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Quality techniques using existing printing equipment

Scope

The purpose of this Technical Information Paper is to identify management initiatives to maximize the performance of existing printing equipment. The process includes a commitment to (1) run at optimal performance, (2) provide adequate training, (3) set up procedures to evaluate print performance (process control), and (4) continuous improvement.

Safety precautions

Observe all safety rules with respect to the operation of any equipment. If liquid displacement volume measurements are performed on the anilox rolls when they are in the press “Lock Out Tag Out Procedures” must be followed.

Dedication/commitment

Obtaining the best quality printing possible using existing printing equipment can be achieved if the operations management and other personnel involved are properly educated in and committed to achieving excellence in the flexographic process. Often the focus is on doing something to improve results without an overall commitment to quality. This commitment must start from the top and be demonstrated in action as well as words. Frequently management is driven to improve quality or safety or some other concept because of some short term economic event, e.g., lost business, an OSHA fine, large customer return, lost time accidents etc. In response to this short term “emergency” management adopts the “program of the day.” To be successful in optimizing the performance of existing equipment, management must be committed to understanding the process capability and dedicated to the concept of continuous improvement. Budget restraints may prevent immediate implementation of recommended capital expenditures, but the process capability of existing equipment can be defined. Understanding the level of quality that can be practically achieved permits the creation of quality standards, and a directive to manufacture to the top end of the process capability. Simply stated, sell the best of what the equipment can produce. If management directs the sales force to sell within the capability of its printing process, the company will routinely meet customer expectations. As the limitations of the process become clear, enlist input from the press crews to identify changes that can further improve the process.

Education/training

Understanding and measuring critical performance parameters are essential to the control of a process. This begins through education/training that should include management, press crews, customers, art designers and system suppliers. Everyone in the manufacturing process must be committed to the idea of continuous improvement and have a desire to learn all they can about the system and their involvement in it. Quality is a combination of materials, equipment, personnel, methods and environment. Using the right equipment and materials make up a large portion of the output quality, but if personnel do not understand the equipment or the effect of the variables in the process, the quality of the output will be left to chance. An appropriately conducted training program can go a long way to ensure this

knowledge. Suppliers (press OEM, ink, plate, color separator, trade house, etc.), consultants or firms/industry organizations specializing in this process can be used as resources. Adequate time and facilities should be provided to maximize the learning experience. Teamwork between management, press operators, and suppliers is important to foster communications that, in turn, will benefit print performance. All team members should be encouraged to ask questions and challenge each other to improve the outcome. Once trained, personnel should be held accountable for the operations they are empowered to perform and rated against measurable standards. All team members should be familiar with the operational capabilities of the equipment they are responsible for using. If a buyer orders the wrong materials or a sales representative takes an order outside the process capability, the press crew will likely attempt to complete the order with less than a satisfactory outcome. Educate everyone regarding the process capability of the existing equipment. Remember, education is an ongoing process. Continually review and address issues through training.

Equipment

Before running a press characterization test such as a fingerprint trial, instruct appropriate personnel to service the printing press to ensure it is in good running order. All normal maintenance checks should be performed and the press cleaned. Cylinders should be measured to determine uniform surface circumference and in combination with cylinder bearings total indicated runout (TIR) should be within manufacturer's specifications. In addition bearing lift should be checked for all cylinders to ensure they meet OEM specifications. Cylinders should be checked for parallelism. If the cylinders are not concentric or are out of parallel, uneven print will result. The TIR can be checked using a dial indicator, while the parallel of the cylinder can be checked using the press indicators on a newer press, feeler gauges, or by mounting impression control guides adjacent to the printing plates. It is a good practice to not "trust the gauges" on the press but to measure the impression nips. Anilox rolls must be free of damage, properly cleaned, and engraved with the recommended cell count, volume, and angle. Measure the cell volume of the roll before the press run. For process color work, the rule of thumb is that the anilox cell count should be 4-5 times the line screen count of the plate. The screen angles of the anilox rolls should be taken into consideration when assigning screen angles to the separations. Incompatible screen angles can cause an undesirable pattern in the print commonly referred to as moiré. More information on anilox rolls can be found in TIP 0306-09, TIP 0306-15, and TIP 0306-17.

If the press is equipped with dryers, they should be checked to ensure that they are in balance and the airflow is properly directed so ink does not prematurely dry on the plates. IR and UV dryers should be checked for proper energy output. The press and the surrounding area also should be kept clean and free of paper dust. Refer to TIP 0306-06 for more information on dryers.

It is prudent to request assistance from the press manufacturer (OEM) to audit the equipment. Request recommendations for needed maintenance, or suggested upgrades to the equipment with product improvements introduced since the equipment was purchased. Note: It may be beneficial to run a fingerprint test prior to performing maintenance work on printing equipment. This test may identify areas in immediate need of maintenance to bring the equipment back to OEM specifications. This early warning fingerprint can also provide the necessary lead-time to coordinate outside resources. When the next fingerprint is run, the corrections can be verified or identified as needing additional attention.

Films

Negatives used for exposure must be of good quality since the photo-imaged plate will reproduce what is in the negative. Sharp images in the negative will help assure sharp images in the plate. The negative must be made with high-contrast film and be right reading, emulsion side up. The optical density should be 0.05 or less in the clear area and 4.0 or greater in the non-image areas of the film. If these standards are not realized, the image formation in the plate may be less than desirable. Films must be free of nicks and dings, as these will cause problems in plate making. Seven-mil film is the gauge of choice, as it is less subject to damage in handling. In imaging sheet photopolymer, matte finish is recommended to provide for the removal of trapped air between the film and plate. When imaging screened work, hard round dots are needed. Veiled dots will not image fully, requiring more exposure time, which may cause reverses to fill in. Highlight limiters should be incorporated to correlate with the minimum dot recommended for the line screen being used. It is advisable to work with a separator who is knowledgeable in flexography. With the increasing use of digitally imaged plates and alternative screening technology, the comments on hard round dots become less appropriate. Film images should have well defined edges between positive and reverse elements. For digital plates, the integrity of the masking layer must be maintained during imaging and processing of the plate.

Plates

Photopolymer plates are increasingly recognized as the materials of choice, as they are dimensionally stable and provide good imaging for high quality process printing. A wide choice of materials is available ranging in hardness,