ESIG

ADHESIVE COATING

2001 AWARD SOLVENT STEWARDSHIP

Jowat Klebstoffe

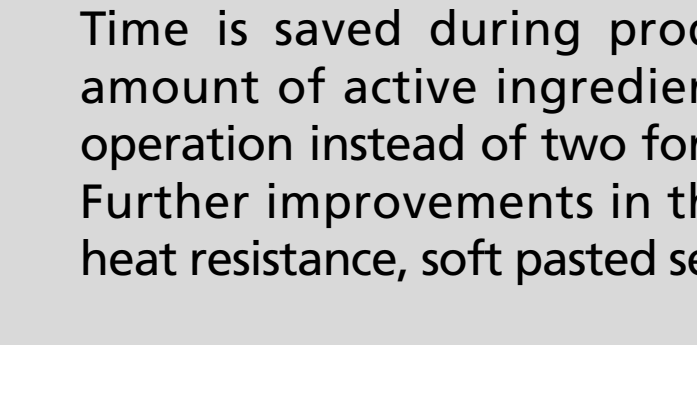
Best Product Improvement Winner

Jowat, Lobers and Frank GmbH, Detmold is a world-wide manufacturer of adhesives, which this year was awarded the solvent stewardship award for Best Product Improvement.

Jowat produces solvent-based glues for applications in the upholstery and foam mattress industry. The team at Jowat, identified a risk during the application of glues, in that sparks resulting from static charge could inflame the upholstery and the foam on which they were being used. With the aim of eliminating this risk an adhesive was formulated with an increased solid content. At the same time, the required viscosity was maintained, allowing the glue to be applied with precision as a spray thus keeping emissions to a minimum. Jowat therefore ensured that the risk of flammability in the industrial application could be reduced to a level comparable with water based adhesives with no compromise to the quality afforded by solvent based adhesives.

Time is saved during product application as the required amount of active ingredients can be applied in one coating operation instead of two for the original adhesive formulation. Further improvements in the quality of the adhesive include heat resistance, soft pasted seam and increased adhesive efficacy.

The demand for the new solvent-based adhesive was such that Jowat invested in a new production site in Zeitz, Germany. The success of Jowat's new formulation with adhesive users lies in the fact that costly refittings and changes to working procedures have been avoided and greater efficiency in processing was achieved through higher yield and fast evaporation times. Equally there is no risk of rusting of barrel cores or moulding of the upholstery material through the addition of water.



Jowat have organised product information in worker news, a film on product safety, a customer symposium, and training for workers on handling solvents by solvent suppliers. The have also worked in conjunction with manufacturers of the adhesive application installations and with trade associations.

ESIG

COATING MANUFACTURE

STEWARDSHIP AWARD 2001

Site Improvement Winner

SOPPEC was the winner of the award in the category of Site Improvement in 2001. The project was to design and construct a new production site for the formulation, manufacture and packaging of special paint aerosols. SOPPEC were assisted by INERIS, consultants in safety issues to both the French Government and Industry.

The plant was designed to ensure minimum impact on the environment and on the health and safety of employees and the local community. Solvents are recycled and cleaned and emissions are kept below 3% of incoming volumes. Amongst other safety considerations, SOPPEC has installed fire and gas detection systems, video surveillance equipment and specially designed safety caps for aerosols. Furthermore, SOPPEC was one of the first aerosol companies in France to install a sloped reservoir for safe storage of Liquid Petroleum Gas (LPG), used in the production process.

Solvents are blanketed with nitrogen and stored in double walled underground tanks with automatic management of leaks and levels. Emissions have been reduced at the source by the use of so-called Pouyes rings and articulated arms in production, packaging and the laboratory. SOPPEC is an active member of the Coatings Care Programme, a progressive health and safety initiative for the paints, inks, and adhesives industries, and regularly participates in other safety work with the Federation of Paints, Inks and Adhesives (FIPEC) and the Comite Francais des Aerosols (CFA).

The preventative management of risks linked to the inflammable nature of certain constituents (solvents, LPG), control over procedures, and a considerable investment, particularly in R&D, allow SOPPEC to offer European markets high-performance and reliable products. These products are adapted to the prescribed requirements and specific sensitivities of the German, Austrian, and Swiss markets.

Most of the described improvements (procedures, products, factory design) can be applied in the various fields of the parachemical industry (industries with discontinuous processes using volatile solvents or inflammable gases such as manufacture of paints, inks, adhesives, cleaning materials, cosmetics, aerosol industry, etc.). The products brought onto the market are more reliable (complete mastery of the manufacturing, packaging and development process), traceable, and less harmful.

INTERGRAF

International Confederation for the Printing and Allied Industries

Overall Winner

Intergraf and the European Graphical Federation

The Integraf and EGF project, 'Printing and the Environment; Guidance on Best Available Techniques (BATs) in printing industries' was co-funded by the European Commission's DG Social Affairs.

The group compiled and published a guide on techniques for dealing with the environment in the European printing industry for printers, suppliers, and enforcement authorities. The content was based on information from all over the European Union and was checked, validated and where necessary corrected, by a multinational group of experts, working for both employer federations and trade unions.

The project covered all process emissions from printing and focused on health, safety, and environmental protection. The Guidelines acknowledged the fact that at least 85% of printing companies are SMEs and therefore the advice was tailored accordingly.

This initiative has produced a set of guidelines which are widely regarded as a great improvement over other existing documents. Furthermore, the project encourages innovation and development of BATs for the future and represents a new and novel set of guidelines with the full support of the European Commission. In addition, in each of the cases considered, in order to compile the guidelines, the cost effectiveness and product performance were checked to ensure no decrease in either standard.

For details of how you can obtain a copy of the guide please visit www.intergraf.org or contact

Anne-Marie De Noose at:

INTERGRAF

Square Marie-Louise 18 Bte 25-27
B - 1000 Brussels
Tel. : +32 2 230 86 46
Fax : +32 2 231 14 64
E-mail: amdenoose@intergraf.org

STEWARDSHIP AWARD 2000

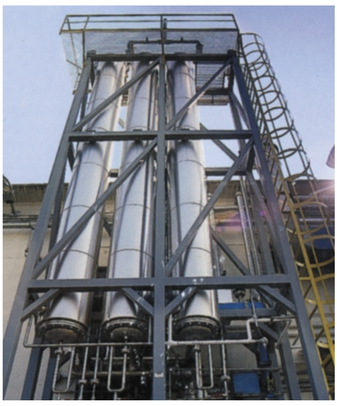
Wictor

Product Improvement Winner

Wictor, based in Italy, produces solvent-based adhesives for use in the production of shoes, leather and furniture. Though Wictor's main factory is located in Palazzolo sull'Oglio there are five other factories located in four other countries employing a total of 70 people. Wictor has been a member of the Responsible Care programme since 1997 and was awarded an ESIG Solvent Stewardship Award in the category of Best Product Improvement in 2000.

Reduction of VOCs Emission By Cryogenic Condensation

Wictor has installed equipment to collect solvent vapours, which are then condensed using liquid nitrogen.



All solvent vapours generated by the filling or emptying operations of mixers and vessels, are collected by pipeline and sent in high concentration, to a specially designed plant containing liquid nitrogen. For reasons of efficiency, the plant is structured in three columns, two of which work alternately (A&B) and the third of which works continuously (C). The vapours containing VOCs are first delivered into the outer shell of the condenser, which is wound with a specially designed configuration of spiraled tubes. Liquid nitrogen is released into the emissions vaporising the nitrogen and condensing the VOCs. The gaseous nitrogen is then reused to displace the solvent vapour in the mixers and vessels. Finally the condensed VOCs are collected into an Intermediate Bulk Container (IBC) and reused as solvent for Polychloroprene adhesives.

This method recovers and reuses approximately 250 Kg of solvent per day. The yield of condensation vapour recovered is above 99% of the origional volume of solvent used and this represents a reduction of 50% of the total factory emissions in both the working area and the external environment.

Development of dearomatised hydrocarbon solvent.

Wictor traditionally used an aromatic solvent in its adhesives manufacture, but has recently developed a new solvent mixture based on dearomatised hydrocarbon solvents. In addition to environmental considerations, Wictor has worked on the industrial hygiene aspect of their products by developing improved formulations.

Wictor's aim was to replace aromatic solvents in an adhesive for bonding laminates. This was successfully achieved by developing a formulation using dearomatised hydrocarbon solvent instead of an aromatic one. The dearomatised solvent has an Occupational Exposure Limit (OEL) almost three times higher than the previous mixture. A higher OEL indicates that that a product is safer as by definition, the OEL is the concentration that workers may be exposed to without a risk for adverse health effects. In addition to this health factor, the mechanical properties of the new solvent mixture are comparable with the performance of the best polychloroprene adhesives on the market.

STEWARDSHIP AWARD 2000

Englender

Winner of the prize for Site Improvement

Englender Furniture is a producer of lacquered cabinets and upholstered furniture. Solvents are used to produce high quality lacquered finishes, and are applied to the furniture using spray guns.

The efficiency in which solvent coatings are applied is dependent upon the quality of the spray guns and the technique of those operating the guns.

In order to ensure that they were operating as efficiently as possible and with the minimum emissions of VOCs to the environment, Englander took the following steps:

- Joined an environmental best practice group, the Furniture Industry Research Association (FIRA), who commissioned a consultant to visit their site and supply them with a full environmental review report.
- Invited 7 different suppliers of spray guns and pumps for a trial of their equipment in their factory with the view of improving transfer efficiency and reducing the amount of lacquer use.

After extensive trials of the new spray gun equipment, the company invested in 28 new spray guns and pumps which gave the best transfer efficiency and thus the lowest amount of waste. The guns purchased met the requirements of Best Available Technique Not Entailing Excessive Costs (BATNEEC). Englender further introduced a solvent monitoring system with process instruction sheets for each operation using solvents, including a spillage procedure.

As part of the solvent monitoring system, Englander also produced a twice yearly Mass Balance Calculation Sheet from their stocktaking figures. The company also invested in a training programme for all those applying lacquers to ensure that best practice was being followed.

The biggest saving that Englender has noted is in the control of thinners and gun cleaners which used the largest volume of VOCs. All gun cleaner fluid is reused up to three times before being sent off the site for reclaiming. Englender's involvement of their whole workforce in the emissions reduction process has been a key in their success.

The steps undertaken by Englender are an excellent example of best practice. This practice is equally applicable to all coating industries using spray guns, including vehicle refinishing, metal coating and many others.

STEWARDSHIP AWARD 2000

DOW CORNING

Site Improvement Winner

Dow Corning at its plant in Belgium produces solvent/silicone-based products for use in industrial applications. Solvents used are aromatic and aliphatic hydrocarbons. The solvent-based unit is dedicated to the production of paper coatings and defoamers.

The process consists of mixing and dilution of high molecular weight silicone polymers into solvent. The main raw materials, apart from the silicone, are the solvents. Since the unit was first installed there has been a continuous process of risk assessment and minimisation, especially regarding the risks associated with solvents.

The unit is classified to be flame and explosion proof (in accordance with regulation) and includes a sprinkler system. There is a general ventilation system (extraction) throughout the production unit as well as local extraction points where solvent concentrations are highest. There is also a nitrogen blanketing system for the mixing kettle. In addition to these local regulations further measures have been taken in the areas of environmental protection and industrial hygiene.

Environmental Protection

A major source of solvent waste originates from the cleaning operation required between production of different types of end product, to prevent cross-contamination.

This has been dramatically reduced via:

- Improvement of the production schedule to minimise the cleaning frequency
- Implementation of novel cleaning procedures whereby the cleaning solvent for one type of product is retained for the next production batch of the same product family (the cleaning solvents are stored in external containers between production batches).

As a result the quantity of waste solvent has been significantly reduced. The nitrogen blanket used on the system for reasons of fire prevention is also a source of solvent release as the flow of nitrogen across the mixing unit has the tendency to evaporate some of the solvent. A study was carried out with the support of an external laboratory to monitor solvent emissions and optimise the nitrogen blanketing system so as to minimise them.

The types of packaging that have typically been used for these solvent-based products were one way packages. These packaging types would mean a small but significant level of solvent-based product being left in the packaging waste. To reduce this level of solvent contaminated waste packaging, returnable metallic packaging (1 ton) is used to ship solvent-based products to the end user.

Industrial Hygiene

As part of the Responsible Care commitment and as required by European Directive EEC/98/24 a Chemical Risk Assessment was performed and as a result of this evaluation, several actions have been implemented to minimise risks associated with production of solvent based products. These actions have focused on reducing the opportunity for contact with the solvents through reduction of manual handling of the products and raw materials.

These actions include:

- Bulk storage of solvent and raw materials as well as solvent based finished products thus reducing the frequency of contact with solvents.
- Installation of automatic charging systems for raw materials and discharging systems for finished products (further reducing the frequency of contact with solvent)
- Establishment of contaminated areas to include the entire production unit (Plus charging and discharging points), in order to prevent potential pollution of the environment through accidental spills.

A key point in the development of these actions and the establishment of new procedures was to include the production operators in the process, such that they have ‘ownership’ of the process.

STEWARDSHIP AWARD 1999

SunChemical

Between the end of 1997 and the beginning of 1998, the Sun Chemical factory in Liverpool installed a new dust and fume extraction system for operation with its 'change pan' process for the manufacture of flexographic printing inks.

The Liverpool site manufactures solvent-based flexographic inks in batch sizes varying from as little as 50 kg up to 1000 kg to meet individual customers needs. Every batch involves a 'change pan' operation during which solvent vapour might emit. The installation of the new extraction equipment was needed to ensure the continuation of a clean workplace environment. Following installation of the new extraction system, consultants were asked to evaluate VOC emission levels and tore-check occupational exposure measurements.

The level of emissions detected by the consultants was well in excess of that expected by Sun Chemical Management, both at a local and UK level. Contact was made with the local Environmental Officer and a decision was taken to re-test the process for atmospheric emissions while at the same time undertaking an equipment status survey to identify the position where VOC emissions could be detected.

The conclusions were:

- The extraction system could operate far more efficiently than previously used
- The operations of the site needed to be modified

The following actions were taken:

- A manufacturing review to see if products made on site could be transferred to other sites and made more efficiently in bigger batches elsewhere
- The lidding of all vessels were made automatic within the bounds of the equipment that was currently in use
- The method of extraction on the vessels was modified
- A re-test would be carried out to check the performance of the equipment
- Following the results, the extraction system would be revisited by the installers to see if less vapour could be drawn from the vessels

The emphasis here was on relatively simple, even basic, improvements made in a very systematic manner, which involved measurement, defining improvements, re-measurement and further improvement. Thus the best practice was recognised for the systematic process used to achieve improvement rather than the reasonably simple and cost effective measures used. Overall there was a seven-fold reduction of emissions. Particularly commendable is the adoption of low cost measures which can be broadly applied by other solvent users.

STEWARDSHIP AWARD 1999

Koninklijke Hoogovens and the European Coil Coating Association

Koninklijke Hoogovens were requested by Dutch regulators to change from a solvent-based system in their coil coating operations to a water-based paint or powder systems. However, they were reluctant to do so mainly because of the high performance afforded by solvent based paints (proven durability for more than 25 years).

Coil coating is a process where in a continuous coil of metal is unwound, cleaned, surface-treated, coated (from a tray with a rollercoat system), heat-cured, cooled and rewound in one operation at a speed up to 100m/min. Coil coating has been a well established practice since 1930 and the process has been highly automated now.

Koninklijke Hoogovens and the European Coil Coating Association (ECCA) linked the coating process with solvent based paint to a capture system which feeds the evaporated solvents to an integrated incinerator. The resultant heat is used for the curing ovens. This has been shown to be best practice for the industry and indeed results in considerably lower VOC emissions (by a factor of 50-100) than the use of non-solvent coating systems with comparable energy requirement. Furthermore, the latest equipment has shown a further 90% emission reduction compared to the industry average. ECCA-Nederland asked an independent institute (TNO-industry in Delft) to make a study regarding the emissions of solvents from coil coating and energy consumption.

The results of the study indicated that solvent emissions were only 0.3% of the total use of solvents and only 0.02% in the newest production line. It was also established that the solvent emissions were only 0.006g/m2 in a coil coating process versus 0.1-0.5g/m2 in a powder coating process. The energy consumption of powder and coil coating processes were comparable (5-10 Megajoule/m2 coated material). Water based coatings could only be used in this application if they were heated (otherwise the water would cause corrosion). However, this would have increased energy consumption and the coating would not be durable enough for outdoor exposure in the Dutch climate.

Ultimately the Dutch authorities were convinced by the low emissions figures, the energy efficient process, and the fact the that the process is constantly being improved. Based on the thorough evaluation, the company was not obliged to switch to a water-based or powder coating system.

STEWARDSHIP AWARD 1999

IROTEC LABORATORIES

Irotec Laboratories were the first winners of the Solvent Stewardship Award, which has been developed by ESIG to promote and share best practice in the use of solvents. This in-depth case study demonstrates how Irotec has made significant steps in managing their solvents. The various practices they have employed will assist other solvent using companies to comply with the requirements of the Solvent Emissions Directive.

Background

Established in 1992, and recently acquired by Cambrex Corporation, Ireland-based Irotec Laboratories (ISO9002 accredited) specialises in the production of bulk pharmaceuticals and active ingredients for the pharmaceutical industry. Their state-of-the-art facilities enable the company to develop safe, efficient and environment friendly processes for transfer to their pilot and multi-purpose production plants. Solvents are used throughout their processes; in purification, as reaction mediums, in crystallisation, in phase separation and for cleaning where multi-product equipment is used. The combination of both the expansion of the company and the increasing legislation had indicated to site management, the requirement for new methods for managing their solvent use. Two key areas were identified, solvent storage and the abatement of solvent emissions.

Solvent Storage

The original tank farm had stored relatively small quantities of solvents, as only a few products were being manufactured on the site. However, the expansion of the production facilities for the manufacture of 25-30 different products, resulted in a significant increase in both the number of solvents and drums (>800 per month) being used. Site management identified a need to minimise drum handling, storage, sampling, washing and disposal, and the number of split loads arriving by tanker.In 1997, Irotec added four modern 40m^3 tanks, three to store virgin solvents (e.g. acetone, ethyl acetate and toluene) and one for solvent waste. The installation of the new tanks has enabled solvents, previously stored in drums, to be added directly from the tanks into the reaction vessels, thereby reducing solvent handling and occupational exposure for operators, and reducing fugitive emissions. The use of monitoring equipment on the tanks (e.g. low level alarms), also ensures better material management. The inclusion of a tank for waste has enabled a significant improvement in waste segregation. The decrease in the number of drums used per month (to about 400), has allowed space to be freed up in the site's drumstores, enabling the introduction of a strict policy of drum segregation based on the primary hazard (flammable, toxic and corrosive) for both virgin and waste material. Other measures incorporated at the same time as the new tanks to improve safety, were the addition of a loading gantry for waste solvent, and a sampling gantry for virgin solvent. The introduction of these changes were made over a 1.5 year period using an outside engineering company, with an investment of about £300,000 (Irish). The investment has continued since the award was made in early 1999, with an expansion of one of their older tanks to meet their increasing demand for solvents. In addition six new similar tanks were installed to service a new production building brought on-line in 1999.

Abatement of Solvent Emissions

Prior to the upgrade of the tank area, solvent vapour from the manufacturing plants and the tank area was collected and fed to a simple water scrubber. The new abatement system comprises a new vent collection header system, a water based scrubber system, a thermal oxidiser and a single discharge point fitted with VOC monitoring equipment.