

Hong Kong Green Label Scheme

Product Environmental Criteria for

Printing Ink (GL-004-004)



BACKGROUND

The Hong Kong Green Label Scheme (HKGLS) is an independent and voluntary scheme which aims to identify products that are, based on life cycle analysis consideration, more environmentally preferable than other similar products with the same function. The Scheme is organized by the Green Council (GC) with support and contributions from the HKGLS Advisory Committee and a number of supporting organizations.

The prime objectives of HKGLS are:

- ✓ For Consumers: assist in making purchases of products that are less harmful to the environment;
- ✓ For Industry: stimulate development and production of environmentally preferable alternatives.

This specification sets out the requirements that printing inks will be required to meet in order to be licensed to use the HKGLS label. The requirements include environmental criteria and product characteristics. The specification also defines the testing and other means to be used to verify conformance with the environmental criteria and product characteristics.

POTENTIAL ENVIRONMENTAL IMPACTS

Environmental impacts of printing inks may include the release of volatile organic compounds (VOCs) from volatile solvents or mineral oil, heavy metals contained in pigments, other toxic and /or hazardous substances during their manufacture, application/use, and disposal.

Conventional solvent-based inks emit VOCs as they dry. VOCs can be highly flammable, result in toxic and narcotic effects when inhaled and can contribute to the formation of tropospheric ozone and smog.

LABEL OBJECTIVE

The aim of the environmental criteria developed for printing ink is to:

- ✓ Reduce the levels of VOCs, heavy metals and other toxic and/or hazardous substances arising from the manufacture, application/use, and disposal of printing ink.

PRODUCT DEFINITION

This document and all product environmental criteria therein apply to all ink types including Water-Based Inks, Oil-Based Inks, Ultra Violet Cured Inks (UV) and Solvent-Based Inks.

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PRODUCT ENVIRONMENTAL CRITERIA

The table below sets out the product environmental criteria for printing ink (GL-004-004) under the HKGLS.

Product Environmental Criteria	Verification Method(s)*
<p>1. The printing ink⁽¹⁾⁽²⁾ shall not contain carcinogenic substances in categories 1, 2A and 2B as classified by the International Agency for Research on Cancer (Lists of IARC Evaluations at http://www-cie.iarc.fr/monoeval/crthall.html)⁽³⁾⁽⁴⁾ (or see Resources Centre at http://www.greencouncil.org/eng/greenlabel/res.asp)</p>	<p>✓ Review of supporting information.</p> <p>The applicant shall declare compliance with the requirement, and ingredient information including formulation specifications, product Safety Data Sheets, ingredient lists and ingredient Safety Data Sheets</p>
<p>2. Impurities of the elements listed below which are contained in the raw materials and components shall not exceed a combined total of 0.01% by weight of non-volatile content⁽³⁾⁽⁴⁾⁽⁵⁾.</p> <p>Antimony, Arsenic, Cadmium, Chromium, Lead, Mercury, Selenium</p>	<p>✓ Review of laboratory test report(s)⁽¹⁾</p>
<p>3. Inks shall not be formulated or manufactured with Halogenated solvents⁽³⁾⁽⁴⁾⁽⁶⁾</p>	<p>✓ Review of laboratory test report(s)</p> <p>✓ Review of supporting information.</p> <p>The applicant shall declare compliance with the requirement, and ingredient information including formulation specifications, product Safety Data Sheets, ingredient lists and ingredient Safety Data Sheets</p>
<p>4. Aromatic hydrocarbons content⁽⁷⁾:</p> <ul style="list-style-type: none"> • Offset lithographic and news ink shall only use solvents containing <i>aromatic</i> hydrocarbons less than 1% of the total volume⁽⁶⁾. • The content of <i>aromatic</i> organic solvents in Gravure ink and resin typographic ink shall be less than 1% of the total volume⁽⁶⁾. 	<p>✓ Review of laboratory test report(s)</p> <p>✓ Review of supporting information.</p> <p>The applicant shall declare compliance with the requirement, and ingredient information including formulation specifications, product Safety Data Sheets, ingredient lists and ingredient</p>

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Product Environmental Criteria	Verification Method(s)*
	Safety Data Sheets
<p>5. Printing inks shall not be formulated or manufactured with the following⁽³⁾⁽⁴⁾:</p> <ul style="list-style-type: none"> • Hydroquinone • Formaldehyde or have the potential to release formaldehyde during use • Phthalates⁽⁸⁾ • Toluene Diisocyanate⁽⁹⁾ • Hexamethylene Diisocyanate⁽¹⁰⁾ 	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s) ✓ Review of supporting information. <p>The applicant shall declare compliance with the requirement, and ingredient information including formulation specifications, product Safety Data Sheets, ingredient lists and ingredient Safety Data Sheets</p>
<p>6. Volatile Organic Compounds⁽¹¹⁾</p> <ul style="list-style-type: none"> • Water-Based Inks⁽¹²⁾ shall contain less than 5% of VOCs by weight⁽³⁾⁽⁴⁾. • Oil-Based Inks⁽¹²⁾ shall contain less than 4%⁽¹³⁾ of VOCs by weight⁽³⁾⁽⁴⁾. • Ultra Violet Cured Inks (UV)⁽¹²⁾ shall contain less than 2% of VOCs by weight⁽³⁾⁽⁴⁾. • - Solvent-Based inks⁽¹²⁾ shall contain less than 50% of VOCs by weight⁽³⁾⁽⁴⁾⁽¹⁴⁾. 	<ul style="list-style-type: none"> ✓ Review of laboratory test report(s)⁽¹¹⁾
<p>7. Packaging requirements (optional)</p> <ul style="list-style-type: none"> • All plastic containers must have a plastic resin identification code clearly visible on each container. • Ink containers must be made of materials that are able to be recycled. 	<ul style="list-style-type: none"> ✓ Inspection of product samples; AND ✓ Review of supporting information; AND ✓ Interview with relevant personnel.

*Analytical testing should be accredited and performed by laboratories that meet the requirement laid out in the IEC/ISO 17025 or EN45001 standards or any equivalent systems e.g. HOKLAS, CNAS. Under special situation and with the approval from GC, test can be performed by in-house method by the accredited laboratory or manufacturer.

Notes

(1) Printing inks are manufactured from the following basic ingredients⁽⁴⁾:

- pigments and/or dyes, which constitute the coloring agent. They are classified as carbon black, organic, white inorganic and colored inorganic. Carbon Black is major ingredient in black inks.

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- a resin that serves to carry the pigment and bond it to the substrate
 - additives, to control such performance characteristics as drying, adhesion, and rub resistance
 - oils, solvents to dissolve the resins and transfer the pigment and resin to the paper.
- (2) There are 4 types of printing ink in relation to printing types. The letterpress and lithographic are based mainly in mineral oil (i.e. petroleum, e.g. paraffin oil), while flexographic and rotogravure use very volatile solvents.
- Letterpress printing : a printing operation in which the image area is *raised* relative to the nonimage area and the ink is transferred to the paper directly from the image surface.
 - Lithographic printing: A printing operation in which the image and nonimage areas exist in the *same* plane. The nonimage area is treated chemically so that the image areas will be printed onto the substrate.
 - Flexographic printing: A printing method utilizing a flexible rubber or other elastomeric plate in which the image area is *raised* relative to the nonimage area.
 - Gravure printing : A printing process involving *recessed* image area; the ink is carried in minute etched or engraved wells on a roll or cylinder, excess ink being removed from the surface by a doctor blade. The dominant gravure printing process is rotogravure.
- (3) Environmental Choice Australia : Licence Criteria for Printing Inks (Draft)
- (4) Environmental Choice New Zealand : Licence Criteria for Printing Inks EC-17-98
- (5) Pigments used in all types of printing are similar, though the vehicles are quite different. Pigments may contain heavy metals or other toxic constituents.
- (6) Japan Environment Association Eco Mark Product Category No. 102 “Printing Ink” Version 2.1 ”
- (7) Besides Aromatic Hydrocarbons, Australia or New Zealand’s criteria for Printing Inks also prohibits MEK (Methyl ethyl ketone), MIBK (Methyl isobutyl ketone), Acetone, Ethylene Glycol, Di Ethylene Glycol and Aliphatic Hydrocarbons. However, this is not mentioned in JEA’s criteria.
- (8) “Phthalates” means phthalic acid diesters, commonly used as materials to aid film forming and flexibility properties.
- (9) Listed with the current International Agency for Research on Cancer (IARC) in Group 2B (Possibly carcinogenic to humans)
- (10) Health Effects: includes Respiratory Sensitization--Asthma; Skin Sensitization; Irritation-Eye, Nose, Throat, Skin.
- (11) As a comparison: (California) South Coast Air Quality Management District (SCAQMD) RULE 1130. GRAPHIC ARTS VOC Content of Graphic Arts Materials: VOC of graphic arts materials is not allowed to exceed the limits specified (Bay Area Air Quality Management District and other local districts have similar rules) :

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	Regulated Printing Inks	Maximum Limits of VOC Content and Effective Dates	
		1 Apr 2007	1 Jan 2009
1	FLEXOGRAPHIC FLUORESCENT INK	300	-
2	FLEXOGRAPHIC INK NON-POROUS SUBSTRATE	300	-
3	FLEXOGRAPHIC INK POROUS SUBSTRATE	225	-
4	LETTERPRESS INK	300	-
5	LITHOGRAPHIC INK (EXCEPT HEATSET INK)	300	-
6	GRAVURE INK	-	300
7	SCREEN PRINTING INK	-	400

(12) Ink types as classified according to solvent used :

Ink types	Description
Water-Based Inks	<ul style="list-style-type: none"> Includes all flexographic, gravure and screen inks, which have <i>water</i> as the primary solvent/diluent component.
Oil-Based Inks	<ul style="list-style-type: none"> Includes all lithographic and letterpress inks which have <i>oil</i> (e.g. soybean oil) as the primary solvent/diluent component.
Ultra Violet Cured Inks (UV)	<ul style="list-style-type: none"> Includes all flexographic, gravure, screen and lithographic inks, which are cured by polymerization upon exposure to <i>ultraviolet</i> or electron-beam energy.
Solvent-Based Inks	<ul style="list-style-type: none"> Includes all flexographic, gravure and screen inks, which have <i>organic solvents</i> as the primary solvent/diluent component.

(13) 2 % instead of 4% of VOC is allowed in Oil-Based Inks in Environmental Choice Australia Licence Criteria for Printing Inks (Draft). As regards JEA criteria : sheet-fed ink and news ink shall contain less than 3% VOC components.

(14) JEA criteria : Gravure ink shall contain less than 20% VOC components.

Notes on verification

(I) ASTM D2348 (Standard Test Method for Arsenic in Paint) or equivalent method.

- ASTM D3717 (Standard Test Method for Low Concentrations of Antimony in Paint by Atomic Absorption Spectroscopy) or equivalent method.
- D3718 (Standard Test Method for Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy) or equivalent method.
- D3335 (Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy) or equivalent method.
- D3624 (Standard Test Method for Low Concentrations of Mercury in Paint by Atomic Absorption Spectroscopy) or equivalent method.

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- (II) The VOC content of the ink shall either be calculated from the VOC data for each of the raw materials or experimentally by ASTM D3960 or equivalent method.