A Cooperative Project between the U.S. Environmental Protection Agency and the Printing Trade Associations Nationwide

design FOR THE ENVIRONMENT

PRINTING PROJECT

EPA 744-K-93-001

LITHOGRAPHY CASE STUDY 1

MANAGING SOLVENTS AND WIPES

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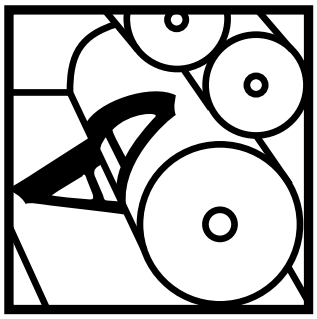


LITHOGRAPHY

Being responsive to the environment means learning new procedures and using new tools to do the same job with less hazard. Decisions about the purchase of equipment and chemicals for press rooms or other production processes depend not only on cost, availability, and performance, but also on whether environmental requirements can be met. Meeting environmental requirements means understanding the comparative human and ecological risks of the alternatives being considered.

This case study is brought to you by the U.S. Environmental Protection Agency's (EPA's) Design for the Environment (DfE) Program. Through the DfE Program, government and industry are working together to identify alternative products and processes that are safer for the environment.

This is the first in a series of case studies that EPA is developing to illustrate how the DfE theme can be applied to lithographic printing operations. This study describes a successful pollution reduction program at the John Roberts Company in Minneapolis, Minnesota. Although the company did not have access to risk and impact information, the way in which it searched out safer alternatives illustrates how printers can achieve significant environmental results.

In particular, this case study illustrates:

- How a self-audit of solvents used in printing operations led to the substitution of more environmentally appropriate solvents.
- How the use of a centrifuge to extract solvents from industrial wipers prior to laundering resulted in reduced solvent in the laundry's wastewater.
- How this company saved money through its efforts to use safer solvents and reduce waste.

The story of this company's experience and the steps it followed show how problems can become opportunities and how environmental planning can be good for business.

Background

The John Roberts Company is a commercial printer of annual reports, brochures, catalogs, forms, limited edition fine art prints, and direct mail pieces using both sheet-fed offset and web offset printing processes. The company began to really understand its solvent use practices as a result of a problem encountered by the industrial laundry that washes the company's press wipers. The effluent from the laundry had become a concern to the local regulatory agency that oversees the sanitary sewer system in the Minneapolis metropolitan area.

Understand the Problem

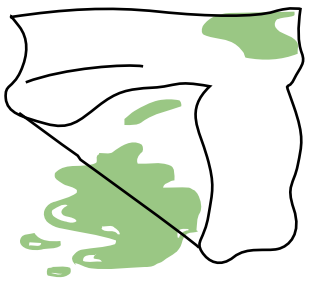
The John Roberts Company uses leased towels as wipers for press cleanup. The company was sending its leased towels to an industrial laundry for cleaning, and with them went a great deal of ink and "spent" solvents. The presence of these solvents in the wipers was creating a problem for the laundry and for the local sanitary sewer system that handles the effluent from the laundry. The two major concerns were volatility and flammability.

The local regulatory agency approached the industrial laundry because too much solvent was being washed out of the towels, causing the vapors from the laundry's effluent to exceed the lower explosive limit (LEL).

The laundry, in turn, asked its major printer customers and a trade association, the Printing Industry of Minnesota, Inc. (PIM), to work out a solution. There were incentives for both parties: the laundry would be able to retain its business, and the printers would be able to continue using leased towels.

Consider Possible Solutions

The John Roberts Company decided to concentrate on two main objectives: (1) to change the *nature* of the solvent that was left in the towels from cleaning presses, and (2) to reduce the *volume* of solvent left in the towels.

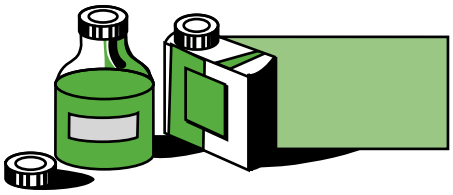


Change The Nature Of The Solvents

Finding An Alternative

The first step was to examine the nature of the solvents used to clean the presses to see if a less volatile substitute could be used. More information was needed about the tasks solvents must accomplish and the conditions under which these solvents perform.

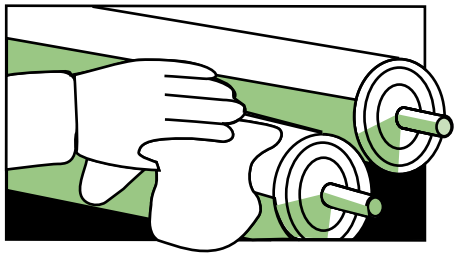
As a result of thorough discussion with everyone involved in the process, the company prepared a list of necessary solvent criteria:



- For washing press blankets, a solvent must work quickly to cut ink, require minimal wiping to remove any oily residue, and dry quickly. Time and the ability to get back up to color quickly is critical during a press run.
- For cleaning the metal parts of a press, a slower-working solvent would be suitable as a general press wash.
- For cleaning the chain of ink rollers, a solvent that is slow to evaporate is needed. This solvent must not flash off before it has gone through the entire sequence of rollers or it will fail to clean them adequately.
- On a limited basis, a very aggressive solvent is needed for removing hardened ink that sometimes collects on the press.

In light of these criteria, the company's first task was to find a blanket wash that balanced these production needs with the environmental needs of less volatility and flammability.

Press operators prefer solvents that do not require a lot of wiping or leave behind an oily film. Unfortunately, most solvents with these desirable properties also create problems for industrial laundries by exceeding the LEL level. When the John Roberts Company audited its operations, it discovered that press operators had been using a highly volatile solvent called type wash as a general, all-purpose solvent, including for blanket cleaning. This product was a blend of acetone, toluene, methyl ethyl ketone (MEK), and isopropyl alcohol and contributes not only to in-plant volatile organic compounds (VOC's) in the air, but also to problems with the laundry's effluent.



This solvent was never intended for all-purpose use, but using the solvent had become a habit that was hard to break. Because it flashed off so readily, no time was lost by press personnel. It was easy to see why the solvent was so popular.

As the company analyzed the product's properties further, however, it found that almost one half the total vol-

ume of the solvent was wasted. It simply evaporated before the work could be performed! The goal was to find a solvent that was better matched to the tasks it was to perform and that did not substantially affect work procedures or productivity.

Work Together To Implement Changes

It is important to recognize that **it was not sufficient to simply look for a technical solution to the problem.** For success to be possible, the support of upper management was vital, as well as the cooperation and understanding of press personnel. Management gave its support by assuring plant personnel that learning to work with new solvents might involve some procedural changes that could affect productivity slightly, but that small losses would not reflect negatively on overall performance evaluations. **Input was sought from each press person and floor helper.** The reasons why it was necessary to change solvents and how the change was to be accomplished were explained to them.

The raising of awareness in the effort to find a substitute resulted in a

reduction in the misuse of the type wash solvent. Type wash usage was reduced from 152 to 5 fifty-five gallon drums in the first year. The company still uses type wash, but only where its use can be justified. A new replacement solvent, an ultra-fast blanket wash, was blended especially for the company and performed well with respect to speed and lack of an oily film. Only 38 fifty-five gallon drums of this new blanket wash were purchased in the first year. Even after including the purchase of the replacement solvent, the John Roberts Company realized a savings of more than $18,000 in the first year by changing solvents and using them more prudently. More importantly, by selecting a replacement solvent with a lower evaporation rate and by strictly limiting the use of type wash, the contribution of vapors from the John Roberts Company to the laundry's effluent no longer exceeded the LEL and was no longer a concern.

Make Additional Improvements

There were, however, some lingering concerns with the new solvent. One ingredient in the new blanket wash was 1,1,1 trichloroethane (TCA), which gave the blend some of its performance characteristics, but is being phased out because it is an ozone depleter and a suspected health hazard. TCA will soon be banned by the Montreal Protocol, an international treaty to eliminate the manufacture of ozone depleters.

The company therefore continued its investigation of alternatives, this time with an emphasis on reduction of fugitive VOC emissions. It reformulated its blanket wash to a less volatile press wash that contains no TCA. The company approached its search for a substitute with reduced VOC emissions with the realization that vapor pressure plays an important role. A solvent with a lower vapor pressure will evaporate less readily will release less VOC emissions to the air. Therefore, when the goal is reduction of fugitive VOC emissions, volatility should be considered.

Early results from this change show that because considerably less solvent is lost to the air through evaporation, the company is purchasing four fewer drums of solvent each month. However, four more drums of spent solvent are removed from the rags and sent off-site for fuel blending. In spite of the costs to manifest and ship this solvent, the company still saves $100 per month. In addition, the John Roberts Company has lower fugitive emissions and a healthier workplace.

During trials for new solvent blends, the company's management came to a critical realization: the way in which a product is used is key to its performance. The company found that testing the same product on different presses using different crews produced widely varying results. The success of the solvent changes the company made was due largely to the development of a very specific procedure for solvent use, which was developed by the press operators themselves.

Reduce The Volume Of Solvent

The second objective was to reduce the volume of solvents left in the towels. With the help of its trade association, the Printing Industry of Minnesota, Inc. (PIM), the company began to explore ways to "wring out" the wipers.

The first step was to make sure efforts to train employees not to dump excess solvent in the pile of used

wipers had not eroded. Confident that training had assured that the rags put in the used rag container retained the "minimum" amount of solvent, **the company explored the use of a commercial grade laundry centrifuge to separate out any remaining solvent.** The company was surprised to learn that the "minimum" amount of solvent was much more than originally thought.

Now, before wipers are sent to the laundry, they are spun in a safe, explosion-proof centrifuge, which extracts between 2 1/2 and 3 1/2 gallons of "spent" solvent for every load of approximately 220 wipers. This amounts to quite a lot of solvent over time. The recovered solvent is now reused throughout the plant in a series of parts washers to clean press ink trays, instead of going out with the laundry, and the spent solvent is then sent to a fuel blender. Reuse of this solvent eliminated the purchase of more than one drum a week of virgin solvent for use in parts washers throughout the plant. The centrifuge recovery program has saved the company more than $34,000 in the first year alone, resulting in a quick payback on the $15,000 centrifuge. The centrifuge has also resulted in a sizeable reduction in the volume of solvent sent to the sewer system. Using a centrifuge for this purpose might not be allowed in all states, but other options could be available.

The Design for the Environment Approach

This case study described how a company systematically assessed a problem, applied knowledge acquired through that assessment (along with the assistance of its trade association), and dealt with the problem in its context.

The result is a methodology that is affordable, effective, readily adaptable, and can be transferred to other printers. Environmental benefits demonstrated in this case study include reduced fugitive air emissions, less solvent discharged to the water system, and decreased toxic chemical purchases. Waste solvent is being used for energy recovery. In addition, the company has completely eliminated its use of TCA, and the safety of its work environment was greatly improved.

The methodical evaluation of a problem, leading to solutions aimed at reducing the creation of pollutants at their source, is what EPA's Design for the Environment Program is seeking to encourage. While this story illustrates a method for evaluating alternatives, the company did not have access to important risk information. The DfE Printing Project seeks to provide information to industries and companies (often through their trade associations) on the comparative risk and performance of alternative chemicals, processes, and technologies, so that printers are able to make more informed decisions. EPA will make this information available in the form of a "Substitutes Assessment" later in 1996.

The search for alternative chemicals and new technologies begins with today's success. Assisting in the search for and evaluation of alternatives is the goal of EPA's DfE program. With this case study and others like it, we hope to illustrate the application of this goal and the pursuit of continuous improvement.

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