

Appendix L

Screen Printing Performance Demonstration Methodology

Note: This methodology incorporates comments from discussions with the Screen Printing Technical Foundation, the Screen Printing Association International, screen printers, and manufacturers and suppliers of screen reclamation products and equipment.

Performance Demonstration Overview

Goal

The objective of this performance demonstration is twofold: (1) to obtain specific information from printing facilities concerning the performance of commercial chemical and mechanical screen reclamation systems; (2) to encourage printers to experiment with new products and work practices that reduce human health and environmental risk. This data will be incorporated into the Cleaner Technologies Substitutes Assessment.

General Plan

The majority of printers participating in the performance demonstration will evaluate the effectiveness of one manufacturer product line/system for screen reclamation, using a method that includes the use of ink remover, emulsion remover and haze remover products in screen reclamation. Each facility will be responsible for reclaiming screens over a thirty-day period, utilizing the specified product system. The performance of one or two substitution processes relying on specially equipped mechanical and/or chemical reclamation cleaning systems will be demonstrated, including: (1) high-pressure water blaster; (2) sodium bicarbonate reclaim system.

Desired Characteristics to be Reported from Performance Demonstrations

Actual cost of chemical product or reclamation equipment

Definition: Cost per volume used per area of screen cleaned (ft²).

We will ask that product manufacturers include the average purchase price of their individual products (haze remover, stencil remover, ink remover, reclamation equipment) when the product/equipment is submitted for the performance demonstration. The adjusted or actual cost of screen reclamation products will be determined through incorporation of product purchase price, product application cost, labor costs, and safety and disposal costs.

Product constraints

Example: Whether the product category (e.g. ink remover) is incompatible with certain types of inks

This information should be submitted by the manufacturers and may also be discovered as a result of the performance testing. If the manufacturer does not provide any information regarding product incompatibilities, we will assume that there are no incompatibility concerns.

Special storage, safety and disposal requirements

Examples: Flammability or volatility of the product

This information will be requested on the manufacturer questionnaire and will vary according to the chemicals comprising the products/equipment to be submitted. We will ask that manufacturers provide recommendations on disposal or treatment of wastes associated with the use of their products. The storage costs will be a factor in determining the adjusted cost of the product.

Ease of use

Definition: The physical effort required to effectively clean the screen using the test product

This is a subjective standard based on the judgment of the screen cleaner and printer. As a frame of reference, the screen reclamation employee or facility point-of-contact will be asked to describe their current work practices for screen reclamation and the physical effort required with their current system. When the performance information is tabulated for each manufacturer system demonstrated at a facility, the data regarding the products currently used at the facility will also be noted.

Duration of the Cleaning Cycle

Definition: The measured time of the screen cleaning process (e.g. beginning with the application of ink removal product to the screen until the final water wash is completed)

This will attempt to measure the labor costs associated with the use of the products. Labor costs will be based on the time required for the screen reclamation with the specific products and a standard screen cleaning wage.

Physical/Chemical properties of the screen reclamation system

Definition: Characteristics associated with use of the individual system, such as chemical components or pressure at which chemicals are applied.

The chemical components of each product system must be submitted by each manufacturer participating in the demonstration project. The physical characteristics of each system as used, including such factors as water pressure as applied and type of specialized equipment used, will be documented.

Effectiveness of the screen reclamation system

This is a subjective criteria and depends on the judgment of the printer and the employee reclaiming screens at the facility. They will examine the screen after the reclamation process is complete and answer two questions: (1) Can this screen be reused for general screen printing purposes?; (2) Can this screen be used to print a reverse image? These questions will not be answered solely on the basis of the screen appearance. When the screen is reused for printing, any problems with ghost images or weak screens will be documented.

Screen, stencil and ink information

The majority of screens reclaimed in the demonstration project should have a monofilament polyester mesh with a nominal thread count in the range of 230-390 Mc/in. However, if the screen mesh thread count is outside of this range, the data will be documented. Data recorded for each screen reclaimed should include threads per inch, the age of the screen and the prior printing history of the screen. The length of time between the end of the press run and the actual screen reclamation should be estimated. The color and type of ink, and the type of emulsion will also be reported. If possible, the tension level (N/m) of the screen should be recorded. The condition of the screen (rips, tears) before and after the test will be reported. The printing performance of the screen after it has been reclaimed will also be documented. This descriptive information serves two purposes: (1) it provides data to determine the specific effectiveness of the methods and various product lines; (2) it may assist in discovering and reporting incompatibilities between the products and types of inks and emulsions.

Methodology For On-Site Performance Demonstration

Selection of Products for the Performance Demonstration

- Products will be submitted by manufacturers in two shipments. One shipment of screen reclamation products, in bucket containers with manufacturer labels, will be sent to SPTF/SPAI, along with a standard OSHA MSDS; the quantity shipped should be sufficient to clean 3 screens of 10 ft² each. The manufacturer will also ship to SPAI a quantity of product necessary to reclaim

50 screens at the volunteer printing facility. SPAI will determine the quantity required for each site and notify the manufacturer prior to shipment.

- SPTF will determine the effectiveness of all of the products submitted. This will include evaluating the standard manufacturer instructions for each product and ensuring that the application technique specified for that product will enable the product to work effectively. Any instructions for an individual product pertaining to dilution or mixing will be followed. If the application technique specified for a particular product is determined to limit the effectiveness of the product or in any other way negatively affect performance, a second application technique will be chosen and tested.
- The effectiveness of each product system will be tested with up to three different ink types (solvent-based, UV-cured, and water-based), depending on the recommendations of the manufacturer. The specific methodology for the SPTF testing is detailed in a separate document (see Appendix G). **Only products deemed effective by SPTF will be used in the field demonstration portion of the project.**
- The selection of printers will take into account the type of inks primarily used and any specialized application equipment. SPAI will match printers with appropriate screen reclamation products. The in-field demonstrations will only include screens on which solvent-based or UV inks have been used. However, if screens on which water-based inks have been used are reclaimed with the product system, the data will be documented.
- After SPTF has completed the initial screening of the effectiveness of products, SPAI will ship the screen reclamation products to the screen printers participating in the field demonstrations. Products will be packaged in generic containers (no screen product manufacturer markings). The printer will receive the masked product that has a masked OSHA MSDS and a generic label. For all other aspects of the demonstration project, products will be identified only by a letter code.

Documentation of Standard Work Practices at Facility

- The observer will visit the facility and explain the project thoroughly to both the facility point-of-contact, and employees involved in printing and screen reclamation. Prior to the observer's visit, the facility will have received a Facility Background Questionnaire. When on-site, the observer will verify that this questionnaire has been accurately completed. Information categories on the questionnaire include: 1) general facility operations (types of products, number

of employees), 2) screen reclamation operations (equipment used, number of screens reclaimed), 3) current reclamation products (application procedures, trade names), 4) storage and disposal practices.

- The observer will verify the questionnaire and document any other relevant information on the **general facility operations**. Recorded information will include the types of products printed, the printing substrates, the typical run length, and the water, sewer, and electric rates for the facility.
- The observer will verify the questionnaire and document any other relevant information on the **screen reclamation operations**. The observer will document the size and general specifics of the screen reclamation area(s), including the type of ventilation. The observer will also briefly describe the experience of the employee(s) participating in the test, including past experiences with testing of screen reclamation products, and document any potential biases.
- The observer will verify the questionnaire and document any other relevant information on the facility's **current reclamation products**. The observer will record the trade name and purchase price of the current screen reclamation products. The observer will document the current work practices by observing screen reclamation utilizing the present method and products used by the facility. The specifics of the screen to be cleaned, such as threads per inch, ink type, color of ink, emulsion type, age, size, tension level and printing history (including estimated time between the end of the press run and reclamation), will be recorded. The physical condition of the screen (small rips, etc.) will be documented before and after the reclamation. The observer will note any pre-application dilution of the product. The observer will measure the quantity of each product applied to the screen and record the time required for each cleaning step, and the overall cleaning of the screen, from application of the ink remover product to the final water wash.
- The observer will verify the questionnaire and document any other relevant information on the facility's **storage and disposal practices**. The observer will note how the products are stored in bulk and in the screen reclamation area. The current waste and rag disposal practices and costs will be documented by the observer.

Phase I: Initial Demonstration and Evaluation at the Printing Facility

- The employee involved in the performance demonstration will prepare to clean

one screen using the masked products supplied for the ink removal, emulsion removal and haze removal steps. The employee will use the application technique designated by SPTF for each product. Prior to the reclamation process, the observer will document any pre-application dilution of the products that is necessary. The observer will note all characteristics of the screen as outlined in B.4.

- The employee will begin screen reclamation. The observer will record the quantity of each product that is applied to the screen. The observer will record all actions taken by the employee in reclaiming the screen to ensure adherence to any specific instructions. The observer will time the entire process, from the application of the ink remover to the final water wash.
- The observer will record the effectiveness of the product system in reclaiming the screen, based on visible appearance and the judgment of the printer and the screen cleaning employee. The observer will ask if the screen can be used again for printing and if there are any printing limitations, such as whether it can be used to print a reverse. After the screen is used again for printing, any problems with the screen, such as ghost images or damaged mesh, will be documented by the printer.
- A second and third screen will then be cleaned using the same method. The observer will follow the process outlined in steps 1 - 3. The purpose of cleaning three screens is to ensure that the screen cleaning employee is familiar with the cleaning method and products, before beginning longer-term testing.

Phase II: Further Demonstration of System Effectiveness at the Printing Facility

- After completion of the above demonstration, the screen reclamation performance demonstration will continue to be performed by the facility through the next thirty days. The masked products supplied by the manufacturer will be used to reclaim these screens. The observer will not be present during this phase of testing. The employee responsible for screen reclamation will record the characteristics of each screen cleaned (see B.4.), the volume of product used for each step in the process, and the effectiveness of the manufacturer system in reclaiming the screen (taking into account future printing performance of each screen). To simplify this process, a short evaluation sheet will be used.
- During the thirty day demonstration period, the observer will interview the facility contact every week over the telephone to document facts or perceptions concerning the reclamation process that could be helpful in determining the

effectiveness of the products used. The observer will determine if there has been any deviation from the initial reclamation procedures. If there has been a deviation, the observer shall record the reasons for the deviation. A work sheet will be developed that will guide the observer through the questions they should ask. The observer will document each conversation on the work sheet, which will subsequently become the telephone log for the facility.

- If at any time during the long-term phase of the demonstration there is a problem, the screen reclamation employee or facility point of contact will document the specific problem and call SPTF for guidance. Any corrective action will be documented by both the industry specialist and the facility employee.

Trouble-shooting

- If problems arise during the field demonstration of the screen reclamation methods and products, the following procedures will be followed. If the observer is present, the problem will be documented and the observer will call SPTF/SPAI for guidance. If the observer is not present, the facility employee will document the problem and contact SPTF/SPAI.
- SPTF will first review the procedures used by the facility employee to ensure they are in compliance with the instructions provided with the product. If the procedures are correct, then SPTF will contact the manufacturer for assistance. SPTF will relay and filter the recommendation of the manufacturer to the printer. SPTF/SPAI will ensure the confidentiality of the products is maintained during this period. The identity of the product in the field will remain masked. The observer will document all actions taken.
- If the recommendations provided by SPTF/SPAI are unsuccessful, the facility employee can attempt to solve the problem. The observer will document the actions taken by the employee responsible for screen reclamation and the success or failure of the actions.
- If a medical emergency arises, CHEMTREC, the emergency response center of the Chemical Manufacturers Association, has volunteered to respond to emergency phone calls to the manufacturer by identifying masked products with chemical components and providing medical information. The phone number for CHEMTREC will be the emergency phone number listed on the MSDS.