# PLANET FRIENDLY GUIDE

## FOR SCREEN PRINTERS

POLLUTION

FESPA
profit for purpose

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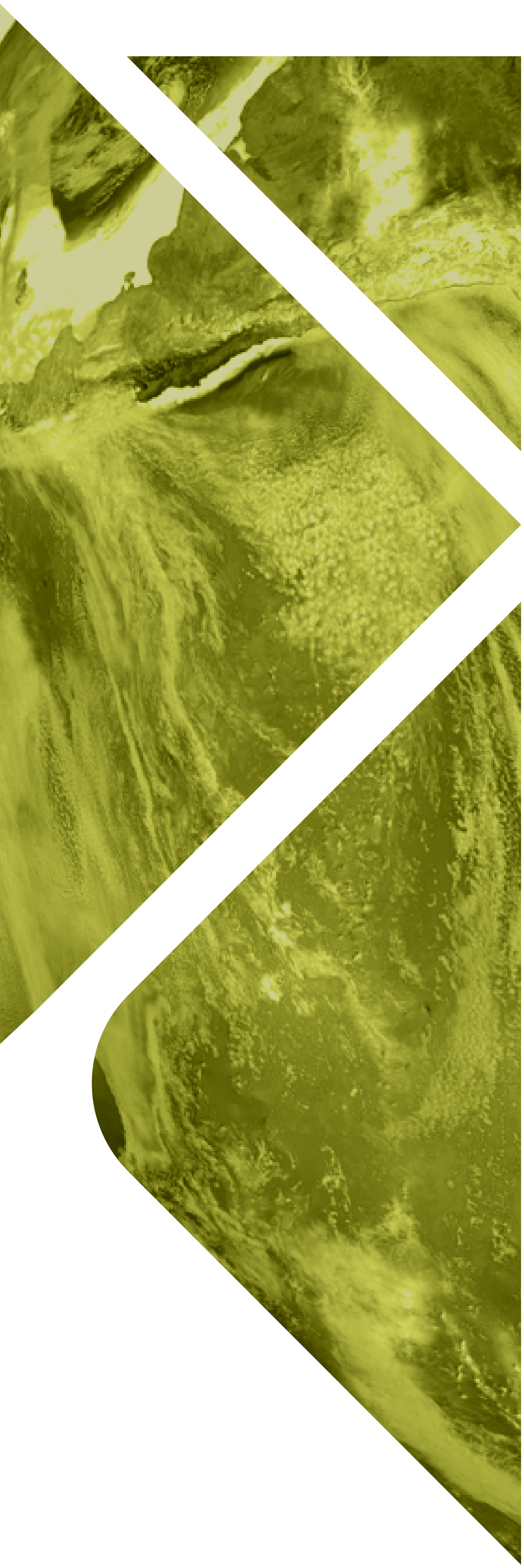


# ABOUT THIS FESPA PLANET FRIENDLY SUMMARY GUIDE

**This FESPA PLANET FRIENDLY SUMMARY GUIDE has been developed as part of a series.**

The Guides aim to provide screen and digital printers with everything they need to know about printing sustainably.

The best available techniques, included in the Guides, give proven practical methods that can also generate financial savings. The Guides can assist printers who are planning to undertake any Environmental Management Certification.

The environment is a global topic that involves all the major industrialised nations. This has led to multi-international agreements such as the Kyoto and Montreal Protocols, the Durban Climate Change Conference, the Rio Earth and the Copenhagen Summits.

The European Union (EU) has been an early adopter of these agreements through various Directives and Regulations. The standards set by the EU in this field are often used as the benchmark by countries all over the world. However, there may be differences and the Guide user should always check with their local government bodies.

**THE FESPA PLANET FRIENDLY SUMMARY GUIDES** are based on these EU Directives and full details of references to this legislation can be found in the appropriate section of the Guide.

FESPA's Associations and their print company members can use and translate the Guides and the images used in them at no cost.

## THE HISTORY OF THE GUIDE

The Guides are based on FESPA's Planet Friendly Guide which has been used as the print industry's reference on this subject since it was created by FESPA in January 2012. Under the expert guidance of Michel Caza and Paul Machin, the Planet Friendly Guide has been developed and regularly updated for use by screen and digital printers all over the world.


Michel Caza is a multiple award-winning leading light in the global screenprinting industry, and one of the 'founding fathers' of FESPA in 1962 and has been a Board Member since 1990.


Paul Machin is a chemist and lawyer Paul has spent 40 years dealing with European and international issues relating to the health, safety and environmental topics within the printing industry.

***While every effort has been made to ensure that the information contained in the Guides is correct as at August 2014, readers are asked to note that FESPA makes no representation, expressed or implied.***

# POLLUTION

## WHAT ARE THE SCREEN PRINTING POLLUTING ACTIVITIES?

**The screen printing operations can be divided into four main steps:**

**Step 1:** Composition of the image and preparation of the screen: “prepress”

**Step 2:** Printing on substrates or objects (paper, board, plastics, textiles, etc.)

**Step 3:** Cleaning and de-coating of the screens

**Step 4:** Converting, finishing and packing

### THE POLLUTING ACTIVITIES ARE:

**a. The production of industrial waste**

**b. Water pollution**
– chemicals discharged to drain

**c. Air pollution**
– Volatile Organic Compounds (VOCs), malodorous smells, dusts, ozone

**d. Indirect pollution**
– use of energy producing $CO_2$ products containing dangerous substances and a selection of substrates; the production of particulate material and $CO_2$ from the transportation of goods and personnel

**e. Environmental nuisance such as noise, light**

# A. INDUSTRIAL WASTE

## I. HAZARDOUS WASTE

All hazardous waste when it is to be disposed of must be described by its European Waste Catalogue (EWC) number for that ink cartridge or container, solvent etc. which must be specified in the Safety Data Sheet. It must not be mixed with other waste and it must be collected by specialised companies who handle hazardous waste. There are four types of waste from screen printing as determined by the Hazardous Waste Directive 91/689/EEC, which must be separated with a view to their disposal.

Some chemicals used in the screen printing process (inks, solvents etc.) can contain polluting elements which can be potentially toxic to humans, animal life and plant life, namely metallic elements and hydrocarbons. These chemicals upset the water table and therefore, disrupt the purifying process of drinking water. Some of these elements need specific treatment. They should not therefore, be discharged either, in the atmosphere nor the drainage system, and certainly not in household waste.

There are other hazardous industrial wastes, for example waste solvent, dirty packaging such as ink cartridges, solvent containers, dirty clothes, contaminated wipes and fluorescent tubes.

## II. NON-HAZARDOUS WASTE

The non-hazardous waste: includes paper, board, plastic and textilesas well as unprinted clean and printed packaging waste (mostly cardboard) that can be collected separately to  be re-used, re-cycled or valorised depending  upon whether printed or not.

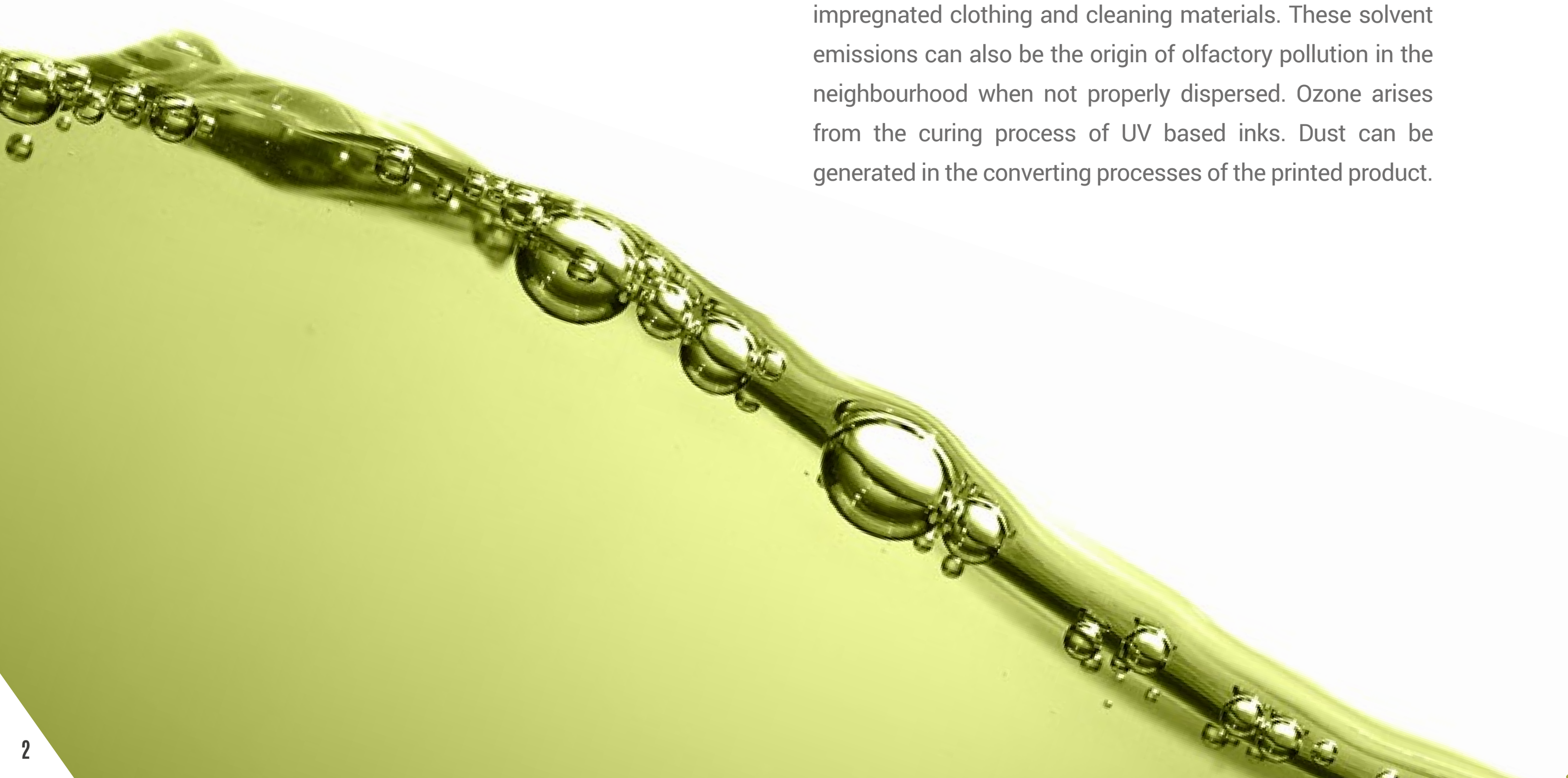
In some countries, the non-dangerous waste is collected by public local authority contractors.

# B. WATER POLLUTION

Polluted water comes from the production of photographic positives fixers and developing fluid. The majority of polluted water is from stencil making and cleaning operations (screen cleaning, reclaiming and/or de-coating, sometimes combined into one operation).

# C. AIR POLLUTION

The atmospheric discharges from a screen printing plant are mostly solvents (eco-solvent included) ozone and dust. The solvents emulate from mixing, printing and drying of inks, cleaning of screens during or after printing, reclaiming screens, open cans or ink and solvent containers and impregnated clothing and cleaning materials. These solvent emissions can also be the origin of olfactory pollution in the neighbourhood when not properly dispersed. Ozone arises from the curing process of UV based inks. Dust can be generated in the converting processes of the printed product.



# D. ENERGY MANAGEMENT

Apart from consumables such as substrates, inks and cleaners, energy is probably the printer's next highest non-payroll expenditure. Within the European Union (EU) the paper and printing industry consumes 11% of the total industrial energy usage. With the continued industrial and economic expansion in countries such as China and India the availability of sources of energy worldwide will be under severe strain. The total cost of energy production from renewable sources is high when compared to the replaced high carbon footprint sources such as coal. This will probably lead to a continual increase in the cost of all forms of energy.

# E. ENVIRONMENTAL NUISANCE

A nuisance can be described as any unlawful interference with a person's use of or enjoyment of land. What act constitutes an unlawful interference is subject to many definitions across Europe. However, it is possible to put forward examples of many acts that could be described as nuisances that may not give rise to any legal redress but affect a neighbour's enjoyment. These could include noise, odour, dust, light pollution, loss of light and rubbish. Where such acts take place can also have a considerable influence as to the perception of a nuisance.

# HOW TO REDUCE POLLUTION FROM SOLVENTS WITH SCREEN INKS?

## i. AUTOMATIC SCREEN RECLAMATION

A major problem related to screen printing is the use of solvents containing VOCs for the purpose of cleaning and reclamation of screens. There exists in the market machines which allow a procedure to either clean or reclaim the screens automatically. The better ones combine the two procedures, all totally automatic and totally enclosed.

The potentially best environmentally performing of these devices, work without solvents, using emulsifiers (surfactants) instead – therefore, totally eliminating the "solvent risk" from both health and environmental exposure and also cutting down the fire risks. However, some of the surfactants and biocides used are subject to the **EU Detergents Regulation 648/2004** and the **EU Biocidal Regulation** and the choices may be limited.

The top quality machines work in an enclosed circuit: the water introduced at the beginning of the month can be recycled until the total saturation point has been reached for the effluents from inks and emulsions. At this point, generally once a month, it is necessary to have the remaining "sludge" removed by a company specialising in hazardous waste. This will ensure the transportation and destruction of this "sludge." For a large size (to reclaim screens of 3 x 2.5 metres) the most sophisticated and safest can involve an investment of €80,000.

Many manufacturers now offer smaller models that are much cheaper and can be adapted to the exact quantity of screens treated and the volume of water used daily.

## ii. REPLACEMENT OF VOLATILE CLEANING SOLVENTS

The European Union's position for the management of volatile solvents actually follows a tendency to focus on the points below to:

**a.** **Reduce emissions of volatile hydrocarbons**

**b.** **Prohibit the use of di/tri-chloroethane in cleaning solvents and chemicals that have carcinogenic, mutagenic or repro-toxic effects.**

**c.** **Discourage the use of solvents with noxious smells in the neighbourhood, such as toluene, methyl isobutyl ketone, xylene.**

**d.** **Prohibit the use of highly volatile solvents where the flash point is lower than 21°C (group 1) and even 50°C (group 2).**

**e.** **Recommend the use of solvents from group 3 (flash point between 50°C & 100°C) better still group 4 (HBS flash point above 100°C) The European Directive applicable is Regulation (EC) No 1272/2008 which incorporate the requirements of the Registration, Evaluation, Authorisation and restrictions of Chemicals (REACH) and the Global Harmonisation System with the exception of respiratory sensitisers (H334) and skin sensitisers (H317).**

# HOW TO AVOID POLLUTION WITH SCREEN INKS & SOLVENTS, ESPECIALLY UV INKS

## POTENTIAL POLLUTION ISSUES:

1. Ozone production
2. Ozone elimination
3. Protection of eyes and skin

## 1. OZONE PRODUCTION

Ozone is an allotropic variety of oxygen; chemical notation O3. It occurs naturally in the environment and is a strong oxidising agent, generated by the ultraviolet rays between 170 and 200 nanometres. It is often produced by UV light sources, for example lamps and welding torches. Ozone is a poison for the body at a high dosage. The recommended workplace exposure level is 0.2 mg/M3 of air. The ozone layer (created in the high atmosphere by the solar UV rays) protects the planet from solar UV radiation.

## 2. OZONE ELIMINATION

There are two solutions: do not produce it or extract it. It is sufficient to block the emission in the rays positioned between 170 and 200 nanometres. A special coating of quartz covering the lamp will work. Unfortunately, this reduces the efficiency of the lamp by 10% to 15% and thus slows down the speed of curing.

An alternative means of elimination is by using LEDs (Light Emitting Diodes) as the light source. LEDs can generate a light source with a concentrated spectral content. Since the optical spectrum is limited to what the process requires, namely the UV range for ink curing, the electrical to optical conversion efficiency is substantially improved over most UV arc lamps.

The simplest and most efficient method in all other cases is to remove the ozone through extraction to the outside. The air draught necessary for this evacuation can help in cooling the lamp and reflector. The ozone produced in minute quantities is a very unstable gas. In a few seconds the ozone converts back to oxygen and is therefore considered as only “slightly polluting”.

## 3. PROTECTION OF EYES AND SKIN

UV radiation is dangerous for the eyes and skin. The eyes are particularly sensitive to UV radiation. Even a short exposure of a few seconds can result in a painful, but temporary condition known as photo-keratosis and conjunctivitis. The medium wave UV causes skin burns, reddening and darkening of the skin. Prolonged exposure increase the risk of skin cancer.

In the UV curing units designed by professional manufacturers, these risks are totally eliminated by the use of safety controls. For example any accidental or unexpected opening of doors when the lamps are being used will cause a close-down of the machine. This reaction is further supported sometimes by the use of opaque or smoked glass and avoiding any discharges of direct or reflected radiation.

Some uncured UV inks can still irritate the skin and eyes in times of direct contact. The reactions that can cause dermatitis can be produced on frequent or prolonged exposure to an allergic reaction. Some people are more sensitive than others and can experience such a reaction. Ink manufacturers continue to carry out research to solve these problems and find less irritating substitutes through using combinations of oligomers and monomers.

Ink manufacturers now take the sensitising effects into consideration and only use resins, oligomers and monomers meeting the following criteria:

**Skin irritancy rating: <2 (OECD test 404)**

**Organic solvent content: <0.2%**

**Acrylic acid content: <0.1%**

Recycling
RE-USE
Reduction
Responsibility
Recycling
Reduction
RE-USE
Sustainability
Responsibility
Sustainability
RE-USE
Recycling

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## ABOUT FESPA

FESPA is a global federation of 37 national associations for the screen printing, digital printing and textile printing community. Founded in 1962, FESPA organises the leading exhibitions and conferences for this community and reinvests profits from these activities into the global print community.



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