

1. GOOD ENERGY CONSUMPTION PRACTICES

1.1. Good practices in general

- ✓ Conduct information campaigns and training among employees to save energy.
- ✓ Carry out a study of electricity consumption in order to set reduction targets and adopt the most appropriate measures for savings.
- ✓ When it is necessary to incorporate new equipment, the selection should consider water and energy consumption. Buy equipment with high energy efficiency.
- ✓ In order to achieve significant energy savings it is convenient to carry out maintenance of work equipment (greasing, adjustments, cleaning ...) and disconnect them from the network when they are not being used.
- ✓ Switch off IT equipment for periods longer than one hour of inactivity.
- ✓ Switch off cameras, computers, photocopiers and other electronic devices that are not being used.
- ✓ Carry out good maintenance on electronic devices, so they work at full capacity.
- ✓ Avoid steam or compressed air leakages which can cause significant energy losses.
- ✓ Reduce the use of batteries using devices connected to an energy source or using rechargeable batteries.

1.1.1. Computers

- ✓ Switch off the computer in the following cases: meal times, meetings, end of working day and weekends.
- ✓ Purchase PCs and monitors with the "Energy Star" logo, which means that the computer with the proper correct configuration reduces power use during downtimes.
- ✓ Is useful to switch off computers with "bookmark" mode; this system allows, through the proper sequence to disconnect the computer, recording the last position it was in. This allows to be restarted in the same working position we left at shutdown.
- ✓ The only screensaver that saves energy is the one which leaves the screen in black, so it is recommended to set the screensaver to "Black Screen" mode. The suggested way is that it starts working after 10 minutes of inactivity.

1.1.2. Printers, photocopiers and other equipment.

- ✓ Set the "toner save" mode when printing or photocopying, when this option exists.
- ✓ Try to print in black and white whenever is possible.
- ✓ Purchase equipment that has the "energy saving" (Energy Star, Power save) mode, thereby reducing consumption to a minimum during downtime.

- ✓ Shake the toner cartridge when it begins to alert that is running out, many more copies can be done after that.

1.1.3. Lighting

- ✓ Take maximum benefit of natural light.
- ✓ Install motion detection systems to turn on and off lighting systems.
- ✓ Place timer switches in bathrooms, locker rooms...
- ✓ Place illumination detection devices so that you can always get the right light intensity.
- ✓ In rooms of continuous use or permanent lighting, it is advisable to use fluorescent tubes or energy saving lamps. For areas such as garages, hallways, common areas... the recommendation is to use lamps that illuminate the place properly, with timers to turn on and off the lighting.
- ✓ Use energy saving lamps.
- ✓ Do not turn lights on and off frequently, because that is when most energy is needed.
- ✓ Clean the lighting systems frequently, because dirtiness impedes optimal performance. A correct maintenance of lighting systems allows energy saving.

1.1.4. Air conditioning system

- ✓ Purchase air conditioning units with heat pump systems with multiple speeds to regulate temperature and, thus, better manage energy.
- ✓ Insulate facilities so that an optimum use of air conditioning systems is obtained.
- ✓ Insulating doors and windows will reduce air consumption.
- ✓ Do not place obstacles between air conditioners and users, to optimize their performance.
- ✓ Use air conditioning only when necessary.
- ✓ It is advisable to use programmable thermostats that allow preselecting heating performance, according to the occupation of the facilities and the preferences of the users.
- ✓ When the air conditioner is turned on, do not set the thermostat to a lower temperature than normal: it will not cool the room faster; the cooling could be excessive, and the energy cost could be expensive.
- ✓ Make good use of air conditioning, programming thermostats to recommended temperatures (25 °C in summer). The difference of temperatures between the outside and inside should be less than 12 °C; more than that is unhealthy.
- ✓ Keep heating thermostat at 20 °C. For each additional degree, you will use from 6% to 8% more energy.
- ✓ If you are going to be absent for a few hours, reduce the thermostat setting to 15 °C; in case of a prolonged absence (one day or more), turn off the heat completely.

- ✓ Clean the filters of the air conditioning apparatus for an adequate performance. Regular maintenance of heating and air conditioning ensures proper operations and reduces energy consumption.

1.2 Good Energy consumption Practices in manufacturing machinery and machining of metal products.

- ✓ Record the energy consumption of machinery and equipment; with that information is possible to define saving measures that will optimize energy consumption.
- ✓ Check the energy efficiency of new equipment that has to be incorporated into production system.
- ✓ Perform preventive maintenance on machinery to save energy.
- ✓ Use energy efficient fuels in furnaces.
- ✓ Place thermostats at heaters storage of welding consumables.
- ✓ Calibrate welding equipment.
- ✓ Turn off equipment when not in use.
- ✓ Do not pack hot pieces, to prevent deformation.
- ✓ Install closed cooling circuits to avoid wasting water.
- ✓ Check the leaks of steam or compressed air from painting equipment; the decrease of pressure in the equipment increases energy consumption.
- ✓ Use purification gas as fuel in special burner boilers.

1.2. Good Energy consumption Practices in metal coating processes.

The surface treatment industry is characterized by high consumption of electricity, mainly in the stage of plating (baths).

1.2.1. Baths

- ✓ Check the appropriate placement of anodes and cathodes.
- ✓ Check the electrode surface to avoid areas so small that increase energy losses.
- ✓ Clean anodes, avoiding dirtiness on the surfaces may increase the resistance.
- ✓ Cleaning electrical connections.
- ✓ Choose the appropriate conductive materials for the racks (e.g. copper).
- ✓ Proper insulation of racks (except contact points) to avoid loss of energy and loss of material by precipitation of metals in uninsulated parts.

- ✓ Check electrolytes.
- ✓ Heat baths with the exhaust gases from the galvanized oven or by the heat of the ventilation air.
- ✓ Cover the hot baths when they are not in operation.
- ✓ Check the working temperature of the baths.

1.2.2. Dried

It is also possible to dry the pieces when they leave the etching bath. The residual heat from the combustion gas can be used to heat the etching bath.

2. GOOD PRACTICES TO AVOID AIR EMISSION

2.1. In car repair workshops

2.1.1. Diagnostics

- ✓ The diagnostics suggests extracting the exhaust gas and having filter systems to reduce air pollution, and minimize the noise impact.
- ✓ No engine testing on the streets of city centers, avoiding increasing noise and gas pollution.

2.1.2. Paint

- ✓ When the supplier supplies primed and painted parts, the painting jobs are reduced and in turn, its environmental impact.
- ✓ Painting processes should be done only in spray booths, with gas extracting systems. Those spray booths should be properly sealed and operated, whenever possible, depressed to reduce the environmental impact.
- ✓ Press the spray gun only at the beginning and end of each pass, pollution on the filtration system and the emission of volatile organic compounds (VOCs) into the atmosphere are reduced, eliminating an unnecessary consumption of paint.
- ✓ The solvent contaminated with paint may be used for prewash operations.
- ✓ When containers and cleaning solvent drums are kept closed or half closed, the emission of volatile organic compounds (VOCs) during the painting process is reduced.

2.1.3. Degreasing and cleaning pieces

Is recommended filtering the air emissions of volatile organic compounds (VOCs) from solvents; health risks of workers can be avoided.

2.2. In the manufacturing of machinery and in the metallic machining workshop

- ✓ Use, whenever is possible, powder paints, that contain few organic solvents, which are dangerous for the environment and workers health. And also, do not cause volatile organic compound (VOCs) emissions.
- ✓ Control gas and smoke from welding and other manufacturing processes.
- ✓ Install exhaust and filtration gas and smoke systems.
- ✓ Change the filters of the extraction systems, as often as possible, to improve their function ability.
- ✓ Select low volatility and high density solvents to reduce emissions, to improve working conditions.
- ✓ Implement zero emission degreasing systems for metal cleaning, and emissions will be reduced.
- ✓ Make the filling of tanks from the bottom, to reduce the loss of volatile materials.

2.3. In a metal coating company

2.3.1. Degreasing

The main air emission are due to the aspiration of the degreasing bath, in which volatile organic compounds (VOCs) are generated when organic solvents are used. We recommend:

- ✓ Replacing, as far as possible, degreasing with organic solvents by aqueous degreasing, those which use solvents or mixed solutions of soluble compounds (alcohols, amines) or insoluble (esters, ethers).

2.3.2. Pickling

The main problem of emissions is due to the generation of acid vapors or from the pickling process. Recommendations:

- ✓ Replace wet pickling processes of pieces with ones which can be done dry (shot blasting). This will avoid the generation of emissions in this stage in the production processes.
- ✓ Establish periodic control procedures regarding the temperature of the pickling bath.

2.3.3. Etching

The emissions produced will depend on the composition of the bath, specifically the amount of ammonium chloride. This is because of its contact with zinc which causes the formation of vapors. In order to minimize these emissions, the following is recommended:

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- ✓ Replace ammonium chloride with other chloralkalis.
- ✓ Study the possibility of carrying out the etching processes using a self-contained etching bath and drying the piece prior to its immersion in the galvanizing bath, given that this method will generate fewer emissions.

2.3.4. Baths

The emissions released into the air from electrolytic coating baths consist of acidic or basic vapors or aerosols which contain metallic ions produced by the evaporation of the baths. In order to minimize the emissions produced by the metal coating baths, the following steps are recommended:

- ✓ Establish procedures to control the temperature and the concentration of the baths.
- ✓ Install automatic opening and closing systems for the tanks in order to avoid evaporation of the baths when they are hot
- ✓ Place floating polypropylene balls on the surface of the bath to help avoid evaporation of hot baths.
- ✓ Add additional surfactants to hexavalent chromium (Cr_6+) baths in order to avoid its pulverization of the bath into the atmosphere due to the release of gases that it produces.
- ✓ Install suction systems when baths produce vapors, aerosols etc.
- ✓ Install a gas washing system for the treatment of emissions

2.3.5 Chromate/Passivation

- ✓ Substitute baths which use to hexavalent chromium (Cr_6+) for ones which do not have this compound. These can be trivalent chromium, molybdates, and phosphates and organically coated, given that these baths use a lower current and produces less galvanized spray.
- ✓ While the piece is being immersed in the zinc bath, the mordant adhered to the piece reacts with the melted zinc, producing a series of emissions in the form of gases (ammonia, hydrochloric acid) or fumes (ammonium chloride and zinc-chloride) whose compounds depend on the composition of the etching bath. The corrective measures to be taken to reduce emissions are the following:
 - ✓ Install movable patricians for vapor/fume extraction.
 - ✓ Install a system for the collection and treatment of particles (zinc splatters) for their reuse.

3. GOOD CONTROL NOISE PRACTICES

- ✓ It is advisable that when a new piece of equipment or machinery is to be purchased, the level of noise and vibrations be taken into account. In order to acquire equipment which emits low levels of noise, follow the standards set in EN ISO 11690-2:1997.
- ✓ There are also noises which are not related to the machinery but to the manual tools. Precautions should be taken when tools are selected or made available in the workplace

(e.g. Soundproof hammers, padded work tables, low noise grinders, magnetic shock absorbers...)

- ✓ Before buying a piece of equipment, read the instruction manual for the noise emission level (Declaration of Noise) and in the case of specific portable hand-held and/or hand-guided machinery, for the level of vibrations produced.
- ✓ In some cases, it is possible to replace noisy procedures for ones which are not as noisy. For example, instead of hammering an object, use a hydraulic press when possible.
- ✓ As far as possible, try to limit the use and therefore the effects of equipment which produces noise and vibrations. In many cases this is possible by eliminating or substituting noisy equipment with equipment which emits less noise.

- ✓ It is possible to modify or substitute components in machinery to decrease noise transmission and the size of the area in which the noise can be heard without affecting the machinery's operation. Some procedures which can reduce the generation and transmission of noise are:
 - The modification of components in machinery or in the operational structure; for example; decreasing the speed of the noise generating parts or of the transportation system.
 - Avoid impacts or sudden movements replacing them with uniform movements and reducing the rate of impact (by lowering the height of the fall, or with smaller objects...) and using material which can absorb impacts (elastic material).
 - Replace materials (whenever possible) with ones which can absorb and block noise. For example: replace metal gears with plastic, rubber or ones made of other similar material. Instead of using metal chains, use V-belts. Use silencers (on the exhaust from the valves, for example.).
 - Reduce the movement from the components that vibrate (using padding).
 - Install gear pumps instead of axial piston pumps.
 - Install helical gears instead of spur gears
 - Make sure that all rotating objects are balanced.
 - Select material which provide the best combinations (for example, plastic/steel) and lubricate contact elements to reduce friction.
- ✓ Frequently, there is an increase in the noise level produced by tools and machinery due to their poor maintenance or due to unnecessary vibrations. The noise may come from loose pieces or from metal parts being hit. Carrying out regular maintenance can easily reduce this noise. Said maintenance should include lubrication, realignments when necessary and a correct balancing...
 - Adjust the oil ring and reduce the longitudinal shaft clearance.
 - Reduce the radial clearance, adjust the separator, reduce the shaft and frame tolerances. The natural frequency of the final screen should not coincide with the frequency characteristic of the ball bearings.
 - Adjust the brush holder, change the natural frequency, divert the brushes, and clean the manifold.
 - Improve the fastenings of the sheet metal.
 - Correct gaps which are too narrow, lubricant which has solidified or is nonexistent;
 - Balance mechanically.
 - Change the lubrication grooves on the bearings.
- ✓ If noisy machinery or equipment can not be eliminated or replaced, it is possible to reduce noise transmission by redistributing said equipment in such a way that the noise affects as small an area and as few people as possible:
 - Correct distribution of machinery (moving machines away from walls and objects which will reflect the noise).
 - Position noisy machines together.
 - Keep people away from the noise source. Proper partitioning
 - Soundproofing (with enclosures it is possible to achieve a reduction in the noise level of between 5 dBA and 25 dBA).

- Position insulating barriers which will limit the noise such as sound absorbing barriers and screens, soundproof booths etc. With sound absorbing screens and barriers it is possible to achieve a reduction of approximately 10 dBA. With soundproofing booths, the noise level reduction is between e 15 dBA y 30 dBA.
- Take measures which will mask the noise, for example, using white noise, or actively controlling the noise.
- ✓ Measures should be taken in order to reduce noise. One of these measures may be the installation of sound absorbent materials which will help lower the noise level that is transmitted by reducing the noise which bounces off the workplace walls and floors. Installing absorbent material in the workplace will help decrease the noise which bounces off the walls and floors.
- ✓ In order to reduce noise born structures, they should be soundproofed. Machinery should be soundproofed using flexible connections. The methods used to soundproof or deaden the sound from solid objects are different to those used in reducing airborne noise. A structure that is an excellent insulator for one type of sound transmission will be very poor for the effect of sound absorption.
- ✓ Implement a periodic maintenance schedule for the facility, equipment and the heating/cooling systems.
- ✓ If there are sound absorbing screens, make sure that they are correctly positioned.
- ✓ Make sure that the sound absorbent material covering the floors and the walls is in good condition.
- ✓ Periodically measuring the noise level will help identify and, in turn, reduce the damaging effects noise has on workers and residents.
- ✓ Businesses must comply with the municipal bylaws which stipulate the level of noise permitted.

4. GOOD PRACTICES IN WATER USE AND WASTEWATER MANAGEMENT

4.1. Good practices in general

- ✓ Carry out information campaigns and teach staff how to save water.
- ✓ Identify activities which use water and study possible ways in which water can be reduced.
- ✓ Request inspections of the water supply in order to identify and repair possible leaks.
- ✓ Monitor consumption in order to identify possible leaks in the system.
- ✓ Repair leaky taps. Continuous leaks can cause up to 20 liters of water waste.
- ✓ Reduce water consumption by installing taps and showers with pressure relief devices and, diffusers...
- ✓ Installing water sprayers and diffusers in showers and sinks, and mixer taps with timers in shared use areas will ensure less water consumption.
- ✓ Install toilets with dual flush dual flush systems, low consumption tanks or tanks with limited capacity.
- ✓ Separate systems which process water to be reused in order to avoid contamination.

- ✓ Monitor the water used for cleaning, reusing it whenever possible. Handle it as dangerous waste when mixed with hazardous substances.
- ✓ Recycle wastewater generated by industrial processes. Afterward the wastewater may be reincorporated into the processes, minimizing waste. If the quality is adequate, it may even be possible to reincorporate the sludge generated.

4.2. Water consumption and wastewater generated in vehicle repair workshops

- ✓ Do not wash tools or equipment used for painting car parts in sinks which drain directly into the public sewage system without being treated first.
- ✓ If spills of lubricants or oils occur, use an absorbent material, not water, to clean them up. Some experts estimate that 40% of the pollution of rivers and lakes is caused by used engine oil.
- ✓ Vehicles should be washed in car wash tunnels not using hoses; this way the wastewater will drain into the appropriate network.
- ✓ It is recommended installing a system which will collect the wastewater produced by washing vehicles in order to filter out the oils before being discharged into the sewage system.

4.3. Water consumption and the generation of wastewater in metal coating processes

Good practices for reducing water consumption and generating less wastewater in the different stages of the production process are:

4.3.1. Degreasing

The wastewater generated by degreasing baths tends to be high in oil and grease.

- ✓ Filter out the oil and grease from the degreasing bath using an appropriate system or replace the chelating agents with ones which are less environmentally harmful. Additive substitutes for chelating products exist which facilitate the physical-chemical treatment of wastewater.
- ✓ A biological degreasing should be carried out before electrolytic degreasing. This will prolong the life of the piece as it substantially reduces the oil and grease drag out.

4.3.2. Pickling

Pickling baths usually involve a dilution of a higher or lower concentration of an acid (most commonly sulphuric, hydrochloric, and nitric) in water. Therefore the depleted bath generated at this stage will be strongly acidic and will be contaminated with metal remains and substances dragged from other baths. Modifying this process will minimize the effects and as a result prolong the life of the pickling.

- ✓ Use a dry method for pickling parts (shot blasting) instead of a wet method.
- ✓ Use pickling inhibitors when carrying out pickling using a wet method. This will minimize the amount of base metal in the depleted bath, and in turn, reduce reagent consumption in the wastewater treatment plant.

4.3.3 Baths

Practices to minimize spills during the bath stage:

- ✓ Preventative maintenance and maintenance of the operating conditions of the baths in order to prevent accidental discharges, leaks and spills.
- ✓ Periodic review of the piping systems (valves, gaskets etc).
- ✓ Automated systems which optimize drainage and minimize the rinsing phase.
- ✓ Waterless deposition techniques (vacuum deposition or thermal spray techniques).
- ✓ Segregation of effluents contaminated/ not contaminated.
- ✓ Recovery of the dragged material from the baths in the first rinse through atmospheric or vacuum evaporation.
- ✓ Installation of rinse tanks to recover material dragged from hot baths
- ✓ Practices which will reduce the dragged material from rinse baths.
- ✓ Drain pieces over the bath it has been removed from.
- ✓ Optimize the drain time in order to avoid salt deposits which can cause passivation problems..
- ✓ Monitor the properties of the bath (concentration, temperature, the use of surfactants, etc.
- ✓ Position pieces on the racks to optimize space.
- ✓ Optimize the speed at which the drums and racks are removed from baths and the time between baths.
- ✓ Design and maintain suitable conditions in the drums and racks.
- ✓ Install collection and recovery systems for dragged material over the baths: trays and drip catcher tanks, spray rinses etc. .
- ✓ Optimize the design of the pieces avoiding, as much as possible, depressions, boreholes, threaded sections, gaskets and grooves.

4.3.3. Chromate / Passivating

- ✓ Substitute chromate/passivating baths which use hexavalent chromium with one of the following alternatives.
 - Chromate / passivating baths formulated with trivalent chromium
 - Chromate /passivating baths which are chrome free, using organic coatings.
 - Chromate/ passivating baths formulated with molybdates and phosphates.

4.3.4. Rinses

Rinsing pieces between the different processing baths is the most repeated operation in metal coating activities, thus making it responsible for high water consumption and the generation of large volumes of low polluting effluents. Therefore the recommendable measures are:

- ✓ Combine existing rinses with spray rinses. These rinses act as a series of cascade rinses providing a high performance cleaning of pieces with little water due to the hydro mechanical effect achieved from the compressed air used to spray the water.

- ✓ Reuse the rinse water as a water supply in another rinse, as long as there are no incompatibilities.

5. GOOD PRACTICES WHEN PURCHASING AND USING RAW MATERIALS, PRODUCTS, PIECES AND SPAREPARTS.

5.1. Good General Practices

- ✓ Provide the purchasing department staff with environmental training so they will avoid purchasing products which are harmful to the environment.
- ✓ Carry out information campaigns and train staff in how they can reduce the use of consumable goods.
- ✓ Take into account the environment when purchasing. Chose products and supplies which have environmental certification.
- ✓ Buy products which do not have negative effects on the environment or workers' health (low energy consumption, low noise level, recyclable cartridge...).
- ✓ When purchasing, take ecological criteria into account. There is a wide range of eco-friendly office material available: recycled paper and cardboard, pencils made from recycled material, markers and correctors which are not environmentally harmful... Whenever possible disposable material should be avoided.
- ✓ Prioritize material which can be refilled or recharged such as pens, batteries, ink and toner cartridges, etc
- ✓ Always use consumable goods which have been approved and have been subjected to quality controls which include environmental aspects.
- ✓ When buying chemical products, you should look at what elements make up the compound so as to avoid using toxic substances unnecessarily.
- ✓ Use less harmful chemical products and use them following the manufacturer's dosage indications. In this way, there will be a reduction in the danger and volume of the waste.
- ✓ Learn the hazard and toxicity symbols and the symbols which identify ecological products.
- ✓ It is important that new air conditioning equipment not use CFC's as refrigerating agents as these contribute to the destruction the ozone layer.
- ✓ Raw materials should be bought in bulk or in large quantities, as this will reduce the production of packaging waste and will result in a cost savings.
- ✓ Ask suppliers to decrease transport packaging, as long as it doesn't affect the safety of the product. This will result in a savings on materials.
- ✓ Ask suppliers to use less packaging or use returnable and reusable packaging as this will generate less waste. Over packaging is an unnecessary use of materials and generates unnecessary waste.
- ✓ Reuse packaging and products whenever possible so s to avoid unnecessary purchases.
- ✓ Buying long-lasting tools and equipment is cheaper in the long run.

5.1.1. Good practices in paper consumption

- ✓ Use recycled paper (bleached without chlorine and made of 50% recycled fibers), for internal use (invoices, computer paper, notebooks etc.) as well as for advertising and brochures. You can use one of the trays of the photocopier for this use.
- ✓ Use the computer: Encourage staff to use email for internal and external communications. Internal computer networks (intranet) and email facilitate the sending and receiving of information without using paper.
- ✓ Revise and correct texts on the computer screen before pressing the print command in order to avoid printing documents with errors.
- ✓ Report printer performance problems so as to avoid failures.
- ✓ Print and photocopy using both sides of the paper. This will cut the use of paper in half.
- ✓ Print using the “two sheets per page” command.
- ✓ Print documents using as little ink as possible.
- ✓ The blank sides of paper already printed on can be used in faxes, printers, as scrap paper etc.
- ✓ Documents which do not need to be printed should be stored in the CDR or the CDRW or on the hard disk until it is not needed and then deleted.
- ✓ Don't use a cover sheet when faxing. This will save on paper use.
- ✓ Separate paper from the rest of the trash. Throw it away in specified bins for used papers which should be placed next to the printer. Then it should be collected for recycling.

5.2. Good purchasing practices for automotive workshops

- ✓ Use, whenever possible, powder paints as these contain fewer organic solvents (environmentally harmful and detrimental to workers' health) and do not emit volatile organic compounds.
- ✓ Buying tyres which minimize friction with the ground is recommended as this will save up to 5% on fuel.
- ✓ You should buy long-life tyres as these reduce energy consumption. The dealer can be consulted about rolling resistance and performance in terms of mileage. Radial tyres reduce fuel consumption. The most effective tyres are the ones with steel ring covers.
- ✓ When buying brake pad and brake lining replacements, be sure they are made of non-toxic materials and not of asbestos. Every time a driver hits the brakes using traditional brakes, minute particles of asbestos are released into the air. Asbestos is a carcinogenic substance.
- ✓ Buy consumable goods which are long lasting so they do not end up becoming hazardous waste when they are no longer useful
- ✓ The higher the quality of the lubrication oil, the higher performance of the vehicle, and therefore less fuel.
- ✓ Buy liquids (oils, antifreeze...) in large drums rather than in small packages. This will save money and resources and cut down on packaging.

5.3. Good practices in the use of raw materials when

manufacturing machinery and in the machining of metal products.

- ✓ Use, whenever possible, powder paints as these contain fewer organic solvents (environmentally harmful and detrimental to workers' health) and do not emit volatile organic compounds.
- ✓ Use cutting fluids which have low boron content (or are boron free).
- ✓ Replace additives containing heavy metals.
- ✓ Replace extreme pressure additives containing chlorine with ones which are chlorine free.
- ✓ Replace traditional cleaning rags with ones which can be reused after being properly washed.
- ✓ Replace traditional absorbent materials for special materials with increased absorption capacity
- ✓ Replace conventional disposable filters with ones which can be reused after being reconditioned.

5.4. Good practices in the use of raw materials for metallic coatings

Good practices in reducing raw material consumption in industry processes are:

5.4.1. Pickling

The reduction measures at this stage focus on:

- ✓ Prolong the bath life by using inhibitors when using a wet pickling method as this will minimize the base metal content in the depleted bath.

5.4.2. Baths (general)

The consumption of raw materials in electroplating baths will depend mainly on the technique and compounds used in the electroplating. It will also depend on how the material has been dragged between the different stages. Therefore the measures to be implemented should focus on these issues:

- ✓ Maintenance and control of the operating conditions of the baths.
- ✓ Automatic systems to optimize the draining of the drums and racks.
- ✓ Pieces should be drained over the same bath in which they were dipped so as to avoid dragged material and replenishment of the bath (reagents and water).
- ✓ Operate at the lowest possible temperature so as to prevent evaporation and thus avoiding the need to replenish the bath (reagents and water)
- ✓ Optimize the design of the pieces avoiding, as much as possible, depressions, boreholes, threaded sections, gaskets and grooves.

5.4.3. Zinc Baths

- ✓ Replace the cyanide alkaline zinc bath with a non-cyanide alkaline zinc bath or one which is zinc free formulated using sodium hydroxide and zinc. Even though this type of bath requires

more rigorous maintenance, its rinse water is easier to treat. It also produces less sludge to be filtered due to its low metal content.

5.4.4. Copper baths

- ✓ Replace alkaline cyanide copper baths with one which are cyanide free using copper phosphates.
- ✓ Replace alkaline copper cyanide baths with high pH nickel baths which have similar characteristics to copper baths.

5.4.5. Chromium Baths

- ✓ Replace hexavalent chromium baths with trivalent chromium baths.
- ✓ Replace hexavalent chromium baths with tin-cobalt alloy baths.
- ✓ Use hexavalent baths “in cold”.

5.4.6. Passivation / chromating

- ✓ Replace passivation / chromating baths with ones formulated with trivalent chromium.
- ✓ Replace chromium free passivation / chromating baths using organic coatings.
- ✓ Replace passivation / chromating baths formulated with molybdates and phosphates.

6. GOOD PRACTICES FOR WASTE MANAGEMENT AND WASTE REDUCTION

6.1. During The storage of materials, products and parts

- ✓ Inspecting materials prior to purchase will help ensure that these materials meet your needs and are in good condition. This will avoid the production of unnecessary material and reduce the cost of waste management
- ✓ Comply with the storage requirements of each product to maintain the maximum quality and to minimize the risks of contamination due to spillage or evaporation.
- ✓ Do not store raw materials or other metals outdoors as this generates rust and causes pollution.
- ✓ As for steel and plastic material (for example: for body parts), sheet metal, pipes and profiles, they should be painted after being positioned. You should avoid storing these pieces outside. Ask the supplier to deliver material that has been primed and is grease free. These actions will result in less pollution because they avoid additional treatment to parts.
- ✓ Use storage space wisely and rationally. Keep shelves en order.
- ✓ Use shelves to store abrasive material. This will help avoid damage done to tapes, sandpapers and abrasive disks. Keep boxes closed to prevent moisture and dust damaging the material.
- ✓ Store electrodes, wires and fluxes in a dry place to prevent moisture damage.

- ✓ You should make a list of all the chemical products you use and group them together according to their use when stored. This list should include:
 - abrasives (polishing pastes, surface finishing pastes),
 - chemicals (adhesives, cleaning products, demoulding agents, paints, primers, resins, hardeners, sealants, antifreezes, varnishes, others),
 - hydraulic / hydrocarbon liquids (brake fluid, hydraulic oils, grease, fuel, solvents).
- ✓ Store cutting fluids and lubrication oils clean containers which have good ventilation in order to avoid contamination from external agents, microorganisms, foreign liquids, dirt...
- ✓ Drums and tanks of chemicals must be hermetically sealed to prevent leaks and evaporation which will contaminate the soil and the air.
- ✓ Installing an overflow alarms on storage tanks will help prevent contamination risks.
- ✓ Periodically check the condition of the containers and packaging used for chemical products and dangerous waste in order to discover breaks and cracks.
- ✓ Check the conditions of the storage tanks which hold welding gases to prevent leakages.
- ✓ Conduct periodic inspections of product storage containers (oils, lubricants...) to prevent leakages.
- ✓ Spill trays should be used in order to collect any leakage from liquid waste storage tanks.
- ✓ Check that products are properly labeled with clear operating instructions.
- ✓ To optimize the use of materials and prevent waste generation, it is very useful to follow their loading/unloading, internal transport and handling instructions.
- ✓ Establish written mandatory procedures to be followed for incoming, outgoing and the storage of consumable goods, above all, when they have an expiration date.
- ✓ Using consumable goods which have been in storage the longest, through proper stock rotation, and optimizing raw material usage, produces less waste.

6.2. During production processes

6.2.1. In vehicle repair workshops

6.2.1.1. Repairs

- ✓ Body parts which are to be replaced should be removed and separated as many of them can be recycled. For example: sheet metal, pieces of plastic, glass, etc. This action will minimize waste.
- ✓ When removing engine parts, special attention must be paid in order to collect oils and other cooling fluids separately.
- ✓ Avoid carrying out repairs in pedestrian areas and open spaces.

6.2.1.2. Bodywork

- ✓ Plan bodywork repairs before starting in order to avoid subsequent corrections which produce waste or having to make adjustments by pounding.
- ✓ It is advisable to have dust and smoke extraction systems with filters (mainly wet) in brushing and grinding operations. Dust from these operations contains paint particles which are environmentally harmful.

- ✓ Drilling emulsions should be recirculated when sawing (with chain saws for example). It is also advisable to watch for possible spills. Used drilling emulsions is hazardous waste and highly polluting to the environment.

6.2.1.3. Paint

- ✓ Before starting a painting job, calculate the quantity of paint that will be needed to complete the job so as to avoid wasting paint leftover in the spray guns.
- ✓ It is advisable that the area which houses the painting booth have overpressure to prevent dust entering and settling on the car body. In this way defects which lead to job rejection and pollution can be avoided.
- ✓ Parts have a more uniform finish if the spray gun is held perpendicularly to the painting surface and the air pressure is low. In this way, paint consumption is optimized.
- ✓ In some task completions (brushing and welding), it is advisable to be extra vigilant in terms of cleaning, dust removal, and paint sills to prevent pollution.

6.2.1.4. Degreasing and cleaning of pieces

- ✓ To minimize the volume of solvent used to remove oils and grease and, at the same time, save on raw materials, a distillation system for used solvent recovery can be installed. In this way, only distillation remains will be left to be treated as hazardous waste.
- ✓ Whenever possible, solvents should be reused as long as their conditions and compositions permit. It is advisable to check that the used solvent has retained its properties so that it can be reused.

6.2.1.5. Fluid changes

- ✓ Use extreme caution when filling levels of oil and other vehicle fluids, in order to prevent spills which harm the soil and contribute to water contamination.
- ✓ The installation of a mechanical dosage mixing system is advisable thus the use of larger amounts of raw materials is avoided in the preparation of solutions.

6.2.1.6. Filters and batteries

- ✓ Clogged filters lead to more energy consumption and as a result, the fuel filter should always be kept clean. These elements (the oil, fuel and air filters should be treated as hazardous waste.
- ✓ Used batteries are hazardous waste. Companies authorized to do so can recover a large part of these hazardous waste (plastic, lead) and properly treat the depleted acid.

6.2.1.7. Oils

- ✓ Properly manage used oil. Following the current recycling procedures, for every liter of oil, 625 ml of new lubricant is obtained (more than 60%). This is a significant energy savings. In Spain scarcely 1 in 5 liters of oil is recovered.
- ✓ Try to avoid spilling oils and other lubricating materials. Oil stains on the floor should be cleaned with absorbent materials instead of water.
- ✓ Remember that cleaning rags and cardboard which have been in contact with used oil and

grease are considered hazardous waste and therefore containers should be available for their collection and subsequent disposal.

6.2.1.8. Clean

- ✓ When cleaning engines, all spilled fuel oil and solvent sludge should be treated as hazardous waste.
- ✓ Repaired vehicles should be cleaned with mechanical systems which save on cleaning products.

6.2.1.9. Communication with customer

- ✓ Customers should be informed of the environmental impacts involved in maintenance and repair operations (hazardous waste, air pollution, waste water discharge noise etc.). This prevents the undertaking of these operations personally and thereby improving the environment.
- ✓ Customers should be shown the parts which have been replaced and it should be explained where these parts will end up and their impact on the environment. This will also improve the company's image.
- ✓ Customers should be sold biodegradable products for cleaning their vehicles. Products which cause a lower environmental impact should be chosen (those which are phosphate free, for example).
- ✓ It is important to inform the customer of the environmental benefits that preventative maintenance of their vehicle has terms of reduced gas emissions, less noise, less fuel consumption, and less waste as well as fewer damaged parts and oil leaks etc
- ✓ It helps improve the environment when customers follow the manufacturer's maintenance schedule and are vigilant for possible failures. A well maintained vehicle uses up to 9% less petrol, which means, among other benefits, 9% less emissions into the air.
- ✓ It is advisable to inform customers that they should monitor fuel consumption in order to detect sudden increases indicating a possible failure which needs to be repaired. When these failures are repaired quickly, there will be a reduction in fuel consumption and thus a subsequent improvement in natural resource management. The best way to achieve effective fuel consumption is with a well maintained vehicle.
- ✓ It is not advisable to let the engine idle unnecessarily. Putting a car in gear uses less fuel than leaving it to idle, if it is standing more than a minute.
- ✓ Keep tyres properly inflated and balanced according to the manufacturer's parameters. This is not only a matter of safety. Poorly inflated tyres result in higher fuel consumption (up to 5% more fuel due to increased rolling resistance.) Maintaining them correctly inflated, will also help tyres last longer.

6.2.2. Manufacturing machinery and machining metal products

- ✓ Properly prepare equipment and material prior to operation and thus avoiding defective pieces upon startup.
- ✓ Manage orders well and adjust production according to these orders, and if possible, adapt them to a larger series as this will prevent defects and save energy.
- ✓ Install vacuum and filter systems to eliminate dust generated in the machining processes.
- ✓ Select the type abrasive to be used depending on the type of process, type of material to be worked, and the degree of abrasiveness required, and thus reducing the number of rejects of both material and tools.
- ✓ Blasting operations will always be carried out within enclosures. This will prevent flying particles which may injure workers and cause the loss of blasting materials.
- ✓ During the welding processes an extractor hood with a filter should be used in order to prevent the build up of combustion gases
- ✓ Optimize cutting processes maximizing the metal sheets and rods.
- ✓ Adjust cutting operations to fit the design and pattern of the pieces. Maximize the use of

metal pieces thus preventing waste.

- ✓ Install a mechanical dosage mixing system to mix materials. This will increase the quality and maximize the use of resources.
- ✓ Cut material as accurately as possible. This will reduce the volume of material to be eliminated and, in turn, the volume of waste (swarf) generated.
- ✓ Operate equipment at appropriate speed.
- ✓ Reuse manufacturing cuts.

6.2.2.1. Associated with Cutting Fluids

- ✓ Avoid using cutting fluids in operations in which their use is not essential, by dry machining. As an alternative, compressed air can be used as a coolant.
- ✓ Apply cutting fluid correctly on the piece-tool interface, ensuring the efficiency of the fluid in relation to the lubrication and the coolant, thus reducing the wear on the tool while at the same time reducing the pollution caused by the fluid and extending the life of the tool.
- ✓ Install a micro-spraying system for cutting fluids.
- ✓ In as far as possible, change the design of the pieces in a way which will facilitate the draining of the cutting fluids during machining operations.
- ✓ Use equipment fitted with fairings protection/retention as the operating conditions (machining speed, pressure and the use of drilling emulsions) are conducive to cutting fluid splashes as well as small flying metal particles.
- ✓ Install all the machines with mist oil catchers and purifiers which can collect and treat oil used in the machining process to be reused.
- ✓ Centralize, in so far as possible, the supply of cutting fluids and lubrication oils. This will reduce the variety in use and simplify operations and quality control. Use cutting fluids which are compatible with one another in order to prevent contamination problems due to their incompatibility.
- ✓ Replace traditional individual oil tanks with a fully centralized system in machines which require lubrication oil or other similar cutting oils.
- ✓ Prevent lubricating fluids from leaking and mixing with cutting fluids as this will diminish the cooling capacity due to the growth and proliferation of microorganisms.
- ✓ Prevent the cutting fluids used on metal swarf caused by the machining processes to drip or leak down the drain.
- ✓ Install containment trays on equipment when there is the possibility of oil leaks. This will prevent contaminating the ground and cleaning material used to clean up the leak.
- ✓ Do not mix dry metal swarf with ones which have been impregnated with cutting fluids as this will contaminate the clean swarf by converting them into hazardous waste and consequently increasing the costs involved in hazardous waste disposal.
- ✓ Continuously monitor the cutting fluids in use by controlling the fluids' viscosity, pH and conductivity as well as the concentration of particles, and foaming tendency...
- ✓ Keep the work area dirt free to prevent the contamination of the cutting fluids.
- ✓ When replacing the cutting fluid, make sure that the entire cooling system is clean. This can be done by checking that the water used in the flushing is clean.
- ✓ Use any of the following equipment for the cleaning and recovery of drilling emulsions separately or in combination with each other.

- Settling tanks: Usually, these types of tanks are the first step in the process of cleaning fluids.
- Flotation tanks for cleaning used drilling emulsions
- Using hydro-cyclones to clean used drilling emulsions.
- Using magnetic separators to used drilling emulsions.
- Using centrifuges to clean used drilling emulsions.
- Reverse osmosis equipment
- Using filtering techniques to clean used drilling emulsions
- Using ultra-filtration techniques to treat used drilling emulsions.
- Using microfiltration techniques in the treatment of used drilling emulsions.
- Using the vacuum evaporation technique to treat of spent aqueous cutting fluids.
- Using physiochemical treatments for spent aqueous drilling emulsions.
- Using centrifugation techniques to treat abrasion process effluents.
- Removal of external oils present in aqueous cutting fluids through means of deoiling machine
- Using centrifuge equipment to remove cutting fluids from impregnated metal pieces and swarf.
- Using a briquetting press to recover cutting fluids remaining on metal swarf.
- Using centrifuge equipment to separate the pieces and machining swarf.

6.2.2.2. Associated with lubricating Oils

- ✓ Keep track of grease and lubrication oil which is in use. Monitor changes in their properties using techniques such as measuring conductivity, concentration, (refractometer) viscosity..., thus maximizing their time in use before being replaced.
- ✓ Perform preventative maintenance on machine tools, primarily on those involved in the lubrication system in order to reduce waste caused by spills and fluid leak contamination.
- ✓ Use extreme caution when filling levels of oil and other vehicle fluids, in order to prevent spills which harm the soil and contribute to water contamination

6.2.2.3. Associated with degreasing

- ✓ When degreasing parts, it is advisable to replace harsh degreasing agents with ones which are less contaminating.
- ✓ Chlorinated solvents should be replaced with alkaline or neutral aqueous agents (bleach or detergents), to degrease machinery parts.
- ✓ If solvents are used in cleaning and maintenance operations, be sure to close their containers promptly and correctly so as to reduce emissions into the working environment and prevent waste caused by spills.
- ✓ Maximize the reuse of solvents provided that their conditions allow for it.
- ✓ Install a distillation system in recover solvents. That way only the distillation residue will remain to be treated as hazardous waste.

6.3. During facility maintenance and cleaning operations

- ✓ When cleaning the facility, it is preferable to use non-aggressive chemical products which will not harm the environment (phosphate and chlorine free detergents...)

- ✓ Overusing chemical products causes pollution and does not necessarily guarantee the best cleaning results. These products are not the only way to achieve the desired cleanliness; many times mechanical means such as pressurized water can be used.
- ✓ In order to avoid wasting water when cleaning, taps and hoses should be closed and turned off when not in use.
- ✓ Cleaning rags and material which have been in contact with hazardous products (oils, degreasers, disinfectants...) and containers which have held them, are to be treated as hazardous waste.
- ✓ The order in the arrangement of materials and taking care of your work area will reduce the frequency of cleaning, thus decreasing water consumption and the use of chemical products as well as the volume of wastewater generated.
- ✓ Waste which can be reused or recycled should be separated so as to avoid it being disposed of during cleaning operations.
- ✓ Maximizing the use of solvents to clean material as well as to adjust viscosity, when their conditions and compositions permit, will reduce the generation of waste.
- ✓ Avoid indiscriminate use of water when cleaning equipment, thus reducing the volume of water contaminated with oil, grease, etc.. and in turn reducing water becoming wastewater discharge which needs to be treated

6.3.1. Waste management

- ✓ Conduct information campaigns and train employees how to reduce and correctly manage waste and in turn reduce pollution.
- ✓ Encourage staff to attend environmental training sessions. In the long run, this will save the company money as it means better managing of resources.
- ✓ Making separate waste bins available will help with waste separation and in turn facilitate waste management, contributing to improvements in the environment.
- ✓ Inform staff about the dangers involved in the chemical products they handle regularly. This will reduce the risk of accidents and pollution.
- ✓ Develop guidelines for the handling of different chemical products and train staff in their use to prevent leaks and spills. This will reduce their environmental impact.
- ✓ In order to establish an environmental control and to set targets for waste reduction, it is advisable to keep a record of the quantity, origin, destination and costs associated with the waste and its management.
- ✓ Use products which can be recycled when they no longer serve their purpose and which do not contain hazardous material.
- ✓ Manage waste in a way that facilitates its management, storing different types of waste separately and clearly identifying them. .
- ✓ Store hazardous materials in appropriate containers. Prevent them coming in contact with the exterior environment.
- ✓ Empty containers whether they be paint, degreasers, additives, glues, or waste impregnated with these substances, should be classified as hazardous waste as they contain, or have been in contact with, substances which are legally defined as hazardous.
- ✓ Protect storerooms from the elements so as to prevent stock being damaged and thus becoming waste.
- ✓ Wastes products must not be left in the open air as rainwater will become contaminated with hazardous substances contained in the waste and, contaminate the soil and surface

water.

- ✓ Hazardous waste should be stored in covered areas which have waterproof floors. Use airtight containers and avoid mixing waste products as this increases their hazardous nature
- ✓ Do not mix hazardous waste with non-hazardous waste to prevent the first from being contaminated and thus become hazardous waste which will result in an increase in waste management costs
- ✓ Place hazardous waste containers in well-ventilated areas, protected from the sun and rain, away from sources of heat and placed so that they do not come in contact with other products with which they may react.
- ✓ Storage areas for hazardous waste should be located away from drains, gutters, sewers or any other element of the water drainage system. This prevents accidental spills polluting the ground water.
- ✓ It is advisable to use spill trays in order to collect any possible spilled substances from drums which contain hazardous waste.
- ✓ Used oils, grease, lubricants, and fuel should never be dumped down the storm drains or down the workshop drain system. This type of material should be collected in tanks and treated as hazardous waste.
- ✓ Install a distillation system to recover solvents. That way only the distillation process residue remaining will have to be treated as hazardous waste.
- ✓ Avoid using more absorbent material than necessary in cleaning up spills and leaks. Absorbent material should be separated according to its type and pollutant thus facilitating its management.
- ✓ Identify accidents and emergencies with environmental impact that may occur: fire, hazardous materials spill, broken sewage pipes, etc. Take measures to prevent or reduce their harmful effects (fire detection and extinguishing systems, spill containment systems, periodic inspection of pipes...) All this will improve company's environmental management system.
- ✓ Assess the impacts caused by accidents in which hazardous substances were involved so preventative measures can be integrated into the repair processes.
- ✓ Encourage waste management through the Byproduct Exchange so waste can be reused and study the possibility of acquiring products through this exchange.
- ✓ Do not incinerate used tyres indiscriminately. Workshops are required to give them to authorized waste management companies for their assessment.
- ✓ Place used cartridges in a container to facilitate pick up.
- ✓ Use an authorized company to pick up used cartridges.
- ✓ Take electrical appliances and electronic goods (computers, printers...) to distributors when they no longer serve their purpose.
- ✓ Used fluorescent tubes and batteries are hazardous waste products due to them containing mercury, lead and acids and need to be treated as such.
- ✓ Batteries should be placed in special containers, separated from other waste material, and then given to an authorized waste management company. Another option is take batteries to certain establishments which provide containers specifically for batteries.
- ✓ Hazardous waste must be separated labeled and stored in appropriate containers to be picked up by authorized waste management companies.
- ✓ Scrupulously comply with legislation regulating hazardous waste material.

Lifelong Learning GREEN POINT

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