SCREEN CLEANING THROUGH THE AGES

With cost and environmental implications affecting cleaning and reclamation of screens, John Schluter outlines a fast and efficient alternative to conventional methods

A common thread among screen-printers through the ages has been the necessity to clean (remove ink) and/or reclaim (remove both ink and stencil) the screen at the end of the printing process. Screen-printing has developed and matured over the past century, resulting in stable screen frames, photo developable stencils, and higher quality mesh. The economics of re-using the screen has made this a necessity. This need has come to an apex throughout Asia, Europe, and the Americas over the past twenty years.

40 years ago, in the 1970s, the most common screen cleaning and reclaiming methods involved low-grade, hazardous solvents for ink removal (aromatics and hydrocarbon solvent blends), while emulsion and film reclaiming was accomplished with sodium metaperiodate crystals dissolved in water or common sodium hypochlorite, household bleach. Mesh stains were commonly removed with an additional application of one or the other, or both combined. Environmental issues were non-existent.

The cleaning and reclaiming processes at this time were primarily manual, involving scrubbing with cloth towels and scrub brushes. At this point in history, screen frames were evolving from wood to aluminium, where adhesive was used to adhere the mesh. Retensionable frames were also developing a following in the screen-printing area of the electronics industry. Finer mesh counts were being embraced, new emulsions were being developed, and industry in the USA and Europe was facing environmental challenges.

Europe reacted to the environmental pressure on screen-printing in the 1970s and 1980s by developing professionally engineered screen cleaning and reclaiming machinery. This equipment (Svecia, Gruenig, Zentner, Moeller) re-circulated the ink cleaning solvents and sometimes incorporated water rinsing between the stages. From this time, to the present, the average results of these machines were screens free of ink and stencil. What remained, typically, was an ink stain in the print area. These stains were removed manually, which added dramatic cost and inefficiency to the model.

CHEMICAL INNOVATION

The USA reacted to environmental pressure not through equipment design, but through chemical innovation. Companies such as Easiway, CCI and ICC began producing screen cleaning and reclaiming chemistry which dramatically improved on the hazards of conventionally used products. Ink degradents (high flash-point solvents which allow solubilised ink to be rinsed with water), high flash, less hazardous on-press cleaners and a multitude of caustic, mesh stain removers hit the United States market in the 80s and 90s. Dozens of other firms came from nowhere and capitalised on the 'green' movement. Many of these products cosmetically appeared safer, but realistically embraced a new generation of hazards. The United States and European consumer at this time was relatively unsophisticated and rarely looked beyond claims of biodegradability.

At this time in the United States (1980s), a small percentage of the screen-printing community were reclaiming their screens with a unique, relatively fast and somewhat inexpensive method. This method involved dipping the screens into a heated immersion tank full of a mixture of water, glycol solvents and an alkaline additive. This mixture would effectively loosen everything on the mesh so the result was a steaming, fully cleaned, stain-free screen when it was pulled from the tank (soak times were about ten minutes). Multiple screens could be soaked simultaneously, providing a quick and relatively low cost process. This process was employed by thousands of printers in the United States, because it directly addressed the primary needs of speed and cost. The hazards were contained in the tank, similar to the hazards in the European machines being contained in the equipment's chemical reservoirs. The dipping process suffered a speedy demise with the growing advent of aluminium frames. Aluminium reacted violently with the chemicals.

Environmental pressure in Europe and North America increased through the 1990s. In the United States, California led the change by outlawing certain chemicals, redefining omissions of MSDS information and ultimately mandating and regulating VOC (volatile organic compounds) air emissions. Europe reacted similarly via REACH legislation aimed at the entire European Union. Chemical manufacturers in North America and Europe responded with warm and fuzzy concoctions of soy esters and citrus by-products which fuelled the desire for compliant, organic, green products for removing ink, emulsion and stains. Some of these products worked, many did not, but universally they all contributed to a much higher cost to clean printing screens.

ESCALATING OIL PRICES

The new millennium brought challenges to many areas of screen-printing. Many were caused by the dramatic escalation of the cost of oil. This worldwide event wreaked havoc and singularly drove up the cost of the screen emulsion, ink and the solvents designed to clean ink. The subsequent result in Europe and North America was a horribly expensive process to re-use mesh. The effects of oil cost increases were felt equally in Asia and Latin America where gasoline was commonly used. The cost of gas quintupled in Latin America during this period which opened the market to change. Asian printers were contracting for more printing with the West and consequently feeling some pressure from the West to give attention to personal hazards and environmental destruction.

In 1999, Easiway Systems originated and began marketing a series of products labelled 'One Steps'. This name referred to the fact that these products removed ink and emulsion or film from the printing screen at the same time in 'One Step'. These products were quickly adapted for use in dipping systems with the results being nothing short of phenomenal.

At this time, standard screen cleaning and reclaiming processes were manual with a minimum of four products (ink removal

A typical dip tank used in the reclaiming process

Svecia in-line screen reclaiming machine (Up North Trading Company in Lakeville, MN USA) using 'One Step' technology

solvent, emulsion remover, stain remover and degreaser). Typical chemical cost for a 1.2 x 1.2m (4 x 4ft) screen were $2.00 to $3.00 USD (€1.50 to €2.50). One man could reclaim five of these screens in one hour. The automatic machinery was faster, but typically used more chemistry resulting in a cost that could easily double the amount.

The 'One Step' chemistry allowed an individual to process dozens of screens in an hour, at a cost of pennies per screen. This new process would simply and efficiently dissolve the ink and emulsion on the screen following a two or three minute dip (the solution in the dipping tank is one part chemical mixed with five parts water). Following immersion in the tank, the screens are rinsed with high pressure water. If a stain exists an additional product is applied and rinsed with water.

This system addressed all the needs of printers in North America. Surfactant and detergent technology was incorporated in lieu of solvents, making the products affordably priced. Health and safety concerns are dealt with by limited human exposure, coupled with safer detergent characteristics. Cost issues are dramatically reduced by the number of required chemicals and more importantly, the amounts consumed.

Tens of thousands of printers adopted this method in North America during the past five years. Dozens of copies of the original products have been developed by all the United States and European Manufacturers.

Interestingly, as a result of the escalation in gasoline prices, this method of reclaiming screens is less expensive and certainly quicker than the use of gasoline and bleach. The Latin American and Asian markets are beginning to accept this process.

During the past two years this technology has nudged into the arena of automation. Equipment manufacturing firms (INPRO, M&R, Rhino and others) have developed machinery to accommodate 'One Step' cleaners. The result has been a dramatic reduction in air emissions, elimination of serious hazards (caustic haze removers, highly acidic emulsion removers), massive cost reduction in chemical usage and overall costs. Water base, water reducible technology has finally come of age. ■

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