



Environmental Standard - Certification Criteria Document

CCD 040: Printing Inks

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A terrachoice company

Ottawa | Philadelphia
T 1.800.478.0399 F 613.247.2228
info@ecologo.org
www.ecologo.org



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Introduction

The EcoLogo® Program is designed to support a continuing effort to improve and/or maintain environmental quality by reducing energy and materials consumption and by minimizing the impacts of pollution generated by the production, use and disposal of goods and services.

EcoLogo® is a Government of Canada official mark used under license from Environment Canada. TerraChoice is not an agent of Environment Canada.

Printing inks, used to produce an image on a substrate, are composed primarily of three basic ingredients: pigments, the vehicle, and additives. A pigment is the solid coloring matter visible on the substrate after the printing process. The vehicle, the largest component of the ink, acts as a carrier for the pigment as well as a binder to affix the pigment to the substrate. Additives differentiate and enhance the performance of the ink and include materials such as driers, waxes, lubricants, reducing oils and solvents, body gum and binding varnish, antioxidants and anti-skinning agents, surface active agents, and resins.

The manufacture, use, and disposal of printing inks, which contain heavy metals, petroleum distillates, and volatile organic compounds (VOCs), are an environmental concern.

Reducing quantities of heavy metals will help protect the environment by eliminating toxic leachate and reducing possible adverse health effects. Minimizing the use of petroleum distillates conserves non-renewable resources. Reducing VOCs will improve both indoor and outside air quality, thus, improving working conditions for print shop workers, and reducing the concentration of one of the precursors of photochemical smog.

Based on a review of currently available life cycle information, the product category requirements will produce an environmental benefit through improved air quality, a reduction in toxic emissions to the environment, and resource conservation.

The criteria for this product category was developed based on the best available information and efforts were also made to harmonize certain sections of this standard with criteria developed by the Environmental Choice New Zealand as well as other members of the Global Eco-labelling Network (GEN).

Life cycle review, standards development and revision are ongoing processes. As information and technology change, the product category requirements will be reviewed and possibly amended.

Notice

Any reference to a standard means to the latest edition of that standard.

The EcoLogo® Program reserves the right to accept equivalent test data for the test methods specified in this document.

Definitions

1) In this standard:

"aromatic solvent" means those organic compounds containing:

- at least one ring structure consisting of six carbon atoms joined by alternating single and double bonds, and
- two or less simple substitutions (additional chemical groups) to the basic benzene ring.

Examples of aromatic compounds under this definition include but are not limited to benzene, toluene, phenol, xylenes, and benzyl alcohol;

"binder" means the components in ink formulation that could hold the pigment to the printed surface after it is dried;

"flexographic" or **"flexography"** means a typographic form of printing using resilient plates with raised (relief) images and printed with relatively low viscosity inks. The inks could be solvent based, water based inks or UV curable inks;

"fountain solution" means a water-based mixture used to prevent the non-printing areas of the lithographic plate from accepting ink;

"gravure" means a method of printing using the intaglio process (i.e. the ink is placed in cells below the surface);

"Halogenated solvent" means any volatile organic compound incorporating halogens including fluorine, chlorine, bromine and iodine and having vapor pressure greater than 0.01 kPa at 293.25 degrees K;

"Ink jet ink systems" means a printing process in which images are formed by the precise placement of small (picoliter-sized) droplets of ink fired at high speeds from the nozzle(s) of computer-controlled printheads.

"letterpress" means a process of typographic (raised type) printing generally using oil-based inks;

"lithographic" or **"lithography"** means a process of planographic printing involving two chemically different areas on the plate: one receptive to ink, the other receptive to fountain solution (see **"offset"**);

"non-renewable resource" means any naturally occurring finite resource which, in terms of the human time scale, cannot be renewed once it has been consumed (e.g. oil, coal, gas);

"offset" (see **"lithographic"**) means an indirect form of printing in which the ink is transferred from the printing plate to a rubber blanket and subsequently to the substrate;

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"**petroleum distillates**" means high flash point, high boiling point organic compounds derived from the cracking of crude oil, which may evaporate under normal atmospheric conditions of temperature and pressure;

"**pigment**" means the fine solid particles of colorant used to give color to printing inks. Pigments are substantially insoluble in the solvent and water;

"**planographic**" or "**planography**" means a printing process in which the image and non-image areas lie in the same plane of printing;

"**printing ink**" means a dispersion of a pigment in a vehicle that is transferred through the printing process to produce an image on a substrate;

"**Screen printing**" means a printing process in which printing ink, coating, or adhesive material is passed through a taut web or fabric to which a refined form of stencil has been applied. The stencil openings determine the form and dimensions of the imprint.

"**substrate**" means the base material that is coated or printed;

"**total volatile organic compounds**" or "**TVOC**" means the sum of those identified and unidentified volatile organic compounds (VOCs) that elute between the retention times of n-hexane and n-hexadecane during gas chromatographic separation on a non-polar column;

"**Ultraviolet Curable**" means an ink that dries by polymerization reaction induced by ultraviolet energy

"**vehicle**" means the liquid portion of an ink that holds and carries the pigment, provides workability and drying properties, and binds the pigment to the substrate after the ink has dried;

"**vegetable-based ink**" means an ink that contain materials whose origins are from plants (e.g. tree sap, gum rosins, rubber);

"**volatile organic compound**" or "**VOC**"¹ means any carbon containing compound whose composition makes it possible to evaporate under normal atmospheric conditions of temperature and pressure. It excludes those organic compounds that the EcoLogo® Program designates as having negligible photochemical reactivity (see Appendix 1);

"**water-based ink**" means an ink containing a vehicle whose binder is water soluble or water dispersible.

¹ In the indoor environment, all VOCs released into the air from the use of products and materials, including those exempted for regulation due to their negligible photochemical reactivity, are of concern due to their potential to adversely impact the health of people that are exposed.

Category Definition

- 2) This category includes all printing inks, intended to be used by individual consumers and/or businesses, as further defined in the subcategories in this section:
- (a) Solvent-Based Inks which include:
 - (i) sheetfed offset
 - (ii) heatset web offset
 - (iii) coldset web offset
 - (iv) letterpress
 - (v) gravure
 - (vi) flexographic
 - (vii) inkjet
 - (viii) screen printing
 - (b) Water-Based Inks which include:
 - (i) flexographic
 - (ii) gravure
 - (iii) inkjet
 - (iv) screen printing
 - (c) Ultra Violet (UV) Curable Inks which include :
 - (i) inkjet UV inks
 - (ii) screen printing Inks

Note: Other subcategories may be added at a later date. The EcoLogo® Program reserves the right to determine which subcategory will be assigned to a particular applicant.

General Requirements

- 3) To be authorized to carry the EcoLogo®, ALL printing inks must:
- (a) meet or exceed all applicable governmental and industrial safety and performance standards; and
 - (b) be manufactured/ re-manufactured and transported in such a manner that all steps of the process, including the disposal and recycling of waste products arising therefrom, will meet the requirements of all applicable governmental acts, by laws and regulations.

Product Specific Requirements

4) To be authorized to carry the EcoLogo[®], ALL printing inks must:

Heavy Metals

- (a) not be formulated or manufactured with pigments based on compounds of nickel, mercury, lead, cadmium, antimony, arsenic and chromium as constituents of the ink exceeding 0.01% by weight of non-volatile content as determined by ASTM D3717, D3718, D3335 and D3624 or equivalent tests as may be appropriate;

Phthalates

- (b) not intentionally be formulated or manufactured with phthalates including di-(2-ethylhexyl)phthalate (DEHP), dibutylphthalate (DBP), benzylbutylphthalate (BBP), di-isononylphthalate (DINP), and di-isodecylphthalate (DIDP).

Chemical Emissions

(c) Volatile Organic Compounds and Petroleum Distillates:

be formulated or manufactured such that the ink products do not exceed the following limits (by weight):

For Solvent-Based Inks

- (i) Sheetfed offset inks: VOC < 4%; petroleum distillates content < 4%
- (ii) Heatset web offset inks: VOC < 25%; petroleum distillates content < 25%
- (iii) Coldset web offset and letterpress inks: VOC < 20%; petroleum distillates content < 4%
- (iv) Gravure inks: VOC < 20%; petroleum distillates content < 25%
- (v) Flexographic inks: VOC < 30%; petroleum distillates content < 25%

- (vi) Inkjet inks: VOC < 20%; petroleum distillates content < 20%
- (vii) Screen printing ink: VOC < 30%; petroleum distillates content < 30%

For Water-Based Inks

- (i) Flexographic and gravure inks: VOC < 6%; petroleum distillates content = 0%
- (ii) Inks used in high speed inkjet printing systems or large format inkjet printing presses: VOC < 300g/L; petroleum distillates content = 0%
- (iii) Screen printing : VOC < 4%; petroleum distillates content = 0%
- (iv) Inks intended to be used office machines:

Be tested in a new printer for which the ink is designed, during the ready and printing phases to ensure that emissions from the combined printer and ink system shall meet the specified requirements for release of total volatile organic compounds (TVOC) and the individual VOCs benzene and styrene as determined in accordance with standard ISO/IEC 28360:2007, Information Technology – Office Equipment – Determination of chemical

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emission rates from electronic equipment following the installation, preparation, sampling and testing conditions specified under the RAL- UZ- 122 option.

Test chamber concentrations of VOC emissions measured during the printing phase shall be converted to product specific emission rates, using the ISO/IEC 28360 RAL-UZ 122 option formulas and shall comply with the values in Table 1.0. In the ready phase, a maximum TVOC emission rate of 1 mg/h for tabletop devices and 3 mg/h for floor-mounted devices must not be exceeded.

Table 1.0: Maximum Allowable Values of Emission Rates Determined in Accordance with the Test Conditions Listed in the Basic Criteria of RAL-UZ 122:2009.

Substance	Emission Rate Printing Phase (mg/h)	
	MonoChrome	Color
TVOC	10	18
Benzene	< 0.05	< 0.05
Styrene	1.0	1.8

Testing shall be conducted by an ISO 17025 accredited laboratory, with the referenced test methods (ISO/IEC 28360 and RAL-UZ 122) within the scope of accreditation

Ultra Violet Cured Inks

- (i) VOC < 3%; petroleum distillates content = 0%

The VOCs should be calculated by using ASTM D2369, D3960, EPA Test Method 24 or equivalent tests as may be appropriate.

Hazardous/Toxic Substances

- (d) not contain any hazardous substances in concentration that causes the ink being classified within the following hazard statements according to European Union Directive 1272/2008:
- carcinogenic effects- H350, H351
 - mutagenic effects- H340, H341
 - reproductive and developmental effects- H360, H361, H362
 - other local and systemic effects- H300, H310, H311, H314, H317, H318, H330, H331, H334, H370, H373
 - environmental effects- H400, H410, H413
- (e) not contain the following inorganic pigments in the ink:
- Pigment Yellow 34 (CAS RN 1344-37-2)
 - Pigment Red 104 (CAS RN 12656-85-8)
- (f) not contain the following for water-based flexographic and gravure inks:
- > 3% by weight of methanol, and
 - > 3% by weight of ammonia or amine compounds

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- (g) not contain any substances subject to restrictions as defined in European Commission Regulation (EC) No. 552/2009 (REACH Annex XVII- restricted substances list).

Solvents

- (h) not contain halogenated solvents
- (i) not contain aromatic hydrocarbons > 1% in total by weight of the whole ink formulation as determined by ASTM D1319, ISO 3837 or DIN 51791

De-Inking

- (j) not be formulated or manufactured such that it prevents recycling at end-of-life; for Graphic Arts grade papers, deinkable recyclability should be demonstrated per INGEDE Method 11p and ERPC (European Recovered Paper Council) Scorecard, and/or demonstrated via large-scale deinking trials in Graphic Arts grade recycling mills.

Packaging and Labeling

- (k) be accompanied with sufficient information on the product package/ labels that would inform the consumer on the reuse, recycling and disposal methods of waste ink
- (l) be accompanied by an indication of the percentage by weight of the vegetable content as verified by the EcoLogo® Program, if any claim of vegetable content is made;
- (m) be packaged in materials, including primary and secondary packaging, that do not contain intentionally added heavy metals of lead, mercury, cadmium and hexavalent chromium, excepting those added as result of using recycled content, the sum of which shall not exceed 100 ppm by weight;
- (n) if plastic, be clearly marked either with appropriate Society of Plastics Industry recycling classification or ISO 11469 or DIN 6120 standards;
- (o) if non-plastic, be comprised of a minimum of 90% by weight recyclable or compostable materials.

Energy Management and Policy

- (p) all manufacturers shall have an energy management plan with reduction targets and track their energy use.



Socially and Environmentally Responsible Manufacturing

Socially and environmentally responsible manufacturing includes careful attention to both environmental management and working conditions. This section includes criteria for assessing and improving environmental and workplace management.

- 5) To be authorized to carry the EcoLogo®, the following requirements must be met:
 - (a) Manufacturers must document compliance with local, regional and national environmental and occupational health and safety requirements. Violations must be reported along with plans for addressing noncompliance;
 - (b) Manufacturing facilities must provide documentation that they have in place an effective environmental management system. Facilities that are certified to ISO 14001, EMAS, or another equivalent certification will be considered to have met this criterion. Manufacturing facilities that do not hold an EMS certification must provide written documentation of their environmental management system;
 - (c) Material Safety Data Sheets should be available publicly and/or upon request

Verification

- 6) To verify a claim that a product meets the criteria listed in the document, the EcoLogo® Program will require access, as is its normal practice, to relevant quality control and production records and the right of access to production facilities on an announced basis.
- 7) Compliance with sections 3(a) and 3(b) shall be attested to by a signed statement of the Chief Executive Officer or the equivalent officer of the manufacturer. The EcoLogo® Program shall be advised in writing immediately by the licensee of any non-compliance which may occur during the term of the license. On the occurrence of any non-compliance, the license may be suspended or terminated as stipulated in the license agreement.

Conditions for EcoLogo® Use

- 8) The EcoLogo® may appear on wholesale or retail packaging, or on the product itself, provided that the product meets the requirements in this document.
- 9) It is required that a criteria statement appears with the EcoLogo® whenever the EcoLogo® is used in association with the printing inks. The intent of this statement is to provide clarification as to why the product was certified and to indicate constraints to which the certification is limited. This is to ensure no ambiguity over, or misrepresentation of, the reason(s) for certification.

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The suggested criteria statement wording for this product type is "Printing Inks". The licensee may propose other wording for the criteria statement, but any such proposed wording must be approved by the EcoLogo® Program.

- 10) All licensees and authorized users must comply with the Program's Guide to Proper Use of the EcoLogo® regarding the format and usage of the EcoLogo®.
- 11) Any accompanying advertising must conform with the relevant requirements stipulated in this document, the license agreement and the Program's Guide to Proper Use of the EcoLogo®.

For additional copies of this criteria document or for more information about the EcoLogo® Program, please contact:

Toll free: 1-800-478-0399, Telephone: (613) 247-1900, Email: info@ecologo.org

Appendix 1: VOCs Determined to be of Negligible Photochemical Reactivity

Source :U.S. ENVIRONMENTAL PROTECTION AGENCY 40 CFR Part 51 [FRL-5466-9] 2009.
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?tpl=/ecfrbrowse/Title40/40tab_02.tp.l

- | | |
|---|--|
| (a) acetone | (ii) perfluorocarbons (classes of): |
| (b) ammonium carbonate | (a) cyclic, branched, or linear, completely fluorinated alkanes |
| (c) carbon monoxide | (b) cyclic, branched, or linear, completely fluorinated ethers with no saturations |
| (d) carbonic acid | (c) cyclic, branched, or linear, completely fluorinated tertiary amines with no saturations |
| (e) ethane | (d) sulfur-containing perfluorocarbons with no saturations with the sulfur bonds only to carbon and fluorine |
| (f) metallic carbides or carbonates | (iii) difluoromethane (HFC-32) |
| (g) methane | (kk) ethylfluoride (HFC-161) |
| (h) methylene chloride (dichloromethane) | (ll) 1,1,1,3,3,3-hexafluoropropane (HFC-236fa) |
| (i) methyl acetate | (mm) 1,1,2,2,3-pentafluoropropane (HFC-245ca) |
| (j) methyl formate | (nn) 1,1,2,3,3-pentafluoropropane (HFC-245ea) |
| (k) dimethyl carbonate | (oo) 1,1,1,2,3-pentafluoropropane (HFC-245eb) |
| (l) propylene carbonate | (pp) 1,1,1,3,3-pentafluoropropane (HFC-245fa) |
| (m) cyclic, branched, or linear completely methylated siloxanes | (qq) 1,1,1,2,3,3-hexafluoropropane (HFC-236ea) |
| (n) parachlorobenzotrifluoride (PCBTF) | (rr) 1,1,1,3,3-pentafluorobutane (HFC-365mfc) |
| (o) perchloroethylene (tetrachloroethylene) | (ss) chlorofluoromethane (HCFC-31) |
| (p) 1,1,1-trichloroethane | (tt) 1-chloro-1-fluoroethane (HCFC-151a) |
| (q) trichlorofluoromethane (CFC-11) | (uu) 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a) |
| (r) dichlorodifluoromethane (CFC-12) | (vv) 1,1,1,2,2,3,3,4,4-nonfluoro-4-methoxy-butane (C4F9OCH3 or HFE-7100) |
| (s) trichlorotrifluoroethane (CFC-113) | (ww) 2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-Heptafluoropropane ((CF3)2CFCH2OCH3) |
| (t) dichlorotetrafluoroethane (CFC-114) | |
| (u) chloropentafluoroethane (CFC-115) | |
| (v) chlorodifluoromethane (HCFC-22) | |
| (w) dichlorotrifluoroethane (HCFC-123) | |
| (x) dichlorofluoroethane (HCFC-141b) | |
| (y) chlorodifluoroethane (HCFC-142b) | |
| (z) 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124) | |
| (aa) trifluoromethane (HFC-23) | |
| (bb) 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC-43-10mee) | |
| (cc) pentafluoroethane (HFC-125) | |
| (dd) 1,1,2,2-tetrafluoroethane (HFC-134) | |
| (ee) 1,1,1-trifluoroethane (HFC-143a) | |
| (ff) 1,1-difluoroethane HFC-152a) | |
| (gg) 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca) | |
| (hh) 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb) | |

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- (xx) 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane (C₄F₉OC₂H₅ or HFE-7200)
- (yy) 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ((CF₃)₂CF₂OC₂H₅)
- (zz) 1,1,1,2,2,3,3-heptafluoro-3-methoxypropane (n-C₃F₇OCH₃ or HFE-7000)
- (aaa) 3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl) hexane
- (bbb) 1,1,1,2,3,3,3-heptafluoropropane (HFC-227ea)
- (ccc) 1,1,1,2,2,3,4,5,5,5-decafluoro-3-methoxy-4-trifluoromethyl-pentane (HFE-7300)