Solution of Dot Gain for Conical Object Printing in Dry Offset

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The present paper discusses about the problems of dot gain and its solution based on the study persued for printing on surface of the conical jobs like cups made up of plastic substrates. The surface of object is made parallel with the blanket cylinder with even pressure, but due to different circumferential speed and circumferential coverage. The image dots are transferred differently at each circle of the conical surface. Therefore, the whole circumferential area of the conical object can be divided in to three main segments i.e., upper and bottom area with high dot gain and middle area with slight dot gain which is totally different than any of the normal printing where cylinders are used to transfer the image on flat substrates or on cylindrical surface. The readings shown here in the graph reflects problem of high dot gain in the dry offset for conical jobs which makes balancing of extreme highlight and extreme shadow areas very difficult, therefore the highlight end of the gray scale can be achieved with lighter ink flow and the mid tone to shadow range of the gray scale can run with slightly darker ink flow on separate plates of Black for dot gain control and quality print on conical object.

1. Introduction

Dry offset uses features of the raised surface plate of letterpress and the rubber blanket of offset lithography. In this all the colors are transferred consecutively from raised plates onto a common impression blanket and then printed on the object in one pass.

In case of printing of conical shape hollow object like long cups on dry offset, the main reason of dot gain and its variation in different areas of object to be printed is due to different circumferential speed of object mounted on mandrel and difference between the area of image on blanket and on the print (shown in Fig.1) caused by necessity of unparallel/ angular positioning of blanket cylinder and mandrel. Apart from this the dot gain is also affected by the substrate of object, nature of photo polymer plate. This paper presents the result of dot gain at different positions of the plastic cups printed on dry offset.

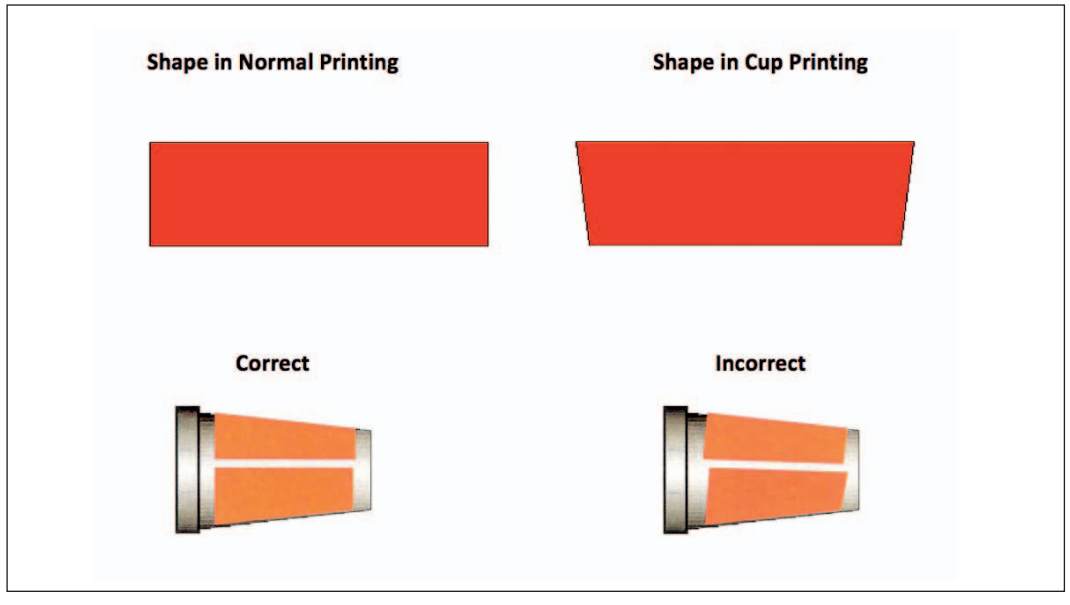

Figure 1: Change of shape in cup printing and stretched incorrect print on cup mountedon Mandrel

2. Materials and Methods

This study is carried out during the dry offset training at Sanden, North America, Kansas center for pre-press and print training on dry offset printing machine Master Color II of Minor Technologies and using X Rite Spectrodensitometer 500 series with Zeller Gmelin UV ink, for carrying this study a standard plate having the various dot percentage 0% – 100% with the interval of 2,3,5 and 10% for the highlight, middle and shadow dots was prepared at 120 line screen, for the best and detail results the printing of samples were planned in three different conditions – first, maximum pressure and maximum ink run; second, minimum pressure and medium ink run and third, minimum pressure and minimum ink run. The feeder belt set properly as per the job size the feeder timings, rotation of cups in front of flamers and exposes to UV lamps was also set accurately for the proper rotation of cups at the time of image transfer the shafts of the mandrels was chosen of appropriate size and the bearings of mandrel were replaced by new one and the mandrels with nearly zero deviations were set for smooth impression with the help of dial gauge.

Form roller pressure were set with1/8 inch stripe on the bearer line and across the image areas of the plate. Ink fountains were filled and checked for plate match and ink flow was set to minimum.

Blanket pressure was set by disengaging plate cylinder to the "off" or "no print" position and plate pressure decreased until there is no image printing on the blanket and then slowly plate pressure added until the entire image get printed on all blankets for minimum pressure setting.

All blankets checked for even thickness and ensured that they do not have variance of ± 0.0005 inch between all blankets and mounted first bottom blanket, using the edge of the blanket cylinder as a guide to keep blanket straight and top blankets separately.

The printing hood of machine was set exactly following the centerline of the print, mandrel and blanket. The most critical setting was made to make taper mandrel with mounted cup making parallel with blanket cylinder for even transfer of ink film on each and every point on the cup. The black ink was used for the job and a selected stock of cups was reserved for the test prints and results obtained from analysis of table & graphs prepared from different readings are suggested for minimizing and compensating the dot gain problem related with such jobs in dry offset printing. IPA is selected to use for cleaning the blanket for its better quality.

3. Dot Gain in different areas of cup

Dot gain on the rigid taper container can be seen over all very high and variably on the top and bottom portions, high to low in middle portions as recorded in the following table:

Actual dot %	Maximum pressure and maximum ink run			Minimum pressure and medium ink run			Minimum pressure and minimum ink run		
	Dot gain Top Portion	Dot gain Middle Portion	Dot gain Bottom Portion	Dot gain Top Portion	Dot gain Middle Portion	Dot gain Bottom Portion	Dot gain Top Portion	Dot gain Middle Portion	Dot gain Bottom Portion
2	51	37	50	22	17	21	19	15	20
5	52	42	58	25	18	27	21	16	24
10	63	45	64	31	18	30	26	18	25
20	76	58	81	44	26	42	34	24	34
30	94	73	SOLID	56	34	51	43	30	41
40	SOLID	SOLID	SOLID	68	44	65	52	34	47
50	SOLID	SOLID	SOLID	85	57	85	61	44	60
60	SOLID	SOLID	SOLID	94	65	92	70	48	70
70	SOLID	SOLID	SOLID	SOLID	71	SOLID	74	53	72
80	SOLID	SOLID	SOLID	SOLID	84	SOLID	78	58	79
90	SOLID	SOLID	SOLID	SOLID	95	SOLID	84	60	82
95	SOLID	SOLID	SOLID	SOLID	99	SOLID	96	64	88
100	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	71	SOLID

This graph shows high dot gain on top bottom and middle portions:

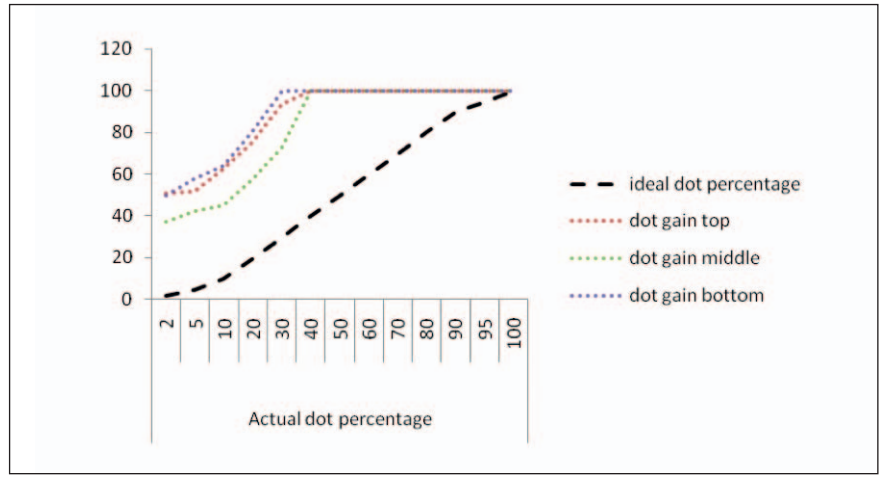

Figure 2: Maximum pressure and maximum ink run

This graph shows high dot gain on top and bottom portions and normal in middle portion:

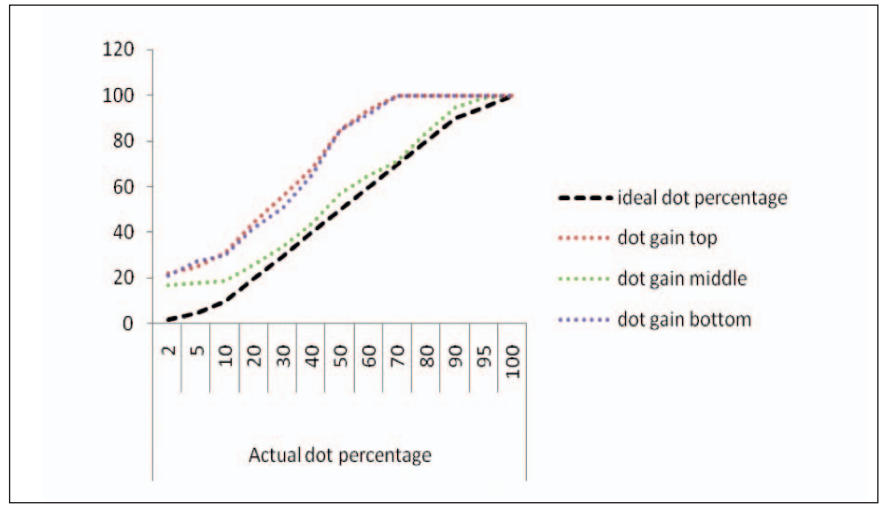

Figure 3: Minimum pressure and medium ink run

This graph shows high dot gain in 2-80% region and dot loss in above 80% region for top and bottom portions but in case of middle portion dot gain in 2-30% region and dot loss in above 30% region:

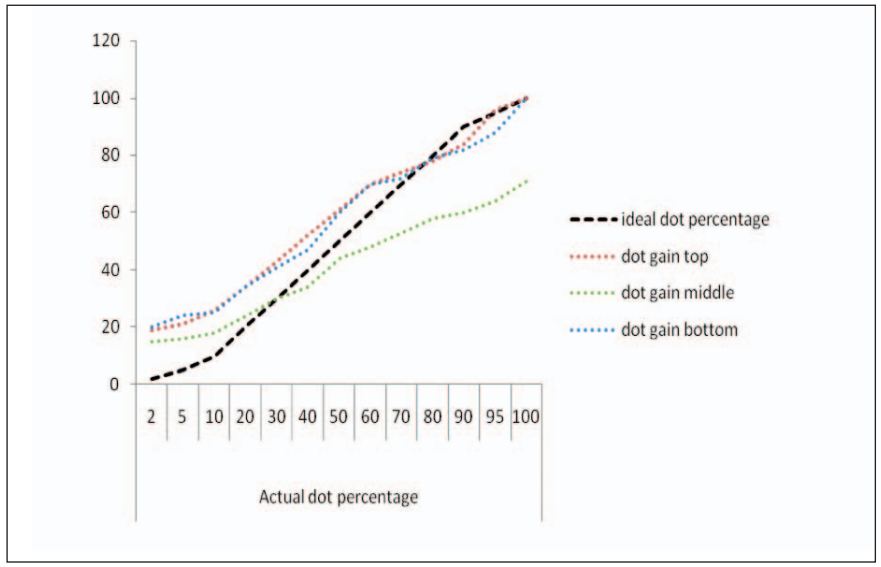

Figure 4: Minimum pressure and minimum ink run

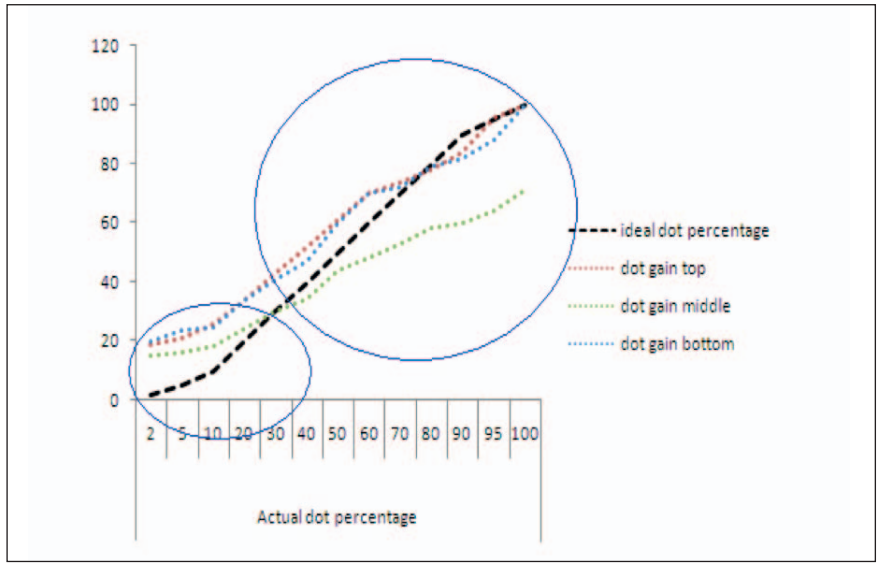

Figure 5: Minimum pressure and minimum ink run with circle

After analyzing the all three graphs it is observed that

1. The dot gain is very high in top and bottom areas of the cup.
2. The dot gain is high in middle portion of cup in first two cases.
3. The dot loss in the middle portion in case of minimum pressure and minimum ink flow and close to ideal in top and bottom portions.
4. Minimum pressure and little more than minimum ink flow is the key for obtaining best possible results for printing on cups by dry offset. This also saves the cost of excesses ink and increases the plate run along with quality.
5. In third case which is more suitable the dot gain problem of shadow areas and highlight areas can be compensated up to maximum extent by using separate highlight and shadow plates and especially in case of black.

4. Conclusion

The conical object is made parallel with the blanket cylinder with even pressure, but due to different circumferential speed and circumferential coverage. The image dots are printed / transferred differently at each circular line of the conical surface. Therefore the whole circumferential area of the conical object/cup can be divided in to three main segments i.e., upper and bottom area with high dot gain and middle area with slight dot gain which is totally different and difficult situation than any of the normal printing where cylinders are used to transfer the image on flat substrates or on cylindrical surface. The readings shown here in the table and graphs reflects the problem and suggests the solution of high dot gain in the dry offset printing for conical jobs with minimum pressure and minimum ink run.

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