Reducing IPA use: Industry examples
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Envirowise

Prepared with assistance from:
McLellan and Partners Ltd
Summary

The printing industry is coming under increasing pressure to reduce its use of organic solvents in dampening solutions. This Good Practice Guide contains eight Industry Examples that describe how companies of different sizes have achieved cost savings and environmental benefits by reducing or eliminating isopropyl alcohol (IPA) use. The Industry Examples included in this Guide are drawn from the sheet-fed, UV-cured sheet-fed, metal sheet-fed and heat-set web offset lithographic sectors of the printing industry.

The information within the Industry Examples has been kindly provided by commercial printing companies for publication through Envirowise. The companies have provided a description of their own IPA reduction experiences and there is a wealth of best practice that can be learned from them.

The Industry Examples demonstrate that reducing or eliminating IPA use has:

- reduced the purchase costs of IPA and other press room chemicals;
- reduced volatile organic compound (VOC) emissions to atmosphere;
- reduced operator exposure to organic solvents;
- reduced the site’s annual organic solvent use;
- reduced the risk of fire;
- provided companies and printing employees with a proactive approach to health, safety and environmental issues.

Furthermore, some companies in the Industry Examples also believe they have made additional savings. These benefits, based on their own operational experience and which have not been quantified, include the following:

- improved management and productivity of the presses, resulting in less substrate and ink waste;
- reduced maintenance;
- not having to install expensive pollution abatement equipment;
- enhanced print quality.

Reduction or elimination of IPA use has allowed the companies featured in the Industry Examples to achieve total savings of £356,000/year in IPA purchase costs alone. The indirect cost savings have also been considerable, while the environment has benefited by a total reduction in VOC emissions of 588 tonnes/year. The technique used by the majority of the Industry Examples to reduce or eliminate IPA use is alcohol replacement chemistry, ie changing to a low-alcohol or an alcohol-free fountain solution. This has proved very successful and generally requires no capital investment. The Guide provides an opportunity for printers to benchmark their performance against the selected Industry Examples and to explore the opportunities and benefits of reducing or eliminating IPA use on their presses.
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1.1 The purpose of this Guide

This Good Practice Guide describes how eight sheet-fed and heat-set web offset lithographic printers have reduced or eliminated their use of isopropyl alcohol (IPA). The companies featured in the Guide are representative of the various sectors within the offset lithographic industry, including:

- small, medium and large sheet-fed offset printers;
- medium to large heat-set web offset printers;
- UV-cured sheet-fed printers;
- metal sheet-fed printers.

Many offset lithographic printers still operate their presses with high IPA concentrations of up to a maximum of 20% by volume in the dampening solution. This has cost, health, safety and environmental implications. The Industry Examples in this Guide illustrate the cost savings and other benefits that can be achieved by reducing or eliminating the use of IPA in the printing process. Significant reductions in IPA use can be achieved in all sectors of the offset lithographic printing industry. Fig 1 shows the percentage reduction in IPA use achieved by the eight companies, grouped according to whether they use sheet-fed or heat-set web offset presses.

**Fig 1 Reduction in IPA use at the Industry Example companies**
1.2 The function of IPA in offset lithographic printing

Fig 2 shows a simplified layout of an offset lithographic press. Offset lithographic printing is a planographic process. The image and non-image areas are in the same plane on the plate - the printing image carrier. The plate is treated to ensure that the image areas are water repellent and ink accepting, while the non-image areas are water accepting. Lithographic ink will adhere to a dry surface, but not to a wet one, thus the plate attached to the plate cylinder is dampened prior to inking it up. Water forms a film on the water-accepting areas, but contracts into tiny droplets on the water-repellent areas. When an inked roller is passed over the dampened plate cylinder, it is unable to ink the areas covered by a water film, the non-image areas, but it pushes aside the droplets on the water-repellent areas, the image areas, and these will be covered in ink. The inked plate cylinder in turn offsets the ink onto the blanket cylinder which has direct contact with the substrate. The process is capable of printing on metals, foils, plastic film or paper-based substrates.

On the offset lithographic press, a dampening system supplies water to the plate cylinder, usually via a series of rollers. Although it is possible to apply only water, most press dampening systems apply a mixture, known as the dampening solution, fount or fountain solution. Dampening solutions typically have three components:

- the majority is water;
- around 3% of fountain solution, which contains water, pH buffer, gum, lubricants, surfactants and anti-microbial agents; typically, these solutions do not contain IPA;
- typically 10% or more IPA (some lithographic presses never use IPA).
To minimise evaporation and to promote consistent print quality, water, IPA and fountain solution are introduced into a mixer unit through special airtight pumps. In most cases, an automatic dosing system is used to ensure that liquids such as IPA are added to the mixer unit economically and that evaporation losses are reduced. The dampening solution is kept chilled to 10°C. The dampening system supplies a controlled amount of mixed dampening solution to the plate. There are various other types of dampening system, including rotary brushes with flicker blades and some with a spraying mechanism.

The addition of IPA to the dampening solution has become very popular during recent years. It is claimed that IPA provides the additional benefits of:

- less emulsification, where water ‘bleeds’ into the ink on a litho plate and degrades the image;
- improved drying of inks;
- quicker ink/water balance - needed to ensure print quality is achieved;
- less fluff and debris on the plate.

The use of IPA in the dampening solution is considered to provide a more ‘forgiving’ press operation, ie it can help to conceal problems associated with low operator skill levels, incorrect setting up of the press and old or poorly maintained machines.

**1.3 The disadvantages of using IPA**

IPA is increasingly becoming the target of stricter health, safety and environmental legislation aimed at controlling its potentially harmful effects.

- IPA is a volatile organic solvent and evaporates rapidly in air. The gaseous form of IPA contributes to the formation of ground level ozone by reacting with nitrogen oxides in the atmosphere and sunlight. Ground level ozone is known to damage human health and vegetation.
- IPA is highly flammable and must be stored and handled with care.
- There are health and safety risks associated with the use of IPA. Uncontrolled exposure can cause irritation of the eyes, nose, mouth and throat. The main legislation covering occupational exposure to solvents is the Control of Substances Hazardous to Health (COSHH) Regulations 1999. Employers are under a duty to control exposure using a ‘hierarchy of control’. The Health and Safety Executive is promoting a voluntary agreement within the printing industry to reduce the use of low boiling point organic solvents, including IPA.
- The use of IPA is often more expensive than using alternative fountain solutions that enable the reduction or elimination of IPA.
- The use of IPA and other solvents may trigger regulatory obligations. For offset lithographic printing, the threshold for registration for Local Air Pollution Control (LAPC) is 25 tonnes or more of organic solvent per year. Companies regulated under LAPC are required to limit the proportion of organic compounds in their dampening solutions to 10% or below for existing presses and 5% for new presses. Large printers may be subject to the Pollution Prevention and Control Regulations as an A2 Installation if they use organic solvents in the printing process in plant with a consumption capacity of more than 150 kg/hour or more than 200 tonnes/year.

For up-to-date information on the environmental legislation affecting your processes contact the Environment and Energy Helpline on freephone 0800 585794.
1.4 The benefits of reducing or eliminating IPA use

The benefits of reducing or eliminating the use of IPA can include:

- reduced cost of buying IPA;
- improved working environment due to reduced exposure to organic solvent;
- reduced volatile organic compound (VOC) emissions to the atmosphere;
- solvent use reduced to below the registration threshold for LAPC;
- demonstration to employees of a proactive approach to health, safety and environmental issues;
- reduced fire risk and insurance premiums.

Some companies in the Industry Examples also believe they have made the following savings, although these are sometimes difficult to quantify:

- improved management and productivity of the presses resulting in less substrate and ink waste;
- reduced maintenance;
- avoidance of the installation of expensive pollution abatement equipment;
- enhanced print quality.

These benefits are illustrated by the Industry Examples in Section 3. All sizes of company can achieve cost savings and environmental benefits from reducing IPA use, with the greatest cost savings obtained by those companies that can eliminate IPA use. Table 1 gives details of the annual financial savings (2000 prices) from reduced IPA purchase costs and the consequent reduction in VOC emissions achieved by each company.
<table>
<thead>
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<th>Industry Example</th>
<th>Company</th>
<th>Type of process</th>
<th>Number of employees</th>
<th>Reduction in IPA use (%)</th>
<th>Reduced IPA purchase costs (£/year)</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
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<td>Sheet-fed</td>
<td>9</td>
<td>43</td>
<td>263</td>
<td>0.41</td>
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<td>120</td>
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<td>2 340</td>
<td>3.1</td>
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<td>3</td>
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<td>100</td>
<td>253 000</td>
<td>385</td>
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<td>5</td>
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<td>Headley Brothers Ltd</td>
<td>Sheet-fed and heat-set web</td>
<td>300</td>
<td>100 (web) 37.5 (sheet)</td>
<td>31 500</td>
<td>41.7</td>
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<td>100</td>
<td>1 560</td>
<td>2.1</td>
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<tr>
<td>8</td>
<td>St Ives Plymouth Ltd</td>
<td>Heat-set web</td>
<td>300</td>
<td>100</td>
<td>54 000</td>
<td>142</td>
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Techniques for reducing or eliminating the use of IPA

The most common method of reducing or eliminating IPA use in lithographic printing is to reduce the concentration of IPA in the dampening solution. IPA reduction can be achieved through changes to working practices and substitution of the fountain solution to one that allows IPA to be reduced or eliminated.

This technique is called alcohol replacement chemistry and involves reducing or eliminating IPA by adding small volumes of alternative chemicals such as glycols or glycol ethers into the fountain solution. This is usually done during manufacture of the fountain solution. The percentage additive within the raw fountain solution is not usually more than 25% of the volume and, when considering the dilution rate of around 3% to the volume of water, this percentage of glycol represents less than 1% of the whole. The fountain solution may contain other additives such as surfactants, which replicate the functions of IPA. Most of the companies in the Industry Examples in this Guide chose alcohol replacement chemistry, as no capital investment is involved and the technique has proved very successful.

A conventional press fitted with an alcohol dampening system normally meters both IPA and fountain solution separately into the water through an automatic dosing and temperature-controlled recirculating unit. Therefore, for the majority of presses, reducing IPA after changing the fountain solution involves reducing or eliminating automatic dosing of IPA.

Successful operation of replacement fountain solutions requires a combination of techniques, for example:

- improved press management;
- very accurate automatic dosing equipment;
- a consistent, ie stable, supply of water, possibly from a reverse osmosis unit;
- correct mechanical adjustment of the roller and dampening settings as per manufacturers’ recommendations.

Press management involves monitoring and controlling the interaction between the dampening systems, rollers, ink, paper, water quality and operator skill. All of the companies in the Industry Examples have found press management to be a key element in reducing IPA use.

Some of the companies have found it beneficial to buy a reverse osmosis system to treat their mains water. Removing bacteria, metal ions and other contaminants from the water by passing it under pressure through a membrane in the reverse osmosis unit helps to maintain a constant ink/water balance. A reverse osmosis water unit for a single press installation typically costs £4 000 (2000 prices). For more information about reverse osmosis, see Good Practice Guide (GG54) Cost-effective Membrane Technologies for Minimising Wastes and Effluents1.

Mechanical devices, eg dampening roller systems, can be used to improve the distribution of the fountain solution during printing with reduced or zero amounts of IPA. Other devices on the market include magnetic and electronic units. These are claimed to mimic the effect of IPA in the fountain solution.

A list of suppliers of equipment and chemicals used for reducing or eliminating IPA use in the offset lithographic printing industry is given in the Appendix. The Environment and Energy Helpline (0800 585794) may be able to supply further names on request.

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1 Available free of charge through the Environment and Energy Helpline on freephone 0800 585794.
Industry examples

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IPA elimination programme reduces VOC emissions at St Ives Plymouth Ltd
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Low-alcohol fountain solution improves print quality at Chromatec Ltd

Chromatec Ltd specialises in printing four-colour marketing literature. The company began an environmental initiative in 1999 to reduce the use of IPA on its two sheet-fed presses through use of a low-alcohol fountain solution. Through the enthusiasm of the senior press operator and the commitment of the managing director, IPA consumption has fallen by 43%. The reduced use of IPA has directly saved the company £263/year, with other significant cost savings resulting from reduced purchase of cleaning chemicals, less substrate waste and increased press productivity.

Background

Chromatec Ltd is a commercial offset lithographic printing and finishing company specialising in four-colour marketing literature. The company employs nine people and operates a Heidelberg GTO press with conventional molleton dampening, and a Komori 428 press with Komorimatic continuous alcohol dampening. Both presses were bought within the last ten years.

The company is not subject to Local Air Pollution Control (LAPC) as solvent consumption is below the registration threshold of 25 tonnes/year.

Introduction of the low-alcohol fountain solution

In 1999, Chromatec began an environmental initiative to reduce its use of IPA. This initiative had the full support of the managing director and was driven by the senior press operator, who had recently completed a Level 3 National Vocational Qualification (NVQ) in printing. The NVQ covered health, safety and environmental issues in the printing industry.

An IPA reduction programme was set up and various suppliers were invited to trial their fountain solutions on the Komori press. Each product was evaluated in terms of print quality and the reduction in IPA use. The fountain solution chosen achieved an improvement in the print quality and reduced IPA consumption significantly.

The trial lasted about two months. A dampening solution containing 3% fountain solution by volume was used on both presses. Before the trials, the concentration of IPA in the dampening solution on both the Heidelberg and Komori presses was 14%. With assistance from the chosen supplier, the concentration of IPA used in the dampening solution was reduced to 8% on the Komori press and to 10% on the Heidelberg press.

The IPA reduction programme has proved successful. Total consumption of IPA has fallen by approximately 43%, with no investment in machinery or re-engineering of the current plant needed. Calibrating the IPA settings on the automatic dosing units involved a minor cost.
Since the introduction of a low-alcohol fountain solution, Chromatec considers it has benefited from improved print quality, with no reduction in press output. Use of the new fountain solution has not necessitated additional training for the press operators or resulted in any significant changes to existing procedures.

In addition, the press operators co-operated fully with the extensive research into the use of low-alcohol fountain solutions carried out during the trials. This has given the operators a better understanding and control of the presses. The improved control has resulted in more efficient running of the presses and less need to use consultants.

Housekeeping practices

In line with standard good practice to minimise evaporation and to promote consistent print quality, the IPA is introduced to the mixer unit through airtight pumps and the dampening solution is kept chilled to 10°C.

An automatic dosing system is used to ensure that liquids such as IPA are added to the mixer unit economically and that evaporation losses are reduced.

All solvent-laden rags are stored in a closed container and taken away by an approved waste contractor for disposal.

Cost savings and other benefits

Table 2 shows the cost savings and environmental benefits achieved by reducing the use of IPA on the two presses. Before the introduction of the low-alcohol fountain solution, Chromatec used approximately 1 200 litres/year of IPA. The use of the low-alcohol fountain solution has reduced IPA consumption by around 43%, saving £263/year in the cost of IPA purchases. Reduced use of IPA has lowered VOC emissions by 0.41 tonnes/year.

Other cost savings claimed by Chromatec Ltd when using the low-alcohol fountain solution include:

- Reduced purchase of cleaning materials.
- Reduced waste costs due to a 33% reduction in waste generated during make-ready.
- Increased press productivity due to reduced downtime during make-ready.
- Reduced frequency of maintenance to clean and rejuvenate the dampening and form rollers. The company believes the annual indirect savings associated with reduced cleaning and maintenance amount to more than it saves on buying less IPA.
In addition to the financial benefits, the use of the low-alcohol fountain solution has resulted in improvements to the ink density and the image quality. The press operators have noticed an improvement in their working environment as less volatile organic solvents are entering the workplace atmosphere.

**Advice to other printers from Chromatec Ltd**

“The implementation of the environmental initiative at Chromatec to reduce the consumption of IPA has proved very successful, with significant savings and improvements in print quality.

“We believe our success in reducing IPA consumption is due to involving the staff fully and by benefiting from the interest of our press room supervisor in environmental issues.

“Printers who wish to reduce their use of IPA should consider identifying members of their press room staff who have the interest and technical expertise to trial new environmentally friendly products. By liaising closely with our supplier of low-alcohol fountain solution, we were able to resolve any technical problems effectively with minimum disruption to our print runs.”

Mr Geoff Woodfield, Managing Director, Chromatec Ltd

Low-alcohol fountain solution supplier

**Shackell Edwards & Co Ltd**
Tel: 0161 406 6033 Fax: 0161 406 6233
IPA-free printing process wins print quality award for Containers Printers (UK) Ltd

Containers Printers (UK) Ltd manufactures drums and aerosol cans for the food and chemical industries. In 1998, the company began a solvent reduction strategy and successfully reduced IPA use on its two sheet-fed presses from around 14% to just 4%. This reduction in IPA consumption saved Containers Printers £1 404/year in purchase costs, and reduced VOC emissions by approximately 1.9 tonnes/year.

In September 1999, the company revisited IPA use on the presses and successfully eliminated IPA use on both presses - saving a further £936/year. VOC emissions were further reduced by 1.2 tonnes/year.

Background

Containers Printers (UK) Ltd is a medium-sized sheet-fed offset lithographic printer and container manufacturer located in Birmingham. The company specialises in printing on metal sheets used for the manufacture of drums and aerosol cans. A major part of the business is dedicated to manufacturing metal drums and aerosol cans that are distributed to food and chemical companies in the UK and in Europe. The company, which was established in 1986, currently employs 120 people and has an annual turnover of £12 million. Its parent company, Containers Printers Pte Ltd, is based in Singapore.

The company uses two presses - a two-colour Crabtree 1200 plus coater and a one-colour Crabtree Marquis plus coater. Both of the presses are fitted with thermal curing ovens and the two-colour Crabtree press is fitted with an ultraviolet (UV) unit for rapid curing of the printing inks. The Crabtree presses were purchased about 20 years ago.

Over the last three years, the company has undertaken a solvent reduction strategy to reduce its use of organic solvents to below the registration threshold for Local Air Pollution Control (LAPC).

Introduction of the IPA elimination strategy

In 1998, Containers Printers began to examine the possibility of reducing the use of IPA on its presses. The main driving factors for reducing IPA consumption were to:

- improve print quality;
- reduce substrate and ink waste on the presses.

Variations in print quality were occurring when conditions in the workplace changed considerably over a 24-hour period as a result of heat being released from machinery in the factory. Depending on the temperature, press operators had to adjust the concentration of IPA in the fountain solution to maintain the ink/water balance.
The print manager realised that it might be possible to improve the consistency of the print quality by using an IPA substitute in the dampening solution. The substitute would have a higher boiling point than IPA and would, therefore, be less susceptible to changes in the workplace.

The IPA elimination programme was led by the print manager with the full support of senior management. The first step was to contact the company’s fountain solution supplier to discuss the possibility of reducing IPA use. The supplier recommended a new fountain solution which contained 4% IPA.

Containers Printers invited the supplier to trial the fountain solution on its one-colour Crabtree press. The previous press fountain solution system was thoroughly flushed out before the trial.

Initial problems with print quality were overcome by:

- adjusting the dampening roller settings;
- ensuring the dampening systems were washed out frequently;
- adjusting the temperature of the dampening solution;
- adjusting the concentration of the fountain solution.

Before the elimination programme began, the concentration of IPA in the dampening solution was between 10% and 14%. Implementation of the programme resulted in the concentration of IPA in the dampening solution being reduced to 4% in only one day.

A review of print quality indicated that the new fountain solution had:

- improved print quality;
- reduced foaming problems caused by the soft mains water and high concentrations of IPA in the dampening solution.

Although the introduction of a dampening solution containing 4% IPA was a significant improvement, there were occasional problems over a 15-month period with the print quality and with foaming in the dampening system.

In September 1999, the supplier of the fountain solution suggested that Containers Printers trials an alcohol-free fountain solution that had just been released onto the market. This fountain solution was tested for one day on the one-colour Crabtree press under the supervision of the supplier. The alcohol-free fountain solution has improved print finish and eliminated the problems with foaming.

The company’s success in running the presses alcohol-free has been demonstrated with the presentation of a print quality award from a leading chemical manufacturer.
Cost savings and other benefits

In 1998, Containers Printers was buying at least 75 litres/week of IPA. Introduction of the 4% IPA fountain solution saved the company £1,404/year and reduced VOC emissions by about 1.9 tonnes/year. Introduction of the alcohol-free fountain solution has reduced costs by a further £936/year and reduced VOC emissions by about 1.2 tonnes/year. Table 3 summarises the cost savings and environmental benefits achieved by the IPA elimination programme at Containers Printers.

<table>
<thead>
<tr>
<th>Cost savings (£/year)*</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of 4% IPA fountain solution</td>
<td>1,404</td>
</tr>
<tr>
<td>Introduction of alcohol-free fountain solution</td>
<td>936</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,340</strong></td>
</tr>
</tbody>
</table>

* Purchase of IPA only

Containers Printers considers it has made other significant savings in reduced purchase costs for anti-foaming chemicals and chemical ink dryers. In addition to these cost savings, the company believes that other benefits include:

- an improvement in print quality;
- reduced operator exposure to organic solvents and reduced fire risk.

Elimination of IPA on the presses has also contributed to the company’s success in reducing its annual use of organic solvents to below the LAPC registration threshold of 25 tonnes/year.

**Advice to other printers from Containers Printers (UK) Ltd**

“We have demonstrated that it is possible to eliminate IPA on presses that use sheet-fed metal substrate. This has been achieved through our willingness to try new fountain solutions and by the commitment from our senior management and press operators to continually improve our products.

“We would recommend other sheet-fed printers to investigate the possibility of eliminating IPA as this can potentially improve print quality and reduce the costs associated with substrate and ink waste.”

Mr Kevin Fouch, Print Manager, Containers Printers (UK) Ltd
Eradication of IPA brings cost savings and environmental improvements at ET Heron & Co Ltd

ET Heron & Co Ltd prints high-quality magazines and business brochures using heat-cured web offset lithographic presses. The company has eliminated IPA use on its Heidelberg and Rockwell presses and recently ran successful alcohol-free trials on its MAN Rotoman presses. Combined cost savings on the Heidelberg and Rockwell presses are £93 000/year, with £80 000/year saved so far by reducing IPA use on the two MAN Rotoman presses. A further £80 000/year will be saved when the company eliminates the use of IPA on these presses. The environmental programme has improved the working environment with a substantial reduction in VOC emissions. These will total 385 tonnes/year when IPA use is eliminated on all of the company’s presses.

Background

ET Heron & Co Ltd is a commercial heat-cured web offset lithographic printing company specialising in the printing of low and high volume high-quality magazines, catalogues and business brochures. The company currently employs 460 people and is regulated under Local Air Pollution Control (LAPC), as it uses more than 25 tonnes/year of organic solvents.

The company operates the following:

- a Heidelberg Harris four-unit single web 32-page press;
- a Rockwell/Baker Perkins four-unit single web 32-page press;
- a Rockwell/Baker Perkins four-unit single web 16-page press;
- a Rockwell/Baker Perkins five-unit twin web 16/32-page press;
- two MAN Rotoman eight-unit twin web 32 presses.

Introduction of an environmental programme

An environmental programme was initiated in 1995 to investigate the possibility of reducing IPA use on the Heidelberg and Rockwell presses. To assess the viability of this proposal, several ink and fountain solution manufacturers were contacted and invited to trial their products. The programme was driven by the works director, who developed a trial protocol that considered parameters such as:

- dot gain;
- ink trapping;
- time taken between blanket washes;
section 15

- temperature of the dampening solution;
- quantity of waste created during make-ready;
- surface water tension on the plates;
- the relationship between the gearing of the dampening system and print quality.

Use of the alcohol-free fountain solution allowed ET Heron to gradually reduce IPA consumption on the Heidelberg and Rockwell presses over a four-year period from 8% per volume to zero.

In 1998, an investigative programme was launched to eliminate IPA on the MAN Rotoman presses. A trial protocol was developed, involving close co-operation between the press manufacturer and the suppliers of press consumables. Since the start of the programme, IPA use has fallen from 8% by volume to 3.5% by volume. No loss in print speed or print quality has occurred. The company has recently run successful trials with a new alcohol-free fountain solution on the MAN Rotoman presses and hopes to run them alcohol-free in the near future.

ET Heron uses a reverse osmosis unit to treat its water supply. This ensures that the water used in the dampening solution has a consistent quality and is suitable for use with the fountain solution. Apart from the investment in the water treatment system, implementation of the programme to reduce and eliminate IPA use has not resulted in any significant capital investment or affected print output and print quality.

The commitment of senior management and the ownership of the environmental programme by the press operators have been vital to the effectiveness of the drive to reduce and then eliminate IPA use at ET Heron. The open line of dialogue from the operators on the presses to senior management operated by the company has helped to identify and eliminate problems effectively, with minimum press downtime. Shop-floor toolbox talks are held regularly to provide training in an informal atmosphere and to give feedback on environmental initiatives.

The extensive research into reducing and eliminating IPA over the last four years has strengthened the relationship between ET Heron and its suppliers and press manufacturers. This has helped to ensure that the presses run efficiently and has reduced the amount of waste generated during make-ready.

Cost savings and other benefits

The elimination of IPA use on the Heidelberg and Rockwell presses has saved the company £93 000/year as a result of not having to buy 180 000 litres/year of IPA. Reducing IPA use on the MAN Rotoman presses has saved the company approximately £80 000/year. This is equivalent to consuming around 154 000 litres/year of IPA. Using an alcohol-free fountain solution on these two presses will save the company an additional £80 000/year. Eliminating the use of IPA on all the presses at ET Heron will reduce VOC emissions by a total of 385 tonnes/year. Table 4 summarises the cost savings and environmental benefits of the company’s environmental programme.
As well as significant cost savings from eliminating IPA, the company has benefited from:

- improved ink density and print image quality with no loss in print output;
- eliminating exposure of press operators to IPA fumes;
- eliminating the risk of fire and explosion associated with the use of IPA on presses;
- improved relationships with the inhabitants of houses close to the site boundary;
- demonstrating a proactive approach to environmental issues to customers and the local authority;
- pre-empting potentially stricter environmental legislation.

### Table 4: Summary of cost savings and environmental benefits at ET Heron & Co Ltd

<table>
<thead>
<tr>
<th>Item</th>
<th>Reduction in IPA use (litres/year)</th>
<th>Cost savings (£/year)*</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elimination of IPA use on the four Rockwell and Heidelberg presses</td>
<td>180 000</td>
<td>93 000</td>
<td>142</td>
</tr>
<tr>
<td>Initial reduction in IPA use on the two MAN Rotoman presses</td>
<td>154 000</td>
<td>80 000</td>
<td>121.5</td>
</tr>
<tr>
<td>Elimination of IPA use on the two MAN Rotoman presses**</td>
<td>154 000</td>
<td>80 000</td>
<td>121.5</td>
</tr>
<tr>
<td>Total</td>
<td>488 000</td>
<td>253 000</td>
<td>385</td>
</tr>
</tbody>
</table>

* Purchase of IPA only  ** Planned

“ET Heron has reduced and then eliminated IPA consumption by ensuring that the quality of our product has been maintained or improved throughout the trial period. Systematically testing printing consumable products against a strict quality procedure has enabled us to identify products objectively that work effectively on our presses.

“A first step for any printing company wishing to reduce its IPA consumption is to network with contacts in the printing industry to establish which products may be suitable for use. We believe our success has been based on a close working relationship with our suppliers and by obtaining full co-operation with the press operators in trying out new products.”

Mr John Newman, Works Director, ET Heron & Co Ltd

### Advice to other printers from ET Heron & Co Ltd

Fountain solution supplier

**Heatons**

Tel: 0117 988 8899  Fax: 0117 988 8866
Environmental strategy reaps rewards at Evon Print Ltd

In 1998, Evon Print Ltd began an environmental programme to reduce its environmental impacts and particularly its use of organic solvents. The company decided to reduce its IPA consumption in response to the possibility of stricter legislation controlling solvent use in the printing industry. Implementing a low-alcohol fountain solution on one of its presses has saved the company £715/year in IPA purchase costs and reduced its VOC emissions by 1 tonne/year. Following this success, the company plans to reduce IPA use on all of its presses.

Background

Evon Print Ltd is an offset lithographic printing company at Small Dole in West Sussex. The company prints business stationery and full-colour brochures for many of the businesses in the local area. It has also enjoyed success in printing brochures and stationery for charities and large national institutions. The company was established in 1987 and employs 15 people.

Evon Print operates three presses:

- a Heidelberg Speedmaster 74;
- a Heidelberg Speedmaster 52;
- a Komori Lithrone 26.

The Heidelberg presses were both bought in the last five years and the Komori Lithrone was acquired in the early 1990s. The company does not use a large quantity of organic solvents and is below the threshold for regulation under Local Air Pollution Control (LAPC).

Introduction of the solvent reduction strategy

In 1998, Evon Print initiated an environmental strategy to reduce the environmental impacts of its operations and activities, particularly in the areas of waste management and solvent use. The first step taken by the company was to reduce its VOC emissions by successfully changing from solvent-based inks to vegetable-based inks.

In response to the possibility of stricter controls on the use of IPA in the printing industry, Evon Print began, towards the end of 1999, to investigate the possibility of reducing its IPA consumption. The company was using relatively high amounts of IPA on the presses, typically 12 - 13% IPA by volume on both of the Heidelberg presses and 12 - 16% on the Komori Lithrone. Typically, the average percentage for the majority of printers is 10% IPA to the volume of water.
In January 2000, the company was approached by a supplier of press room chemicals to trial a low-alcohol fountain solution that had recently been introduced onto the market. Evon Print invited the supplier to reduce the consumption of IPA on its busiest machine, the Heidelberg Speedmaster 74. To minimise disruption to the print runs, the trial was carried out over one day. Before the low-alcohol fountain solution was introduced, the mixer unit and the press rollers were cleaned thoroughly and the mains water supply was analysed for pH and conductivity. In conjunction with the low-alcohol fountain solution, the concentration of IPA in the dampening solution was reduced in steps of approximately 2% to a final concentration of 5% by volume.

Although initially the press operated well at 5%, the print quality began to deteriorate because the IPA in the dampening solution was evaporating too fast on the plate. The poor print quality and rapid evaporation of IPA on the plate were thought to be due to hot workplace conditions. The supplier helped Evon Print to adjust the alcohol concentration until an acceptable print quality was achieved. The IPA concentration in the dampening solution on the Heidelberg 74 was finally set at 7% by volume, with no deterioration in print quality.

Reducing IPA use on the Heidelberg 74 press did not require any capital investment or any significant additional training for the press operators. As part of its strategy to reduce IPA use, Evon Print has been encouraging the press operators to spend extra time setting up and adjusting the presses correctly for individual print runs.

Improved maintenance schedules have also helped the company to reduce the quantity of IPA used and to maintain print quality. As the company is situated in a hard water area, particular attention is given to ensuring that the rollers are decalcified frequently and that the filter on the mixer unit water tank is kept clean.

**Future solvent initiatives**

The second phase of the environmental strategy will begin shortly. This involves reducing IPA use further by introducing the low-alcohol fountain solution onto the Heidelberg 52 and Komori Lithrone presses.

The company has set a target to achieve a concentration of 7% IPA on the Heidelberg 52 and Komori presses within six months.

**Cost savings and other benefits**

Evon Print has successfully reduced IPA use on its Heidelberg Speedmaster 74 press by approximately 50%. In 1999, half of the 100 litres/week of IPA bought by the company was used on this press. Introduction of the low-alcohol fountain solution has reduced this amount to 25 litres/week, enabling the company to save £715/year and to reduce VOC emissions by 1 tonne/year (see Table 5).

Introducing the low-alcohol fountain solution on all the presses is expected to halve IPA consumption. This will save the company £1,430/year and reduce VOC emissions by a further 2.1 tonnes/year.
Additional cost savings have been made because the new low-alcohol fountain solution costs about half that of the original fountain solution. The concentration of the low-alcohol fountain solution in the dampening solution is also less.

Other benefits from the environmental strategy include:

- reduced operator exposure to IPA;
- increased use of press operators’ skills in setting up the presses to maintain the print quality;
- evidence that Evon Print is an environmentally responsible company - this has helped the company to obtain new business.

### Table 5  Summary of cost savings and environmental benefits at Evon Print Ltd

<table>
<thead>
<tr>
<th>Reduction in IPA use (litres/year)</th>
<th>Cost savings (£/year)*</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 300</td>
<td>715</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* Purchase of IPA only

### Advice to other printers from Evon Print Ltd

“The implementation of the environmental initiatives at Evon Print has been based on the philosophy that it is often cheaper to be ‘green’. The implemented initiatives have either saved us money or been achieved at no extra cost.

“The reduction of IPA on the presses is a good example of where a little effort at the initial stage in talking to press room chemical suppliers can reap rewards both financially and environmentally. The initiative to reduce IPA has put us in a strong position to cope with any future legislation requiring a reduction in the use of solvents.

“We have been able to demonstrate that the use of low-alcohol fountain solutions works and would recommend that other small companies investigate the possibilities of reducing their IPA consumption.”

Mr Kevin Evans, Print Manager, Evon Print Ltd

Low-alcohol fountain solution supplier

**Hydro-Dynamic Products**
Tel: 01273 464881  Fax: 01273 464626

**Heatons**
Tel: 0117 988 8899  Fax: 0117 988 8866
Print Council helps to reduce IPA use at Field/First Cartons Congleton Ltd

Field/First Cartons Congleton Ltd specialises in printing on packaging substrate for the food and automotive industries using conventional and UV inks. Before the implementation of a solvent reduction programme, the presses were running with as much as 20% IPA. This percentage is well above the industry average for IPA in the dampening solution. A Print Council made up of managers and press operators was set up to oversee the solvent reduction programme. Using effective management practices rather than changing to a low-alcohol fountain solution has reduced IPA use by 33.5%. This reduction has saved the company about £12 500/year and reduced VOC emissions by 12 tonnes/year. These savings were achieved without significant capital expenditure.

Background

Field/First Cartons Congleton Ltd is a commercial offset lithographic printing company that specialises in printing on packaging substrate for the food and automotive industries. The company employs 100 people and has an annual turnover of £12 million. The site operates for 24-hours a day and has three shifts. The site at Congleton was established in the 1940s and historically provided printed packaging for the tea industry.

The company uses IPA in the dampening solutions on the following presses:

- Planeta seven-colour plus coater;
- Roland 800 six-colour plus coater;
- Komori Lithrone five-colour plus coater;
- KBA six-colour plus two coaters.

The presses are fitted with ultraviolet lamps for rapid curing of the printing inks. The Planeta and Roland presses were bought about ten years ago. The Komori press was bought after this and the KBA press was installed in May 2000. The company uses more than 25 tonnes/year of organic solvents and is, therefore, regulated by the local authority under Local Air Pollution Control (LAPC).

Introduction of the solvent reduction programme

Over the last ten years, Field/First Cartons Congleton has introduced a number of initiatives to improve the management of health, safety and environmental issues at the site. In anticipation of future legislation that may restrict the use of organic solvents in the printing industry, the company launched its solvent reduction strategy four years ago. The solvent reduction programme was driven by the press manager, who had recently joined the company and was aware of the possibilities for reducing the use of IPA on the presses.
The solvent reduction programme began with a simple monitoring programme to determine how much IPA was used on the presses. By monitoring the chemicals used in the mixer units, the company discovered that the presses were often running with more than 15 - 20% IPA in the dampening solution. This highlighted an area where excess IPA was being used, thus increasing the risk of substrate waste because of scumming (ink flecks on the non-image areas of the plate).

The monitoring regime enabled the company to identify which print jobs could be run without a deterioration of print quality using less IPA.

To gain shop-floor ownership of the solvent reduction programme, press operators were encouraged to participate in efforts to resolve print quality problems without resorting to increasing the percentage of IPA used in the press runs. During the initial stages of the solvent reduction programme, a number of workshop tutorials involving the press operators and the managers were arranged to discuss the environmental and technical issues associated with reducing IPA use.

Field/First Cartons Congleton favours a team-based approach, with three teams working over the three shifts. A Print Council was set up to discuss departmental performance and waste levels. This body consists of the chief executive, the production manager and the three lead operators.

The solvent reduction programme has worked particularly well on the two older presses, the Planeta and the Roland 800, which in the past were running with high percentages of IPA. Both presses now generally run at less than 15% IPA.

While increased management control and supervision has reduced IPA use on the two older presses, the company decided to reduce IPA use on the newer Komori press to the lowest possible level compatible with maintaining acceptable print quality. In conjunction with the suppliers of its fountain solution and ink, Field/First Cartons Congleton undertook a six-month trial to reduce IPA use in a staged implementation programme.

Over the six-month period, IPA use was reduced from over 15% to zero on most of the Komori colour units. Initially results were good, but the ability to run the press at zero or low IPA concentrations could not be maintained for all the print jobs. The IPA concentration was gradually increased to take into account the requirements of most of the print runs and is now generally 10%. However, this reduction has lowered IPA consumption by a third. Improvements have been maintained by regular seminars to resolve technical issues and to develop and maintain operators’ skills.

**Future solvent initiatives**

Field/First Cartons Congleton plans to implement an IPA reduction programme on the KBA press and install a reverse osmosis water system to achieve consistent water quality and reduce calcification on the rollers. The company has set itself a target to reduce IPA concentration to 6% on this press over a period of six months.
Cost savings and other benefits

Implementation of the solvent reduction programme has produced significant cost savings. Before the programme was initiated in 1997, Field/First Cartons Congleton used 46 800 litres/year of IPA. Over the four years of the solvent reduction programme, IPA use has fallen to approximately 31 200 litres/year. This is equivalent to a saving of £12 500/year on IPA purchase costs and a reduction in VOC emissions of 12 tonnes/year (see Table 6). No capital expenditure was involved in achieving these benefits.

The company considers that it has also benefited from:

- an improvement in print quality;
- less substrate wastage;
- reduced fire risk and annual insurance premium;
- improved relations with the local authority.

### Table 6 Summary of cost savings and environmental benefits at Field/First Cartons Congleton Ltd

<table>
<thead>
<tr>
<th>Reduction in IPA use (litres/year)</th>
<th>Cost savings (£/year)*</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 600</td>
<td>12 500</td>
<td>12</td>
</tr>
</tbody>
</table>

* Purchase of IPA only

Advice to other printers from Field/First Cartons Congleton Ltd

“The successful implementation of a solvent reduction programme involves three major inputs - technical skills, reliable equipment and regular maintenance. The management approach at Field/First Cartons Congleton is to ensure that the press operators have the technical skills and experience to run the presses without relying on the use of high concentrations of IPA.

“In order to improve the technical skills of the press operators, it is important to obtain their co-operation and to provide regular feedback on solutions to technical print quality problems. Ensuring the equipment is regularly maintained and is replaced when necessary greatly reduces the amount of waste produced and helps to ensure that IPA is used efficiently.

“The company has benefited from working closely with the suppliers of ink and fountain solution when setting up trial runs on the Komori press. It is important to keep an open mind when trying new products and to learn from the experience of other printers.”

Mr John Morgan, Print Technical Manager, Field/First Cartons Congleton Ltd

Fountain solution supplier

Varn International Ltd
Tel: 0161 775 5412  Fax: 0161 775 5415
Reduced IPA use brings cost savings and workplace improvements at Headley Brothers Ltd

Headley Brothers Ltd prints a wide variety of magazines, journals and business literature using sheet-fed and heat-set web presses. The company eliminated the use of IPA on its heat-set web presses over ten years ago and, in 1999, reduced the concentration of IPA used on its sheet-fed presses from 12% to 7.5%. Eliminating IPA use on the heat-set web presses has saved the company £25,500/year and reduced VOC emissions by 33.7 tonnes/year. Use of a low-alcohol fountain solution on the sheet-fed presses has allowed the company to increase production by 38% without increasing IPA use. The saving in IPA purchase costs is worth some £6,000/year.

Background

Headley Brothers Ltd prints a wide variety of magazines, journals, annual reports and colour prints using sheet-fed and heat-set web presses. The company employs 300 people and was established at Ashford, Kent, in 1881.

The company operates:

- three sheet-fed eight-unit Heidelberg Speedmaster 102 presses;
- two 16-page Heidelberg heat-set web presses.

The sheet-fed presses are 18 months to six years old and the heat-set web presses are over ten years old.

Introduction of a low-alcohol fountain solution on the sheet-fed presses

Headley Brothers has explored the possibility of reducing IPA use on its sheet-fed presses for several years. Historically, these presses were run with a dampening solution containing 12% IPA. In 1999, a trial using a low-alcohol fountain solution was set up on one press. The press operators were fully involved in this trial. The press’s performance over a month was recorded and any problems relayed to the supplier of the fountain solution. With the supplier’s assistance, the concentration of IPA was immediately reduced to 8%. After two months, the new fountain solution was introduced onto the other two sheet-fed presses.

Attempts to reduce the IPA concentration to 4% affected print quality and increased maintenance of the presses. The IPA content was then increased gradually until an acceptable print quality was achieved at a concentration of 7.5%. Running the presses at an IPA concentration of 7.5% has proved successful, with no reduction in press output.
Introduction of the new fountain solution did not necessitate any additional training for the press operators or result in any significant changes to existing procedures. No investment in new equipment was required.

Other initiatives introduced by Headley Brothers to reduce the environmental impact of IPA include the use of an automatic dosing system to ensure that liquid concentrates such as IPA are added to the mixer unit economically and that evaporation losses are reduced. IPA is introduced to the mixer unit through airtight pumps and the dampening solution is kept chilled to prevent evaporation and to help control print quality.

**Introduction of an alcohol-free fountain solution on the heat-set web presses**

Headley Brothers eliminated the use of IPA on the 16-page Heidelberg heat-set web presses ten years ago. Before that, the presses were run using 15% IPA in the dampening solution. The trial period for testing the alcohol-free fountain solution lasted approximately two months, when IPA use was reduced to zero almost immediately. Some initial print quality problems were experienced due to over-emulsification, but these were quickly solved by introducing a bridging roller and increasing the frequency of the roller wash-up.

The change increased the frequency of the roller wash-up which added a small additional cost to the business. To prevent calcification on the press rollers, a reverse osmosis water management system was subsequently installed.

**Cost savings and other benefits**

Before the low-alcohol fountain solution was introduced, the sheet-fed presses consumed 27 000 litres/year of IPA. Since then production has increased by approximately 38%, but the amount of IPA purchased has remained the same. Use of the low-alcohol fountain solution has, therefore, avoided the need to buy over 10 000 litres/year more IPA. Based on current production levels, the company will, therefore, save around £6 000/year and avoid emitting some 8 tonnes/year of VOCs.

Eliminating IPA from the heat-set web presses has saved Headley Brothers approximately £25 500/year. Before this, these presses used around 42 640 litres/year of IPA. This rate of consumption is equivalent to the release of 33.7 tonnes/year of VOCs into the atmosphere.

Table 7 summarises the cost savings and environmental benefits of the IPA reduction programme.
In addition, the lower IPA concentration used on the sheet-fed presses and elimination of IPA use on the heat-set web presses have:

- resulted in a more comfortable working environment, with reduced risk of operator exposure to IPA;
- allowed Headley Brothers to demonstrate good environmental practice to its local authority.

Headley Brothers has recently purchased a Heidelberg Sunday 2000 web press which has been running alcohol-free since its installation.

**Table 7 Summary of cost savings and environmental benefits at Headley Brothers Ltd**

<table>
<thead>
<tr>
<th></th>
<th>Cost savings (£/year)*</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliminating IPA use on the heat-set web presses</td>
<td>25 500</td>
<td>33.7</td>
</tr>
<tr>
<td>Introduction of low-alcohol fountain solution on the sheet-fed presses**</td>
<td>6 000</td>
<td>8.0</td>
</tr>
<tr>
<td>Total</td>
<td>31 500</td>
<td>41.7</td>
</tr>
</tbody>
</table>

* Purchase of IPA only  ** Avoided increased IPA consumption when production increased

“Printers who wish to reduce their use of IPA should try to be flexible and willing to try new products in closely supervised trials carried out with the full knowledge and support of the press operators. To remain competitive with other printers, it is important to try new products such as low-alcohol fountain solutions from time to time. In our experience, it is vital that the suppliers of such products are willing to come on-site to advise on the setting up of the presses and to deal with any problems with print quality.

“We have experienced questions from our customers on our environmental policy and the environmental initiatives at Headley Brothers. Reducing our use of IPA has allowed us to demonstrate that we are reducing our environmental impact and has allowed us to maintain and expand our customer base.”

Mr Tony Smith, Works Director, Headley Brothers Ltd

**Advice to other printers from Headley Brothers Ltd**

Sheet-fed presses:

Shackell Edwards & Co Ltd
Tel: 0161 406 6033  Fax: 0161 406 6233

Heat-set web presses:

Varn International Ltd
Tel: 0161 775 5412  Fax: 0161 775 5415
A decade of alcohol-free printing at Kent Art Printers Ltd

Kent Art Printers Ltd has been successfully printing quality business literature for over ten years without using IPA in the printing process. Printing alcohol-free has improved the working environment for the press operators and saved the company at least £1,560/year in IPA purchase costs. Kent Art Printers has also saved approximately £1,000/year because the alcohol-free fountain solution is cheaper than the original fountain solution.

Background

Kent Art Printers Ltd is a medium-sized sheet-fed offset lithographic printing company located in Chatham. It prints company brochures, periodicals, company reports and multilingual publications for the European market. Kent Art Printers currently employs 45 people and has a turnover of approximately £2.5 million. The company was established in 1934 and has been family-run for three generations.

The five presses in use at the company are:

- a six-colour KBA press;
- two four-colour KBA presses;
- a Heidelberg GTO press;
- a Heidelberg KORD press.

The two four-colour KBA presses are the oldest presses on the site and were purchased in the 1980s. The company does not use a large quantity of organic solvents and is below the threshold for registration with the local authority under Local Air Pollution Control (LAPC).

Introduction of the IPA elimination programme

When Kent Art Printers moved to its present premises in 1990, it decided to investigate the possibility of running the presses without using IPA. The main driver for the decision to eliminate IPA use was to improve the working environment of the press operators and avoid their exposure to IPA. In addition, because the site is directly above an aquifer, any solvent spillages could result in an expensive clean-up operation.

The IPA elimination programme was steered by the general manager with the support of the lithographic print manager. The first step was to identify press room chemical suppliers that could supply alcohol-free fountain solutions suitable for use on the presses. In August 1990, a supplier was contacted and invited to trial an alcohol-free fountain solution on one of the KBA four-colour unit presses.
Before the elimination programme, the concentration of IPA in the dampening solution was 12 - 15%. With the implementation of the programme, the concentration of IPA in the dampening solution was reduced to zero virtually overnight. During the next six months, the press set-up was adjusted until the company was fully satisfied with the print quality. The alcohol-free fountain solution was then run on the other presses.

Initial problems with the print quality were resolved by:

- adjusting the dampening and ink rollers to a harder setting;
- reducing the temperature of the dampening solution;
- adjusting the ratio of the water to fountain solution, following the supplier’s recommendations;
- implementing new procedures to ensure the dampening system was flushed out regularly to prevent the build-up of fungal growth.

Training provided by the chemical supplier helped to achieve a smooth transition to the new fountain solution. The lithographic manager, who was also the site union leader, worked to ensure that any problems identified by the press operators were sorted out quickly, thus minimising any disruption to the print runs.

Elimination of IPA did not require any investment in additional press equipment. Changing to an alcohol-free fountain solution did not increase the cost of press consumables.

**Future initiatives**

The company is always keen to try out new technologies to improve print quality and plans to invest shortly in a reverse osmosis water system to improve the consistency of the water and to prevent calcium deposits building up in the pipework. The company is also considering investing in automatic dosing units to ensure that the correct amount of fountain solution is added to the water.

Kent Art Printers is holding discussions with a chemist from its ink supplier about techniques to reduce the erosion of printing plates which may be caused by bacterial growth.

In the near future, the company will be acquiring a new KBA five-colour press (plus coater), which has the option of running waterless if required.

**Cost savings and other benefits**

Kent Art Printers has successfully eliminated the use of IPA on all the presses. In 1990, the company was buying 50 litres/week of IPA. Using the alcohol-free fountain solution has saved the company £1 560/year and reduced VOC emissions by 2.1 tonnes/year (see Table 8). Without the successful elimination programme, the company would now be buying 200 litres/week of IPA to meet current production levels and releasing 8.4 tonnes/year of VOCs.
In addition, the company has saved approximately £1,000/year because the alcohol-free fountain solution is cheaper than the original fountain solution. The concentration of the alcohol-free fountain solution in the dampening solution is also lower.

Elimination of IPA use has met the main management objective of improving the working environment in the press room. Eradicating the press operators’ exposure to IPA has noticeably increased productivity - with less stress, less illness and improved relations with the operators.

Running the presses alcohol-free has tested the skills of the press operators, but improved press set-up procedures have helped to improve print quality.

As well as achieving the main benefit of improved working conditions, elimination of IPA has given the company a significant commercial advantage over other printers. Kent Art Printers is able to acquire clients that demand a more environmentally friendly printing process to print their products.

**Table 8 Summary of cost savings and environmental benefits at Kent Art Printers Ltd**

<table>
<thead>
<tr>
<th>Reduction in IPA use (litres/year)</th>
<th>Cost savings (£/year)*</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,600</td>
<td>1,560</td>
<td>2.1</td>
</tr>
</tbody>
</table>

* Purchase of IPA only

“Sheet-fed offset printing companies that wish to reduce or eliminate IPA use should want to do so for the right reasons. Although the direct cost savings are welcome, they are less important in our experience than improving health and safety in the press room. As a family-run company, the welfare of our employees is of primary concern. Elimination of IPA has resulted in an improved working atmosphere and increased productivity.

“The eradication of IPA from the printing process demands time and commitment, especially in the initial phase where there may be problems with print quality. These problems can be overcome by utilising the expertise of the press room supplier and encouraging people to take on-board new techniques for managing the presses.”

**Mr Kerry Warnock-Horn, General Manager, Kent Art Printers Ltd**

**Alcohol-free fountain solution supplier**

**Varn International Ltd**

**Tel:** 0161 775 5412  **Fax:** 0161 775 5415
IPA elimination programme reduces VOC emissions at St Ives Plymouth Ltd

St Ives Plymouth Ltd is a large heat-set web offset lithographic printing company, specialising in the printing of high-quality magazines and business brochures. The company stopped using IPA in its printing process in 1995. St Ives Plymouth has achieved significant benefits from using an alcohol-free fountain solution, saving approximately £54 000/year in IPA purchase costs and reducing its VOC emissions by 142 tonnes/year.

Background

St Ives Plymouth Ltd is a large heat-set web offset lithographic printing company located in south Devon. The company specialises in the printing of magazines, company brochures and catalogues, printing between 7 - 9 million magazines per month. St Ives Plymouth was established in 1987 and currently employs 300 people.

The four presses currently in use on the site are:

- two M300 Heidelberg eight-unit presses;
- a M600 Heidelberg eight-unit press;
- a MAN Rotoman N eight-unit press.

The MAN Rotoman is the newest press on the site and was purchased in January 2000. The other presses were bought in the 1990s. The company uses more than 25 tonnes/year of organic solvents and is regulated by the local authority under Local Air Pollution Control (LAPC).

Introduction of the IPA elimination programme

In 1994, St Ives Group produced its first environmental policy statement, which included an objective to reduce VOC emissions. That year, St Ives Plymouth began an environmental initiative to reduce the VOC emissions from its site. A key element of this initiative was to investigate the possibility of using alcohol-free fountain solutions on its presses.

The first step in the IPA elimination programme was to contact suppliers of press room chemicals to determine the availability of alcohol-free fountain solutions. After developing quality procedures to ensure that different products could be compared objectively, St Ives Plymouth invited several potential suppliers to provide alcohol-free fountain solutions for a trial period.

The different alcohol-free fountain solutions were tested on all the Heidelberg presses over a range of representative print jobs and substrates to determine their suitability. Parameters during the trials included:

- the compatibility of the alcohol-free fountain solution with the inking system and the substrate;
the amount of waste generated;
- the length of time taken for the print run.

Before the trials, the Heidelberg presses were using 10% IPA by volume in the dampening solution. During the changeover to an alcohol-free fountain solution there were initial problems with the print quality. However, with the help of the fountain solution suppliers, St Ives Plymouth identified the main causes of these problems as:
- the rollers and dampening systems had not been adequately cleaned and flushed through;
- the ink and dampening rollers were too heavy and not set as per the press manufacturer’s specification.

Eliminating IPA use on the Heidelberg presses did not require any capital investment. Print quality and press speed have been maintained.

Involving employees at all levels of the business and gaining their full support helped St Ives Plymouth to successfully eliminate IPA from the Heidelberg presses by 1995. This has led to a new company culture and enabled health, safety and environmental initiatives to be integrated into the daily running of the site.

Toolbox talks on the shop floor were an important factor in gaining the full support of the operators to run the presses alcohol-free. The talks gave the company the opportunity to demonstrate how to run the presses alcohol-free and to deal with any concerns that arose.

The newest press on the site (the MAN Rotoman) was bought with a dampening system that allowed it to be run with a suitable alcohol-free dampening solution straight away.

St Ives Plymouth continually tries out new products and investigates technological advances to further improve the performance of its presses. The company is currently testing the use of reverse osmosis water units to improve the constancy of the water quality used in the mixer dosing units.

Cost savings and other benefits

Elimination of IPA use on the presses at St Ives Plymouth has resulted in significant cost savings. The company has saved approximately £54 000/year, equivalent to the consumption of around 180 000 litres/year of IPA (see Table 9). The environmental benefits are also significant, as VOC emissions have been reduced by approximately 142 tonnes/year.
In addition to the direct savings in IPA purchase costs, the company has benefited from:

- reduced fire risk and lower insurance premium;
- an improved maintenance programme;
- increased lifetime of the ink and dampening rollers;
- an improved health, safety and environmental culture;
- improved team working between the management and operators;
- improved press operator skills;
- the demonstration of a proactive approach to environmental issues to customers and the local authority.

**Table 9 Summary of cost savings and environmental benefits at St Ives Plymouth Ltd**

<table>
<thead>
<tr>
<th>Reduction in IPA use (litres/year)</th>
<th>Cost savings (£/year)*</th>
<th>Reduction in VOC emissions (tonnes/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 000</td>
<td>54 000</td>
<td>142</td>
</tr>
</tbody>
</table>

* Purchase of IPA only

"Success at St Ives Plymouth has been management-driven, ensuring that the press operators are alongside and are provided with the right training and resources to obtain the best from the alcohol-free solutions. Companies wishing to evaluate and trial low-alcohol and alcohol-free fountain solutions should assess the technical support offered by the fountain solution supplier. It is also important to identify how change will be managed, to ensure that new fountain solutions are enthusiastically taken on-board by the press operators."

**Mr Barrie Winkworth, Factory Manager, St Ives Plymouth Ltd**

**Advice to other printers from St Ives Plymouth Ltd**

**Alcohol-free fountain solution suppliers**

- **Heatons**
  Tel: 0117 988 8899  Fax: 0117 988 8866
- **Stehlin Hostag UK Ltd**
  Tel: 0115 986 0477  Fax: 0115 986 2681
- **Varn International Ltd**
  Tel: 0161 775 5412  Fax: 0161 775 5415
This Good Practice Guide has shown how eight companies have successfully reduced or eliminated IPA use on a range of offset lithographic printing presses. The Industry Examples describe how these companies have:

- achieved cost savings from reduced purchases of IPA and other press room chemicals;
- reduced their impact on the environment by reducing their VOC emissions;
- improved the working environment for press operators;
- reduced fire risks and annual insurance premiums.

Some companies in the Industry Examples also believe they have made the following savings, although these are sometimes difficult to quantify:

- improved management and productivity of the presses, resulting in less substrate and ink waste;
- reduced maintenance;
- avoided having to install expensive pollution abatement equipment;
- enhanced print quality.

Most of the companies found they could use alcohol replacement chemistry to reduce or eliminate IPA. This was achieved without capital investment.

Fig 3 shows an action plan for companies wishing to reduce or eliminate IPA use in their dampening solutions.
4.1 Further help and advice

If you would like help with specific questions about IPA reduction or elimination, the Environment and Energy Helpline on 0800 585794 can help signpost you to relevant technical experts. The Helpline can also:

- provide free, up-to-date advice on environmental issues;
- tell you about relevant environmental and other regulations that could affect your operations;
- send you copies of relevant Envirowise publications;
- suggest other sources of information;
- arrange for a waste minimisation specialist to visit your company if you employ fewer than 250 people (at the discretion of the Helpline Manager).

Particularly relevant Envirowise publications include:

- *Simple Measures Reduce Isopropyl Use* (GC85) - a Case Study at The Beacon Press;
- *Free Help to Stop Your Profits Evaporating* (ET209) - details of all Envirowise publications with practical advice for cost-effective solvent management;
- *Good Housekeeping Measures for Solvents* (GG28) - practical no-cost and low-cost measures to reduce solvent consumption and VOC emissions.

All Envirowise publications are available free of charge through the Environment and Energy Helpline on freephone 0800 585794 or via the Envirowise web site (www.envirowise.gov.uk).
Suppliers of press room products to the printing industry

The following table lists possible suppliers of equipment and chemicals used for reducing or eliminating IPA use in lithographic printing. The list is not exhaustive but has been compiled from the information currently available to Envirowise. The listing of a supplier should not be regarded as an endorsement of its services or products by Envirowise. Similarly, Envirowise makes no claim for the competence or otherwise of any supplier not listed.

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Telephone no.</th>
<th>Low-alcohol/ alcohol-free fountain solutions</th>
<th>Electronic and magnetic devices</th>
<th>Mechanical devices</th>
<th>Reverse osmosis water treatment</th>
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<tr>
<td>AMI Supplies Ltd</td>
<td>01442 242251</td>
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<td>Bottcher UK Ltd</td>
<td>01495 350300</td>
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<tr>
<td>Druck Chemie</td>
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<tr>
<td>Envertron Aquatek</td>
<td>01277 214455</td>
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<tr>
<td>Heatons</td>
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<td>-</td>
<td>-</td>
<td>✔</td>
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<tr>
<td>Hydro-Dynamic Products</td>
<td>01273 464881</td>
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<tr>
<td>Keane Graphics</td>
<td>01233 502065</td>
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<tr>
<td>Litho Supplies Plc</td>
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<tr>
<td>Openshaw International</td>
<td>01706 812672</td>
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<tr>
<td>Pomeroy Press Room Products</td>
<td>01594 837474</td>
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<tr>
<td>Shackell Edwards &amp; Co Ltd</td>
<td>0161 406 6033</td>
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<tr>
<td>Stehlin Hostag UK Ltd</td>
<td>0115 986 0477</td>
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</tr>
<tr>
<td>Ultrachem Ltd</td>
<td>020 8446 8263</td>
<td>✔</td>
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</tr>
<tr>
<td>Varn International Ltd</td>
<td>0161 775 5412</td>
<td>✔</td>
<td>-</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

✔ = YES - = NO
Envirowise - Practical Environmental Advice for Business - is a Government programme that offers free, independent and practical advice to UK businesses to reduce waste at source and increase profits. It is managed by AEA Technology Environment and NPL Management Limited.

Envirowise offers a range of free services including:

- Free advice from Envirowise experts through the Environment and Energy Helpline.
- A variety of publications that provide up-to-date information on waste minimisation issues, methods and successes.
- Free, on-site waste reviews from Envirowise consultants, called Fast Track Visits, that help businesses identify and realise savings.
- Guidance on Waste Minimisation Clubs across the UK that provide a chance for local companies to meet regularly and share best practices in waste minimisation.
- Best practice seminars and practical workshops that offer an ideal way to examine waste minimisation issues and discuss opportunities and methodologies.