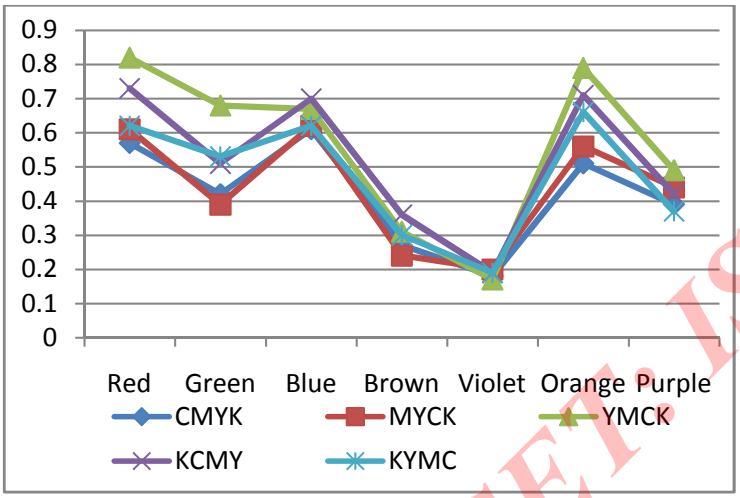

Fig.- 2, Density value at 70%

Color	CMYK	MYCK	YMCK	KCMY	KYMC
Red	0.19	0.19	0.23	0.23	0.21
Green	0.13	0.11	0.18	0.2	0.18
Blue	0.18	0.2	0.19	0.21	0.2
Brown	0.09	0.1	0.11	0.08	0.11
Violet	0.06	0.08	0.07	0.06	0.06
Orange	0.13	0.14	0.17	0.17	0.15
Purple	0.11	0.12	0.18	0.14	0.13

Table 3.Density value at 15%

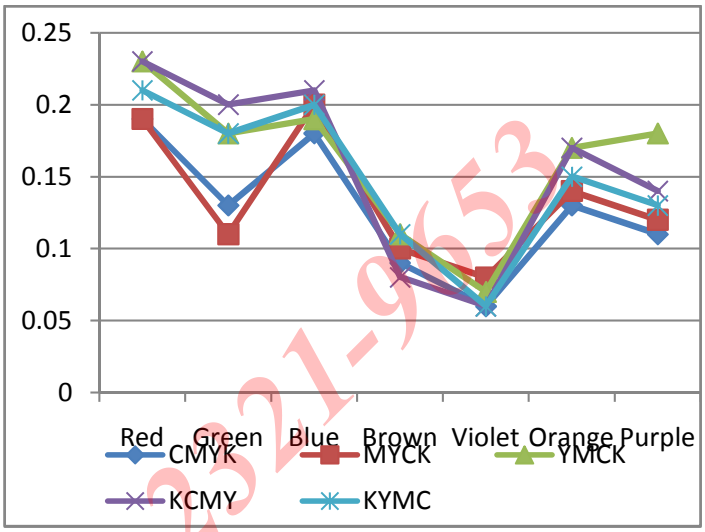

Fig.- 3, Density value at 15%

Result & Conclusion

By this study, we find out that there are no more variations in the density value of Blue, Brown and Violet color with different ink sequence as shown in fig- 1, 2 and 3. It is find out that if there is need of higher density value of Red then, the YMCK ink sequence and for lower density CMYK ink sequence can be to be used. For the higher density value of Green, the YMCK sequence and for lower density MYCK sequence will have used. The same way for higher density of Orange YMCK sequence will have to be used and for lower density CMYK ink sequence. YMCK is best out these five sequence found in this study as compared to other with reference to density.

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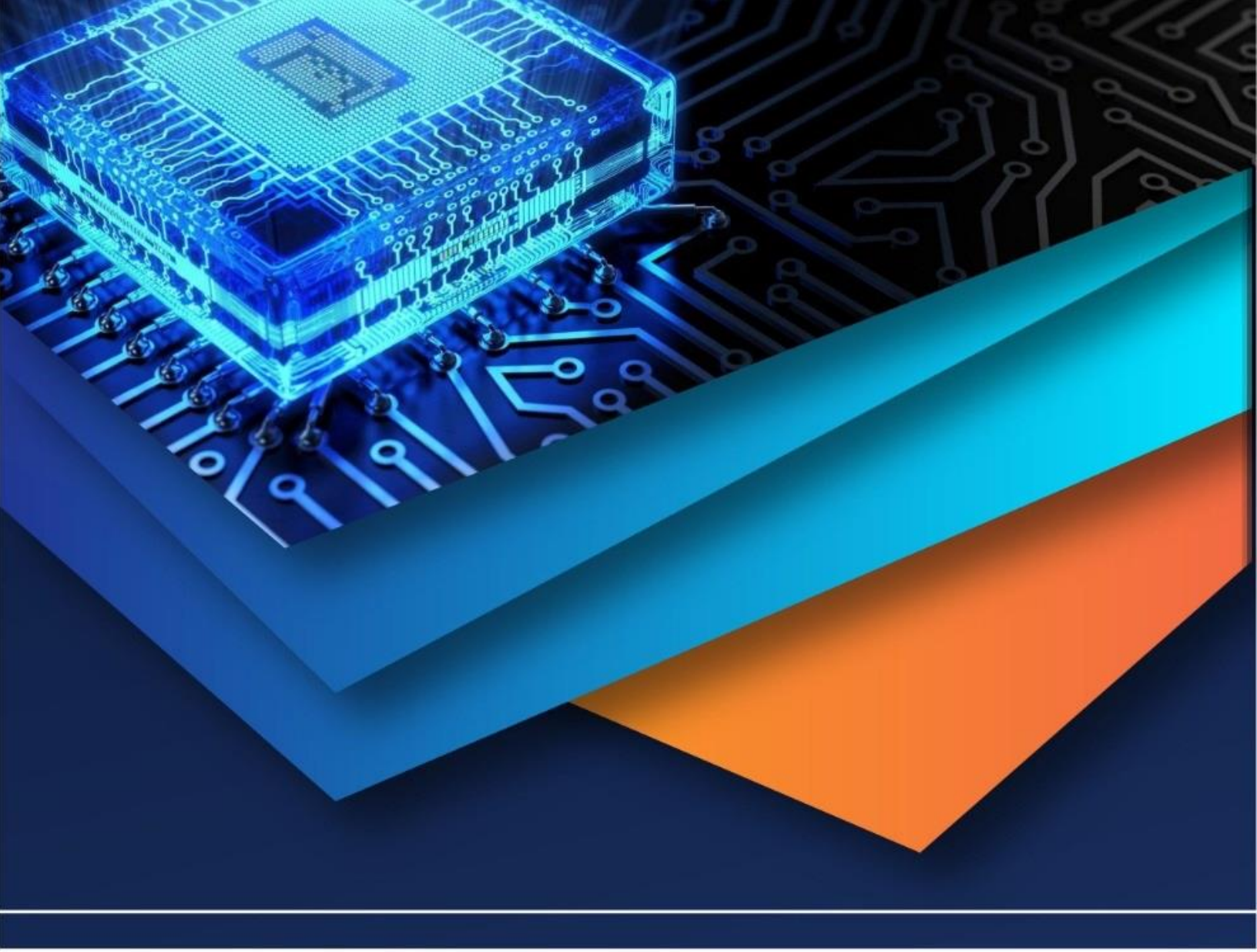

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