6 – Examples

6-1 Green procurement in public institutions

In the following you find a typical list of green procurement guidelines, taken from the Austrian public federal institutions. This list illustrates that they rely strongly on the requirements of the Austrian Eco-label in their tenders. If the Austrian Eco-label does not provide any criteria for specific types of products, they rely on the EU Eco-label or on the Blue Angel (German environmental label).

The following example is an extract of the catalogue for the purchase of office equipment:

Office material, office equipment, publications

Paper

General requirements

- If paper is purchased, it must be made of recycled pulp. The used waste paper has to contain the highest possible percentage (at least 60%) of so-called lower and middle sorts of waste paper;
- In the paper production process, exclusively chlorine-free pulps must be used and, if possible, optical brighteners have to be avoided;
- If the procurement of paper out of primary pulp is necessary, as for example for special printers or due to the special requirements of archiving, the wood for the pulping process has to come from sustainably grown woods or from waste wood;
- The environmental burdens resulting from the process of paper production should be minimized as far as possible;
- A product declaration, comprising at least use-specific information and details of the raw material employed, has to be available.

Photocopying and printing paper

- For the purchase of paper, the tender documents have to be based on the requirements specified in the directive "Printing and writing paper" of the Austrian Eco-label, especially for the description of the service and definition of technical specifications.

Booklets, notebooks and writing material

- For the purchase of these products, the tender documents have to be based on the requirements of the directive "Products made of recycling paper (including notebooks for schools)" of the Austrian Eco-label, especially for the description of the service and definition of technical specifications.

Publications and print products

- For the purchase of offset print products, the tender documents have to be based on the requirements specified in the directive "Low-emission printed products" of the Austrian Eco-label (UZ24), especially for the description of the service and the definition of technical specifications.

- For the purchase of products manufactured with other printing methods, the requirements specified in the directive "Publication papers (including paper for newspapers)" of the Austrian Eco-label (UZ36) have to be considered.

Household and sanitary papers

- For the purchase of household and sanitary papers, the tender documents have to be based on the requirements specified in the directive "Household and sanitary paper made of waste paper" of the Austrian Eco-label (UZ04), especially for the description of the service and definition of technical specifications.

Office material

General requirements

- The purchase of disposable products has to be avoided;
- Re-usable, long-life products with the following characteristics have to be used: stable construction, possibility to refill, high filling quantity, high volumetric capacity, reparability, deliverable spare parts and long functionality;
- Products made of PVC have to be avoided;
- For products with a short life span, aluminium has to be avoided;
- Unpainted alternatives (i.e. pencils and crayons) are prioritized. For painting processes which cannot be avoided, water-based paints have to be used;
- Correction pens, text markers, pens and overhead marker pens have to be solvent-free and refillable;
- Glues have to be solvent-free and water-soluble;
- Staples, paper clips and drawing pins have to be produced without any surface treatment.

Office equipment

This category comprises equipment such as monitors, computers, copy machines, printers, fax machines, scanners and multi-functional devices.

General requirements

For the purchase of office equipment the following environmental characteristics have to be considered:

- Lowest possible energy consumption;
- Lowest possible radiation, emission of noise and pollutants (emission or immission of dust or ozone);
- Long life-time (time of use, warranty and availability of spare parts);
- Repairability;
- Low-pollutant spare and additional parts;
- Adapted to the use of recycling paper;
- Equipped with a duplex function;
- The producer or supplier is liable under contract to take back the old machines and dispose of them in an environmentally sound way.

Copy machines

- For the purchase of a copy machine, the tender documents have to be based on the requirements specified in the directive "Copy machines" of the Austrian Eco-label (UZ16), especially for the description of the service and definition of technical specifications.

PCs and monitors

- For the purchase of a PC or monitor, the tender documents have to be based on the requirements of the EU Eco-label for computers, especially for the description of the service and definition of technical specifications.

Laptops

- For the purchase of laptops, the tender documents have to be based on the requirements of the EU Eco-label for computers, especially for the description of the service and definition of technical specifications.

Printers and fax machines

- For the purchase of printers and fax machines, the tender documents have to be based on the requirements of the directive "Printers (RAL UZ 85)" or "Fax machines, telecopiers and combined fax machines" (RAL UZ 95) of the Blue Angel, especially for the description of the service and definition of technical specifications.

Toners, ink and colours

- For the purchase of toners, ink and colours, the tender documents have to be based on the requirements of chapter 2.1 of the directive "Recycling of colour containing devices such as toner modules, ink ribbons and colour ink cartridges" of the Austrian Eco-label (UZ11), especially for the description of the service and definition of technical specifications.

- Recycling systems have to be prioritized.

6-2 Handling and storage of hazardous materials

A construction company specialized in the reconstruction of old buildings has an exemplary storage room for hazardous materials which is shown in the pictures below. The door of the storage room is labelled with the appropriate symbols, inside the room all hazardous materials are properly stored (a metallic collecting tray is used to avoid spillage of the substances into the ground water, etc.).

Figures 1 – 3: Storage room for hazardous material

Figure 4: Gas storage with danger symbols

Apart from the model storage room, which was built with high investment costs, the company carries out regular training courses for its employees. The hazardous materials management system provides instructions for the workers on the appropriate handling of hazardous materials. These instructions are enclosed as an example on the next page.

6-3 Working instructions for the proper handling of hazardous material

1.) Treatment of hazardous materials

- Store all materials in a dry place. Do not place them under stairs, in passageways or in gateways.
- Only the amount of hazardous material needed and used during one working day may be stored.
- Chemicals have to be protected against heat or frost.
- If flammable or explosive materials are stored, it is prohibited to smoke or to use tools which might provoke sparks.

2.) Working with hazardous materials

- If there is a hazard symbol on the packaging (black symbol on orange background or black symbol on white background with a red frame), the substance has to be handled under special precautions and the corresponding protective equipment has to be worn.
- In case of any uncertainty ask the head of the construction site.
- While hazardous materials are used, do not smoke, eat or drink under any circumstances.
- After the end of work, the remaining hazardous material has to be stored immediately at a safe place.

3.) How to proceed in case of an accident involving hazardous materials

- First aid measures have to be carried out by a person with special training;
- Call the ambulance and, if necessary, the fire brigade;
- Inform the head of the construction site;
- Inform the company headquarters (Ms. XX – extension yyy);
- Check the safety data sheet and follow the instructions.

4.) Disposal of hazardous materials

- If possible the packaging (empty or half empty) should be returned to the supplier for proper disposal. The safety data sheet provides information on legal compliance and environmentally sound disposal of the hazardous material.

6-4 Sustainable Chemicals Management

The first three examples are taken from the European Week 2003 Good Practice Awards Report "The practical prevention of risks arising from dangerous substances at work" published by the European Agency for Safety and Health at Work. This report provides real examples of companies and organizations which have changed their processes in view of reducing the exposure to dangerous substances.

Example 1: Eliminating methylene chloride from bitumen binder testing

Issue

This example involves the manufacture of asphalt-coated road stone materials used in the construction of new roads. The respective quality assurance standard specified periodic testing of the material to ensure the quality of the binder and the use of the correct aggregate. The binding material was removed from the aggregate with methylene chloride. To avoid the use of this hazardous substance, a laboratory oven for the testing of bitumen binders was installed.

Problem

The health hazards of acute (short-term) exposure to chlorinated solvents include:

- Harmful, if swallowed or inhaled;
- May cause skin and eye irritations;
- Easily absorbed through the skin;
- Asphyxiant;
- Light-headedness, drowsiness, headache, dizziness.

Figure 5: Old testing method: A worker pours bitumen and methylene chloride solution into the vacuum pump. The waste methylene chloride is then discharged into a container below the fume cupboard.

Methylene chloride causes central nervous system depression and is suspected to be carcinogenic. It has also proved toxic to reproduction in experiments. Workers were at risk of exposure through absorption, inhalation and ingestion while performing the test. Other associated risks included environmental pollution due to accidental spillage and fire or explosion during storage, unloading and transportation.

As the tests prescribed by the standard required the use of methylene chloride, the laboratory technician had to decant the substance into a container from a drum and to take this container to the laboratory. The sampling method required six tests per day, which involved further decanting from the container into a metal container, where coated asphalt was added and placed on a roller for 30 minutes to allow the material to separate. The mixture was then sieved through the vacuum pump, which removed the bitumen and methylene solution and discharged it. The solution was then periodically distilled and the methylene chloride re-used.

The sieved aggregate was placed in a ventilated cabinet to remove the remaining methylene chloride. During this process, residues of methylene chloride on the aggregate still emitted fumes. Throughout the process, the laboratory technicians had to wear chemical-resistant gloves and safety goggles, half face filter masks with two special filter cartridges for methylene chloride as well as chemical-resistant footwear and aprons.

Approximately 50 litres of methylene chloride were distilled at a time. After distillation, a plastic container with the waste substance (residue of bitumen and methylene chloride) was taken back to the chemical storage area and transferred into a drum, which had to be disposed of as contaminated waste by a licensed contractor.

Solution

Identifying risks

A risk assessment was carried out for all operations and activities involved in the transportation, storage and handling of methylene chloride. In addition to exposure to the chemical, a number of risks were identified.

The risks included:

During unloading:

- Environmental contamination due to the unintentional release of the substance during unloading;
- The plant operator coming into contact with reversing vehicles;
- Fire or explosion due to contact with a heat or ignition source after the unintentional release of the substance;
- Foot injury from 200 litre drums falling during unloading.

During storage:

- Cross contamination with other substances resulting in increased fire and explosion risks;
- Environmental contamination due to the corrosion of the storage container;
- Fire or explosion due to contact with a heat source after the unintentional release of the substance.

During handling:

- Inhalation, ingestion and absorption of the substance due to accidental contact during unloading, transportation, decanting and testing;
- Fire due to contact with a heat source during decanting and testing in the laboratory;
- Eye injury from accidental contact with the substance.

The risk assessment involved the observation of the process, consultations with the workers and enquiries at the premises of the manufacturer of the substance. In addition, the safety data sheets and product information sheets were reviewed.

Determining effective control measures

The company introduced a formal safety management system and monitoring arrangement. Short-term and long-term control measures were implemented including a change of the process, which was agreed with the plant manager and the persons involved in the activities. From that time on the decanting of the substance and the tests were carried out inside the fume cupboard. In view of a risk transfer and to reduce the exposure of the workers, samples were sent to an external testing laboratory.

Meanwhile, however, technological changes in sample testing and the corresponding modifications of the quality assurance standard permitted a complete review of the process and the elimination of methylene chloride. An evaluation of the alternative testing facilities was carried out and a specialized oven was purchased which separated the material by burning the bitumen off at high temperatures. While the possible contact with hot substances still involved certain risks, the process change eliminated the use of a carcinogenic substance and drastically reduced the risk of serious ill health, fire, physical injury and environmental pollution.

Results

The new solution ensured a more effective control of the working conditions and the improved working environment helped to develop the safety culture. The waste products were less hazardous, the cost of purchasing methylene chloride was eliminated and consultancy and health surveillance fees could be reduced. In addition, the new testing method was less time-consuming.

Benefits from the introduction of the new furnace include:

- In addition to quicker binder recovery and earlier results during testing, the tests required fewer resources. Moreover, as the laboratory technician was free to perform other operations while the sample is in the oven, significant savings in labour costs (on average 3 to 4 working hours per day) could be achieved;
- A safer process performed at a relatively low cost of EUR 10,000;
- Savings of EUR 330 per year on the cost of filter replacements;
- Long-term costs had to be measured against the initial cost of purchasing the testing equipment and the personal protective equipment. Monitoring costs amounted to approximately EUR 3,600 per year (based on 6 hours per month for the internal health and safety coordinator);
- The costs of health surveillance and consultancy fees for monitoring exposure levels could be significantly reduced. The saving in consultancy fees amounted to EUR 3,600 based on one half-day visit per month by an external consultant;
- The costs of purchasing methylene chloride and the disposal costs of the waste product were eliminated altogether. Thus annual savings of EUR 2,000 in purchasing costs and EUR 1,000 in disposal costs could be achieved;
- The likelihood of absence due to sickness was reduced;
- A better working environment increased safety awareness in the workplace and contributed to the development of the safety culture.

Figure 6: New, safer method using the oven

Comments

Follow-up evaluation is important to check that the solution is effective and that the expected results have been accomplished.

Example 2: Metal degreasing – from solvents to demineralized water

Issue

Example 2 deals with a safer method of degreasing metal components prior to the manufacturing process.

Problem

Metal components have to be degreased before further machining such as punching, welding, finishing, mounting, etc. Failure to degrease can also increase the exposure of workers to hazardous substances during the subsequent processes. Large quantities of solvents, including chlorinated solvents, were used in the degreasing processes. The risk of exposure to organic solvents during the degreasing arose mainly from:

Figure 7: Workers in the central washer

- Manual handling of boxes containing components where the solvent had not completely evaporated;
- Insufficient process ventilation;
- Direct contact with the skin;
- Cleaning and maintenance of equipment.

Solvents can cause irritation of the eye, skin and the respiratory tract. In case of repeated and prolonged exposure, the central nervous system can be affected both in the short and long term. Short-term symptoms include headache, dizziness, nausea and unconsciousness. Long-term effects can be fatigue, loss of appetite, memory problems, irritability and weakened learning capacity. Some solvents have other long-term effects such as cancer, reproductive damage or allergies. To meet the legal emission limit value both mass flow calculations and specific control measurements were carried out by external companies. The company therefore wanted to replace the solvent products by less hazardous products.

Solution

The company already had in place an ongoing substitution approach. Some years before, the company had implemented a project to eliminate the use of organic solvents for degreasing of metal components. The project covered:

- Determining the necessary level of purity for the further machining;
- Contacting suppliers about alternative products;
- Testing of products both in laboratory and production;
- Risk evaluation of alternative products;
- Evaluation of different technologies for use in the degreasing process;
- Implementation in the production.

As a result the company decided to use alkaline degreasers instead of organic solvents and achieved the following results:

- Installation of two large central washers with a strong alkaline degreaser for the most demanding degreasing tasks. The machines were filled automatically. No employee was in direct contact with the product;
- Installation of smaller closed washers with alkaline products for sub-processes;
- No use of organic solvents.

Continuing its substitution policy, the company wanted to replace the solvents completely in the degreasing process, since it had set targets to reduce the number and the consumption of chemicals.

The company decided to examine the following options:

- Abolishing the degreasing processes in full or in part;
- Replacing the solvents with a less dangerous substance;
- Examining the possibility of technical solutions to limit the exposure risk.

The company set up an environmental learning group. The group carried out degreasing with demineralized water and process temperatures were lowered from 60 °C to 40 °C.

The company was able to implement various improvements:

- Products which are more environmentally sound were used in the two central washers and the appropriate concentration of the products was controlled. The washers were filled automatically and the process was completely enclosed, eliminating worker exposure and reducing manual handling;
- Several smaller washers which use a low-alkaline degreaser or demineralized water (50% using demineralized water) were installed;
- The use of low-alkaline degreaser was limited;
- The degreasing process was carried out at lower temperatures and therefore energy consumption was reduced;
- Oil shimmers were mounted on washers. The water could be recycled over a longer period of time thus reducing water consumption.

Results

In addition to improving worker and environmental safety, the use of chemicals was reduced by nearly 60% resulting in considerable cost savings.

Comments

The changes implemented and the new policy were part of the company's quality certification procedures. The substitution process was carried out over a number of years. The very hazardous substance used at the beginning was replaced by a safer one, followed by further efforts to substitute this safer alternative as well. Worker participation was important for the success of this solution.

Example 3: Reducing risks from glue vapours

Issue

The exposure of workers to harmful vapours from gluing processes during the production of isothermal boxes was reduced through a change in working procedures.

Problem

A company produces isothermal boxes for food transport.

During the company's general risk assessment activities, a problem was identified in the section where glue is applied to the panels that make up the isothermal boxes.

Each panel is composed of several layers of polyurethane and fibreglass which were glued together with a styrene-based resin. The entire gluing procedure comprised four sub-tasks:

- Preparation (about 1 hour): A worker prepared the glue by mixing the catalyst, the accelerator and the calcium carbonate with the resin, stirring them manually to blend them into a homogeneous mixture;
- Application to the resin base (1.5 hours): Two workers used a spraying device to glue together the elements of the panels placed on top of the glue tables;
- Drying (6 hours): The panels were kept pressed down and monitored regularly;
- Cleaning (1 hour): All the equipment used was cleaned with acetone.

The assessment revealed that the main risks of the task were the exposure to styrene vapours (preparation and application sub-tasks) and acetone vapours (cleaning). The toxicological effects associated with these substances include irritation of the skin, eye and upper respiratory tract, and gastrointestinal effects. Chronic exposure may affect the central nervous system showing symptoms such as depression, headache, fatigue, and weakness, and can have minor effects on kidney function and blood. Styrene is classified as a possible human carcinogen by the International Agency for Research on Cancer (IARC). Acetone can also cause serious respiratory problems.

Solution

The company included some modifications to the working procedures of the gluing section within its risk prevention programme implemented between 2001 and 2003. The proposed changes were discussed by the health and safety committee, and there was agreement to implement both short and medium-term measures.

Short-term measures:

- Inform the exposed workers about the potential risks;
- Provide training on prevention measures;
- Display the relevant safety data sheets in the storage and work areas for consultation by the workers;
- Acquire proper containers for clean acetone and dirty acetone, to allow recycling;
- Acquire personal protection equipment appropriate for the existing risks;
- Limit the number of exposed workers;
- Provide exposed workers with specific six-monthly health checks in addition to the standard health surveillance.

Figure 8: Before: resin spreading with rollers

Figure 9: Afterwards: application of polyurethane glue

The company carried out investigations to identify long-term technical solutions in view of replacing the working methods and/or products by less harmful or dangerous ones. The investigations included demonstrations of new equipment and alternative products and the analysis of scientific literature on those products and methods. It was decided to adopt the following measures:

Long-term-measures

- Glue preparation: A closed-circuit procedure with automated cleaning features was installed to replace the open-air procedure. This involved substituting the styrene-based glue resin with polyurethane glue. Although this product is still a hazardous substance, unlike styrene it is not volatile at room temperature, and together with the new system for preparation, application and cleaning risks were significantly reduced;
- A system of ventilation and air renewal was implemented as a collective prevention measure;
- Workers were also advised to use the appropriate personal protective equipment in accordance with the safety data sheets for polyurethane glue;
- Specific health surveillance was introduced for exposed workers, which included monitoring the appearance of symptoms of asthma and the levels of relevant biological markers in urine.

Results

Benefits from the new arrangements included:

- The new polyurethane glue was prepared in a closed circuit and therefore exposure to harmful substances was eliminated in this part of the process. A volatile product was replaced with another one which is non-volatile at ambient temperature;
- The new glue was applied via a closed circuit through pipes placed directly above the panel surfaces. The time required for this task was also reduced from one and a half hours to one hour.
- Cleaning was also carried out automatically in a closed circuit, removing the need for workers to use acetone.
- Fewer workers were involved in the process, thus reducing the number of exposed employees.
- New working practices reduced the overall exposure from four and a half to three hours.

In addition to these health and productivity benefits the company achieved also financial advantages. For example, two subtasks (preparation and cleaning) were eliminated thus saving two man hours per week. Changes to the application phase resulted in a further reduction of one and a half hours.

Comments

Consultation with the workers involved in the process should always be a feature of this type of intervention. This helps to ensure the sustainability of any measures taken. It may also identify some unintended consequences of proposed changes and raise awareness of the risks involved.

Example 4: Reduction of VOC emissions by using fatty acid esters for metal cleaning processes

Background

In the metal industry, which is one of the largest consumers and emitters of solvents, Volatile Organic Compounds (VOCs) are used on a large scale in many industrial processes. Calculations have shown that more than one tenth of the annual solvent consumption of 2.2 million tonnes in the European Union is used for degreasing processes.

VOCs are highly volatile and therefore many of these compounds are emitted directly into the air. The negative effects on the environment include:

- Creation of atmospheric ozone by photochemical oxidation (summer smog);
- Ozone depletion in the stratosphere;
- Water and soil pollution (low biodegradability).

The negative effects on human health include:

- Neurotoxic effects, causing fatigue, dizziness and intoxication;
- Degreasing of the skin.

In addition, VOCs are flammable and therefore are a fire hazard.

Therefore a project was launched to examine the possibilities of using alternatives to volatile organic solvents in the metal industry.

Project

In the project, VOCs used in the cleaning processes of the metal industry are substituted by products on the basis of vegetable oil esters. Fatty acid esters are a good alternative for the environment and human health because they are non-toxic, emission-free, easily biodegradable and based on renewable resources.

The main tasks of the project were:

- Practical industrial tests;
- Dissemination of information;
- Improvement of products, cleaning, processing and recycling;
- Work on scientific questions which resulted from the industrial tests.

More than 130 metal companies took part in the project by testing fatty acid esters as new cleaning agents for their cleaning processes.

Information on the new cleaning method was spread within interested companies, associations and the public via information material, publications, media and the internet.

Different kinds of fatty acid agents were developed for special tasks (e.g. a paste for tasks with a longer cleaning time). Additionally a number of methods for recycling were tested.

Characteristics of the alternative agents, such as cleaning ability, corrosion protection, penetration tension, emissions by welding and skin tolerance were tested during the project.

Results

More than half of the companies were satisfied with the test results and replaced the old cleaning agents used before. The best effects were achieved in the areas of maintenance and repair. The most important outcome of the substitution of VOC cleaning agents, however, was the reduction of VOC emissions into the atmosphere by the metal industry.

The project established that volatile organic solvents can be substituted by fatty acid esters without higher disadvantages in about 50% of the cleaning activities in the metal industry.

Example 5: Optimization of the cleaning process of metal parts

Supplier

SAFECHEM Europe GmbH and PERO AG

User

Automobiltechnik Blau

Supplier activity

Producing chemicals for the cleaning of metal parts (SAFECHEM Europe GmbH) and manufacturing of cleaning machines (PERO AG)

User activity

Manufacture of re-fuelling systems and modules for the automotive industry

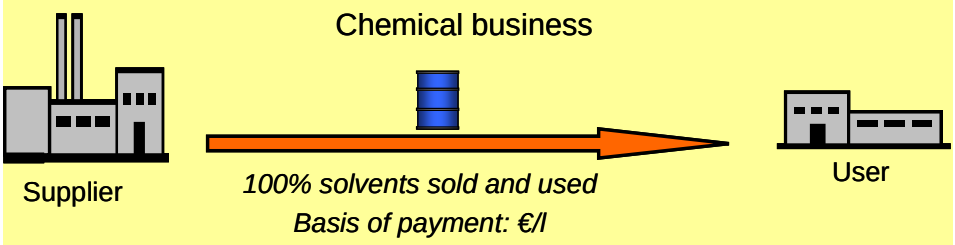
Project

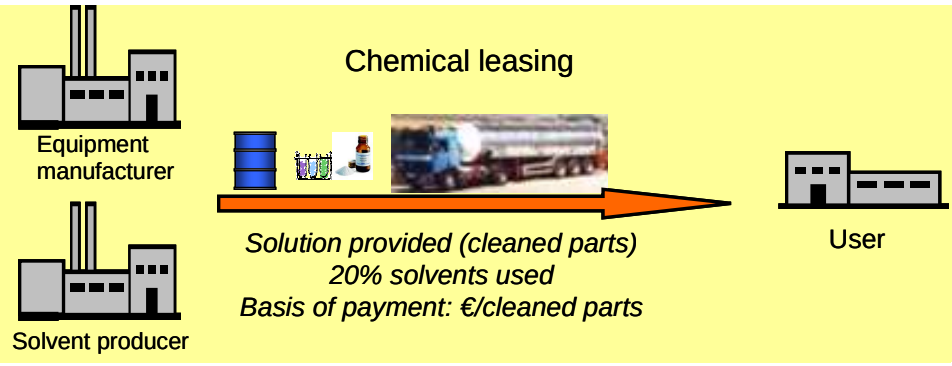
SAFECHEM Europe GmbH not only sells and markets solvents, but also provides service elements for their safe use and disposal integrated in an innovative closed-loop system. The sales price includes the delivery of fresh solvent as well as the collection of used solvent for recycling in special safety containers. In addition, the company offers services for an extended solvent use, process safety and quality assurance.

To optimize the cleaning process even further, SAFECHEM works in close cooperation with the machine manufacturer PERO AG. Key factors of this service-oriented approach are pooling of know-how between the involved partners and an invoicing process based on the provided cleaning services. The revenue is therefore solely service-based and solvent consumption becomes a cost rather than a revenue factor for the supplier. As a direct consequence, the solvents are used more efficiently and their consumption is reduced.

Model calculations have shown that in cleaning plants where emissions have already attained a low level, solvent consumption could even be further reduced by 40 – 80% through additional services and improved sharing of know-how.

Automobiltechnik Blau, a manufacturer of re-fuelling systems and modules for the automobile industry participates in the Chemical Leasing project by purchasing the comprehensive metal parts cleaning service.

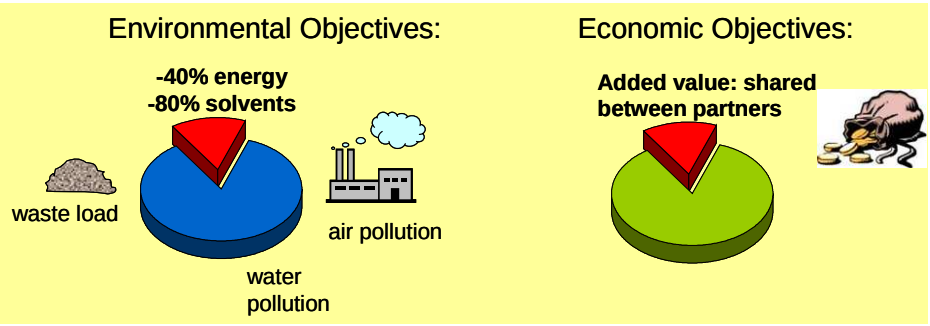




The customer does not pay for the chemicals purchased but for the amounts of metal parts cleaned. Consequently it is in the interest of the supplier to clean the metal parts with as little solvent as possible.

Results

Through the improved use of chemicals and machines, the solvent consumption was reduced by more than 80% compared to the traditional metal cleaning procedure, and energy consumption could be equally cut by more than 40%.



Example 6: Reduction of coating powder consumption

Supplier

Akzo Nobel

User

ABB ARAB

Supplier activity

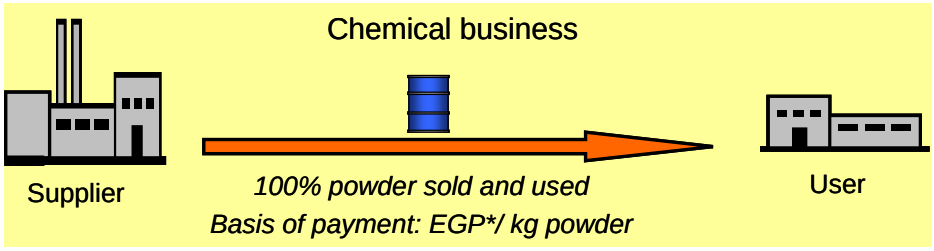
Production of electrostatic coating powder

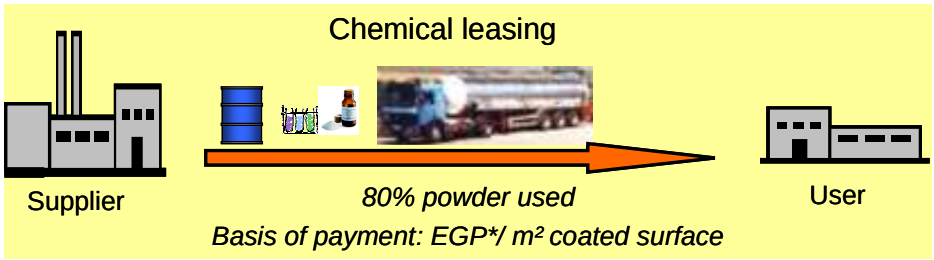
User activity

Manufacturing of power equipment (high-voltage and low-voltage equipment)

Project

For the coating of components of power equipment, ABB ARAB uses an electrostatic coating powder purchased from Akzo Nobel. To improve this process and reduce the loss of coating powder, ABB ARAB introduced a Chemical Leasing business model with Akzo Nobel.





*Egyptian Pounds

Within this model, Akzo Nobel provides the coating powder and manages and supervises the powder coating line at ABB ARAB. This includes, among other things:

- Improvement of the quality of the products;
- Organization of the delivery of the coating powder and the collection of losses;
- Powder recycling;
- Provision of data relevant to the product and its application;
- Training of the personnel.

The tasks of Akzo Nobel in the Chemical Leasing partnership are, among other things:

- Compliance with the specifications for quality control;
- Providing information and data relevant to the process optimization;
- Selection of the powder coating staff;
- Compliance with the handling specifications of the coating powder product and the output.

Akzo Nobel is not paid for the amount of coating powder supplied but for the square meter of equipment components coated. Therefore it is in the interest of Akzo Nobel to use as little coating powder as possible for this process.

Results

In this way the process was optimized. The amount of coating powder used and the loss of coating powder during the process could be reduced by 20%.