WHERE STANDS STANDARDIZATION FOR SHEETFED?

A Study of Practices and Attitudes
of Sheetfed Commercial Printers in the West

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Abstract: The results of a study of leading commercial sheetfed offset printers in the Western United States is reported. The study investigated to what degree standardization of printing variables currently exists, if any, in this industry segment and the approaches used for standardization.

An investigation of the level of communication between pressroom and color separation departments is included. An opinion survey of printing company owners and managers as to the advisability of standardization of sheetfed offset and its potential impact upon their competitive position is included.

The introduction, acceptance, utilization, and owner satisfaction of sheetfed automated press controls and computer assisted quality controls is reported.

Introduction

The Graphic Communication degree program at Cal Poly includes techno-management courses such as sheetfed offset lithography and the control of its quality. This study was performed for the purpose of dissemination of the results to the industry and to support both the undergraduate program at Cal Poly and the seminars, conferences and workshops offered to those in the industry.

A group of about fifty sheetfed commercial printers were selected who had a reputation for producing excellent and consistent color printing. Printers were chosen by the recommendations of graphic arts suppliers, manufacturers and also other printers.

Allied with the question of standardization is the question of communication between printer and color separator; what kind of information is flowing, how much, and in which direction. The opinions of sheetfed printers as to whether or not standardization would be a benefit to the industry and its customers should

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be of interest to both the technical associations and the suppliers to the industry.

The utilization of automated or computerized press controls by the companies was investigated. Perhaps even more important, the acceptance levels by printing plant personnel was investigated for implications in the areas of training and education.

Findings

The majority of the plants in the study have annual sales in the $5-10 million range and have 20-50 employees. The typical printed product for these plants is high quality color printing that includes annual reports, catalogs, advertising and poster work in the commercial segment.

The equipment profile (Figure 1) consists of a profusion of multicolor presses currently in these printing plants. Nearly 20 percent of all the presses observed are in the configuration of a six color 40" or 41" press of German or Japanese manufacture. Of those six color presses, 86 percent were equipped with a press remote control console, 50 percent with a computer aided quality console, and 64 percent had a plate scanner supporting the press somewhere in the plant.

The next most frequent configurations found are the two color versions of the 40" and 28" presses, then the 28" six color presses, and fewer but equal numbers of four color versions of 40", 28", and 25" machines. Continuous dampeners were found on 40 percent of all presses and IR dryers were installed on over 30 percent of the presses.

Process Controls and Quality Controls

All of the plants visited have densitometers in the pressroom, these having become a routinely accepted piece of control equipment. Out of a hypothetical sample of 100 densitometers 55 of them would be of the manual type only capable of reading reflected density, while 38 would be an instrument with a program to calculate and display several print quality aspects. Only seven of those 100 would be of the scanning type of densitometer interfaced with a computer for more complete measurement and reporting. Of those seven only one was a stand alone unit, the others being wired to a press console.

It was encouraging to find the high incidence of color viewing booths with 5000°K lighting in the pressroom and/or in a customer service area. Ninety two percent of the plants had controlled lighting with an average of 3.4 booths per plant. One printer went so far as to equip the entire pressroom with 5000°K lighting and another stated the entire plant was 5000°K.

By contrast, there are a very discouraging number of printers who make film duplicates of their press color bars, nearly 60 percent. When I am done figuratively shaking my finger in admonition at these people, I must then contemplate why this percentage appears so high. The majority of printers, it

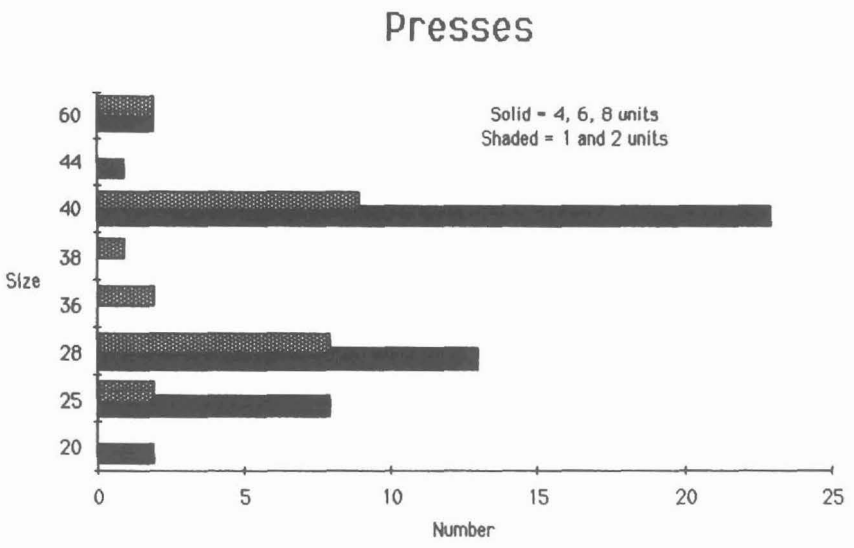
Presses
Solid = 4, 6, 8 units
Shaded = 1 and 2 units
Size
60
44
40
38
36
28
25
20
0
5
10
15
20
25
Number

Figure 1

seems, are concentrating on the measurement and control of solid ink density, as they have been taught over the years and as their customers demand, occasionally the trapping and little else during the actual production run. Other variables, dot gain, etc., would only be considered when a stubborn matching problem occurs. The film duplication of the solid printing patches therefore is considered adequate. The justification is often that the prep department personnel rightfully claim they can duplicate film "dot for dot." Unfortunately the duplicating materials and procedures available to prep departments are not intended to hold the degree of resolution required for these targets which is of course many times greater than a halftone dot.

Sometimes this duplicating is encouraged simply as a convenience when composite negatives are made that include the control bars. Or on occasion, printers make their own custom color control bars. There is little evidence this duplicating is done to save the small costs of purchasing original color bars.

My concern is that the printing managers do not consider it important enough to preserve the accuracy of the process controls in the original film. There were some managers interviewed that believed deeply in the value of the application of science to offset printing or "printing by the numbers" as it is sometimes referred to. However, I also encountered some managers that seemed frightened by the information revealed in printed control devices and preferred not to know.

The color bars most frequently observed during the survey are equally divided between GATF[1] and System Brunner[2]. This balance represents, I believe, a decision on the part of printers to introduce a higher level of science for the control of color reproduction than they had previously used.

Color bars and densitometers are being used mostly as backups to the press operator for diagnostics when the color cannot be matched. Generally the operators are measuring density on less than 100 percent, perhaps as few as 50 percent, of the sheets pulled for inspection and virtually never measuring and quantifying any other press variable, i.e., gain or trap.

The responses to the question as to whether special test images have been printed to determine press characteristics are nearly equal between the DuPont/Brunner[3] and the Matchprint II[4] test forms.

Press analysis systems, such as those offered by several suppliers in addition to those mentioned, are receiving mixed reviews due, I believe, to the degree of readiness of a printer to utilize the data supplied.

The points that printers are proud of is their accuracy in color matching, consistency, and service to their customers. A frequently mentioned point was the ability to lay heavy ink films on a sheet to achieve color saturation, contrast, and the visual "punch" that pleases clients. The standards shown in Table 1 are based upon the results of the study and have been adopted for use in the Cal Poly press lab.

Table 1

IN-HOUSE COLOR PRINTING STANDARDS

Heidelberg Presses with CPC 2

Date: November 1986

		SOLID INK DENSITY			DOT GAIN		CONTRAST			TRAPPING %		TACK
					Mid tone	3/4 tone	3/4 tone -- 80%					@
		Lower limit	STANDARD	Upper limit	40% tint	80% tint	Lower limit	Standard	Upper limit			1200 RPM
	black	1.85	1.90	1.95	20% ± 3	11% ± 2	49	55	61	M+Y	85	16
Gloss	cyan	1.45	1.50	1.55	20% ± 3	11% ± 2	39	45	51	C+Y	85	15
Coated	magenta	1.40	1.45	1.50	20% ± 3	11% ± 2	36	42	48	C+M	85	14
	yellow	1.15	1.20	1.25	20% ± 3	11% ± 2	24	30	36	C+M+Y	75-65	12
	black	1.70	1.75	1.80	20% ± 3	11% ± 2	44	50	56	M+Y	85	16
Dull	cyan	1.35	1.40	1.45	20% ± 3	11% ± 2	36	42	48	C+Y	85	15
Coated	magenta	1.30	1.35	1.40	20% ± 3	11% ± 2	34	40	46	C+M	85	14
	yellow	1.05	1.10	1.15	20% ± 3	11% ± 2	24	29	34	C+M+Y	75-65	12
	black	1.15	1.20	1.25	24% ±3	13% ± 2	24	30	36	M+Y	85	16
Uncoated	cyan	1.05	1.10	1.15	24% ±3	13% ± 2	22	28	34	C+Y	85	15
Offset	magenta	1.00	1.05	1.10	24% ±3	13% ± 2	21	27	33	C+M	85	14
	yellow	0.95	1.00	1.05	24% ±3	13% ± 2	18	23	28	C+M+Y	75-65	12

HUE ERROR	
printed as 1 color	
cyan	15-25
magenta	40-50
yellow	3-7
HUE ERROR	
when overprinted	
M + Y	75-100
C + Y	75-100
C + M	45-65

GRAYNESS	
printed as 1 color	
cyan	7-11
mag	2-5
yellow	0-3
GRAYNESS	
when overprinted	
M + Y	0-6
C + Y	26-38
C + M	30-45

Color bars: Heidelberg CPC

Standard sequence: B-C-M-Y

Standard plate exposure:

Degree of Standardization

Sheetfed commercial printers are aware of the lack of standard specifications and appear to be seeking some guidelines or standards. They may even welcome such standards as they are being pushed into more consistent and predictable color by (1) their customers, (2) the awareness of such standards due to the emphasis given the subject by trade magazines and seminars. This possible acceptance may be in part due to the myriad selections available to a commercial printer in equipment, materials and techniques, complicating not only the choices available but also thwarting many attempts at standardization.

Specifications for sheetfed color printing, when used, are most often internally generated in printing plants. These are initially set through inquiries of their color separator followed by a program of experimentation to find the combination that seems to work. This is opposed to the standards being generated by a technical association, an outside consultant or seminar or other outside source. The specifications referred to here are those to which a press is made ready in preparation for a press check even though a client may or may not change the specs (densities) for the production run.

The second most popular source for standards was the adoption by sheetfed printers of the SWOP standards, the Specifications for Web Offset Publications. This was found to have occured in about one-third of the plants visited. It would not be surprising to find this adoption by sheetfed printers in a plant that has both web and sheet equipment operating side by side. What is surprising is the adoption of SWOP by a few exclusively sheetfed plants.

Paper choices are generally accepted from the customer specs with occasional advising against very inappropriate choices. One printer interviewed is willing to upgrade a job stock to a proven sheet and absorb the difference in cost in order to save press downtime due to problems of lesser quality paper. They come out ahead, they believe, in both dollars saved and improved scheduling efficiencies.

These printers routinely use a single vendor of process inks for their production but had a backup vendor if needed. Sixty two percent used a single source while 20 percent routinely used two sources of process ink and seven percent routinely used three sources. The criteria by which vendors were chosen are: 62 percent service and quality; 24 percent product consistency; seven percent frequency of quality problems; and only one printer used price as the criteria.

The sequence of color laydown used is K-C-M-Y in 85 percent of the plants. This choice was based on the desire to have heavy coverage last in the sequence and trapping considerations. Other reasons occasionally advanced were: tradition; published surveys; back trap contamination; sheet distortion; and the comment that "the inks came tacked that way."

Opinions Concerning Standardization

By a ratio of 2 to 1, the printers surveyed have favorable opinions about a set of nationwide color printing standards for sheetfed as being beneficial to printers and customers alike. The printers also believed the dissemination of standards, if attempted, should be from an existing and trusted printing industry organization as opposed to any newly formed printing group, or even a non-printing industry group. A governmental agency as the developer and disseminator received absolutely no support from the printers and on occasion a very vocal opposition to the possibility was volunteered.

Those who felt standardization was not a good idea for sheetfed based their objections on several points. The first being the perceived weakening of their individual market position in this very competitive industry segment. This point was uppermost in their minds. Commercial sheetfed litho plants often use their color reproduction capability as a marketing tool. A company may develop a trade name type of approach to a color printing system they have developed to meet the needs of customers in their service area. This system is then used in the promotional efforts of the company to enhance and maintain their competitive position.

The term standardization was often thought of as a system of "averages." Those printers who had, in their minds, optimized their color reproduction for their market were not favorably disposed to the suggestion of reducing their optimized methods to those of averages.

The second major objection to sheetfed standardization was the potential reduction of one of sheetfed's major attributes of versatility, such as the range of printed products, sheet sizes, substrates, etc. While other printing processes may perform superbly in one or more parameters of production such as longer runs, special substrates, etc., there are significant tradeoffs in those specialized situations. These printers believed that sheetfed would suffer from limitations they anticipated being imposed by standardization.

Two printers had adopted a double set of standards in a literal sense. If they were printing jobs that contained separations from multiple sources outside their plant they used a different set of standards than if they were printing a job in which they had total control inside their plant of the separation films.

The printers who favored standardization hedged a bit when asked if they would actually adopt such standards if established. The attitude I perceived was one that "standards are good for the other guy but not for me." Again, I have to remind myself that I had targeted those printers for this survey who had an excellent reputation for color work through their own diligence and I was not talking to the printer who had been thrust into a situation of being required to print critical color with little or no preparation.

Color Communication

Sixty eight percent of the printers obtained their color separations from an outside source.

Color communication seems to be transmitted from the separator to the printer as the separator became versant in the science of color much earlier than did the printer.

It is encouraging to see the number of instances where information is flowing in both directions between printer and separator concerning both pressroom and scanner capabilities.

Printers sometimes bring upon themselves a great deal of their own problems by blindly accepting what is told to them by the suppliers of either separations or ink as to what the printer should be running. I believe these supplier recommendations are made with good and honorable intentions of assisting the printers and are not as self-serving to the supplier as one might think. But the main problem, I believe, is that the supplier has considerably less opportunity to truly know the operating conditions in the individual printing plant and therefore the recommendations may be inappropriate. Only the printer is in the position to know the operating conditions, and often they do not, professing the lack of time due to production schedules as a reason for not knowing. The bottom line is that the printer must know the plant's operating conditions and become educated as to what is required--and that is not happening often enough.

Automated Press Controls

The introduction of computerized press controls in sheetfed pressrooms has met with mixed reactions. Management must approach this aspect of change effectively otherwise the automated controls are considered either as a threat to job security and/or a challenge to the judgement of the craftsman.

Those who have been promoted to head operator of an expensive multicolor printing press have relied over the years on their craftsmanship and intuitive judgement of what is required to achieve desired results. This person is likely to be of the age bracket where they are not members of the electronic revolution. They probably do not spend spare time playing video games, do not have a personal computer at home, and may not even have typing skills. Yet management places a computer console with keyboard in the pressroom for this person to learn to operate. The video screen displays for all to see the data concerning errors and deviations from standard. The computer never compliments the press operator when things are going well. Its messages tend to be negative in nature.

However, for those managers who did manage change well the automated controls cannot be taken from the press operator without a struggle, reminiscent of the similar sequence of events when densitometers were first introduced years

ago. This new equipment was first hated then loved by the press operators.

This investigation examined, among other things, whether or not the age of the pressroom personnel affected the acceptance level of these controls. The head press operator (defined as those responsible for maintaining press quality) were grouped into three age brackets. The average age was found to be low. Over 60 percent were under the age of 40, less than a third were middle aged, and only 8 percent could be considered as approaching senior citizen status. It is a young person's pressroom these days, due in great part to the physical requirements of operating these larger, faster presses.

Commercial printing is still in the transitional period between utilizing craftsmanship for color reproduction and the application of science in the printing process. We may be seeing the start of a trend of using machine tenders who will be less understanding of printing as an art than they are understanding of electronics, physics, chemistry, hydraulics, pneumatics as well as the mechanisms that today's operators well understand.

An example of a positive approach to the introduction of automated controls would be if such controls were instituted at one particular plant, the vice president of manufacturing believed the controls would be welcomed as merely one more tool to allow the craftsmen to do their job better. The creativity is not removed. He used the analogy of a concert pianist at the keyboard creating desired results. He advised keeping the open loop in the control system that includes the craftsman.

An example of a negative approach is the one in which a printer believed the more automation provided to a pressroom creates the feeling amongst the craftsmen that more judgment, i.e., craftsmanship, is being removed from the purvue of the operator.

Additional Observations

• Printers consider their most frequent problems encountered in color reproduction not to be that of color matching (only six percent of the responses), but instead 25 percent of the responses indicated unknowledgeable customers and sales personnel. Closely following these in descending order are: paper quality, image fit, the consistency of raw materials and consistency of internal production.

• A positive correlation may exist between the degree of color science applied in a plant and the length of time required to obtain a color OK during a press check. If the film is right when the job goes to the press the OKs are easily acquired as only the Author Alterations and rule-ups for position need to be checked. The times reported for press checks averaged 30 minutes with a range of 15 minutes to as high as 10 hours. The customer asks for changes in color balance more than 50 percent of the time while five percent perform color experimentation and art direction on the press according to the printers.

• Press checks. The inexperienced representatives of clients that spend hours checking press sheets may be afraid of accepting the responsibility of signing off a sheet representing many thousands of dollars of printing. Until such time as they have experimented with all possible combinations of densities and they finally feel comfortable that they cannot improve upon the printers' efforts, then they will approve the run. This is why so often the first press sheet offered by the printer is finally the one signed even after many changes, revisions and reversions. There are printers that have gone so far as to use the psychology of having the client feel useful and their trip to the pressroom justified by allowing them to find a hickey or two or a small misregister problem that was deliberately left for them to find. Otherwise, if the proof is made perfect and assuming the color is right, the client may drive everyone nuts by finding something irrelevant and very difficult to correct. There are also printers who prefer not to use this psychology on their clients.

• On-the-job training is the most popular technique for advancing experienced press operators for printing critical color work as it is used by over half of the plants visited. This is consistent with findings of the 1985 GATF study.[5] Not nearly so frequent are the inside training programs conducted by the plant's own staff. This usually consists of sharing information obtained at a seminar or meeting outside the plant.

Less than a third of the plants surveyed send their crews to seminars for specialized color training, and only then if offered in a nearby community. Even fewer send their people to multi-day workshops. The pressure of production scheduling to meet customer demands often prevents pulling crews from the line for training purposes. The popular notion that printers hire employees for their expertise, from wherever they can such as from other printers , was not strongly substantiated as less than 15 percent of the printers stated they hired people on that basis.

• Gray Component Replacement (GCR) separations. The heavy coverage aspect of the black printer suggests to some printers that black be run last in the sequence. Others state the black should be first down in order to print it the sharpest since most detail is in the black printer.

GCR does stabilize process printing by a lessened sensitivity to changes in ink film thickness and was judged therefore to be a benefit more to the web printers. Sheetfed printers consider GCR a detriment in that they cannot alter color balance significantly through changes in ink film thickness if so requested by the customer during a press check. That point does underline the necessity of standardization.

Summary

Standardization in the sheetfed segment is advancing slowly. Existing progress is primarily due to the efforts of individual printers who are interested in standardization. As a rule they are not being forced into standardization due to

market pressures. The communication of specifications seems to be flowing from the prepress area to the pressroom rather than the opposite direction. Sheetfed commercial printers are wary of standardization due to apprehension as to the effect upon their competitive positions. Automated and computer aided press quality controls may be ahead of their time in sheetfed pressrooms as commercial printers are generally not faced with customer demands for statistical quality control nor are they faced with extremely difficult process control.

References Cited

1. Compact Color Test Strip. Available from Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, PA 15213.

2. Print Control Strip. Available from System Brunner USA, Inc., 12 Harbor Lane, Rye, NY 10580.

3. E.I. DuPont DeNemours Co., Photo Products Dept., Chestnut Run, Wilmington, DE 19898.

4. 3M Printing Products Div., 3M Center, St. Paul, MN 55144.

5. "Education and Training in the Graphic Arts 1985-1990; The GATF Manpower Study". Techno-Economic Forecast No. 26. Pittsburgh: 1985. Graphic Arts Technical Foundation. Table 2-11.