

## INTRODUCTION OF WATER-BASED PAINTS AT A REFRIGERANTS SUPPLIER

This Case Study at Harp International Ltd demonstrates the cost savings and environmental benefits that were achieved when a supplier of refrigerant gases applied material substitution through green chemistry. Harp International has a very proactive approach to improving its environmental performance. Upgrading the paint plant to use water-based paints has been one of many initiatives to reduce the company's impact on the environment. The benefits to Harp International of green chemistry include:

- Replacing hazardous, solvent-based paints with a less-hazardous alternative
- Increased process efficiency
- Reduced exposure of employees to hazardous substances
- Lower VOC emissions from the site
- A reduction in the amount of hazardous waste generated on site



# BACKGROUND

Harp International Ltd provides a complete service to the refrigeration/air-conditioning, aerosol-propellant and foam-blowing industries by supplying a range of products including halocarbon and hydrocarbon secondary refrigerants, and reclaiming waste refrigerants. Its capability includes full cylinder traceability and a comprehensive analytical service.

Through the company's main UK distributor, Harp provides customers with refrigerant gases packaged in steel cylinders. These products are used to charge refrigeration systems and are bought by companies ranging from large contracting firms to smaller independent engineers. When finished with, the cylinders are returned to Harp. They are then emptied of any residual product (which is pooled and re-used), internally inspected for faults and repainted prior to refilling.

In an attempt to prevent illegal venting to atmosphere (enforced through several EU directives and protocols), Harp provides the market with financial incentives to recover waste refrigerant. The incentive can be significant and, in return, Harp can reprocess and resell the refrigerant, thus generating a secondary revenue stream. Waste refrigerants returned to Harp for reprocessing and re-use are put in special reclaim cylinders which are distinguished from the pure product cylinders by a yellow band.

In an effort to continue to improve its environmental performance, Harp has made significant modifications to the cylinder-painting process, leading to a reduction in risks to the environment and human health.

## DRIVER FOR MATERIAL SUBSTITUTION

The original paint plant, designed for solvent-based paints, was installed in 1992. Although the annual consumption of solvents fell short of any statutory regulations (eg the Solvent Emissions Directive), a business decision was made to upgrade the facility and convert to using less-hazardous, water-based paints. Aside from the potential to achieve greater plant efficiency, the main driver leading to this move

was to improve the company's overall performance in line with the objectives of its environmental policy.

The upgraded paint plant can also band recovery cylinders with yellow paint, which was previously a labour-intensive activity, and a new ink-stencilling unit replaces the manual-labelling process, which previously used aerosol cans.

## PROJECT IMPLEMENTATION

The main plant modifications involved a capital expenditure of about £50,000, with an additional £8,500 to install the new stencilling unit. The parts of the paint plant that were sensitive to the more viscous, water-based paints needed to be completely replaced (eg the paint-mixing chamber and head gear). In fact, it was getting the viscosity correct that involved the greatest challenge. The whole process was trialled at the paint/plant manufacturer's premises for up to nine months before commissioning started on site.



## ENVIRONMENTAL BENEFITS AND COST SAVINGS ENCOUNTERED

### Paint Plant

Although the water-based paints are more expensive (£5.50/litre compared with £2.03/litre for solvent-based paint), the increased costs have been offset by the plant operating much more efficiently, consuming a significantly lower amount of paint per cylinder (previously 0.13 litres/cylinder and now 0.04 litres/cylinder) and processing more cylinders in a day (425 cylinders/day compared with 300 cylinders/day previously).

From an environmental point of view, the substitution has reduced volatile organic compound (VOC) emissions by some 30% and much less hazardous waste is generated (the resultant sludge is now non-hazardous). An added benefit is that staff no longer have to handle hazardous substances (all staff hold Handling Safely certificates and the company is committed to the Investors in People (IiP) standard).

### Inkjet Stenciller

After painting, each cylinder is stencilled with the gas type and net weight of product. Previously, this process was carried out manually using aerosol paint cans that had a high VOC content. An inkjet stenciller was installed and the cylinders now pass through a programmable printing head. Just 1 litre of ink is used to stencil one year's supply of cylinders (about 40,000) compared with 398 aerosol cans containing 179 litres and a VOC content of around 123 kg. Therefore, VOC emissions are significantly reduced by a factor of at least 100 (depending on the ink VOC content). Annual material costs were reduced from £788 to £138 and the disposal of 398 used aerosol cans as hazardous waste was also eliminated.



## SUMMARY OF BENEFITS

ITEM	SAVING	ENVIRONMENT
Paint Plant	<ul style="list-style-type: none"> <li>Annual costs for materials reduced by £1,700</li> <li>Material quantities reduced by a factor of at least 3</li> <li>Throughput increased by 40%</li> </ul>	<ul style="list-style-type: none"> <li>VOC emissions reduced by 30%</li> <li>Waste sludge now non-hazardous</li> </ul>
Inkjet Stenciller	<ul style="list-style-type: none"> <li>Reduction in materials: 1 litre of ink replaces 398 cans containing 179 litres</li> <li>Annual cost for materials reduced by £650</li> </ul>	<ul style="list-style-type: none"> <li>398 aerosol cans per year not now used or disposed of</li> <li>VOC emissions reduced by a factor of at least 100</li> </ul>

## LOOKING AHEAD

This has been the first major step change towards the application of green chemistry within Harp International. However, in keeping with the company's approach towards continual improvement, it is looking into the feasibility of a new powder-coating process. This would remove the use of water-based paints completely and further reduce emissions of VOCs.

## HARP INTERNATIONAL LTD

Harp International Ltd was established in 1991 with the objective of providing a complete refrigerant service to the refrigeration and air-conditioning industry. Since that time, Harp International has become a leader in the supply of high-quality refrigerants in the UK and overseas. As a natural extension to the business, the 'Complete Service' philosophy has been expanded with the addition of a range of products and services that are principally tailored to the foam-blowing and aerosol-propellant industries.



Harp International is based at Pontypridd in South Wales in a 4,650 m<sup>2</sup> plant, which incorporates state-of-the-art packaging and reclamation facilities, together with extensive warehousing and distribution capabilities. The company maintains the highest quality, environmental, and health and safety standards.

## COMMENTS FROM HARP INTERNATIONAL LTD

The upgrade to the paint plant has improved the quality of our packaged product, reduced our environmental impact and eliminated a health and safety hazard. This fully complements our integrated management system policy and demonstrates our commitment to continuous improvement through our accreditations to IIP, ISO 9001, ISO 14001 and our current implementation of OSHAS 18001.

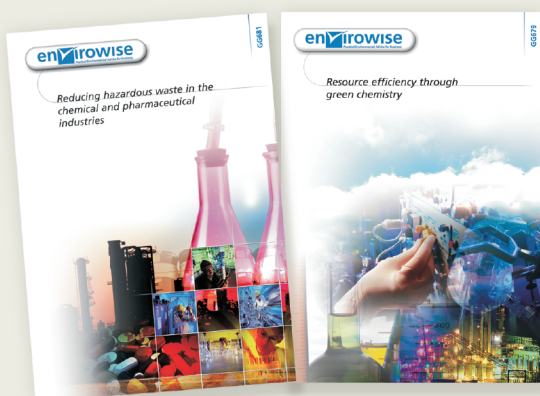


**“THE UPGRADE TO THE PAINT PLANT HAS IMPROVED THE QUALITY OF OUR PACKAGED PRODUCT, REDUCED OUR ENVIRONMENTAL IMPACT AND ELIMINATED A HEALTH AND SAFETY HAZARD.”**

Bryan J Davies, Finance & Operations Director,  
Harp International Ltd

### Host Company:

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