Newsletter on Eco-labelling and Eco-friendly Products

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Textiles – An Introduction

Contents

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Foreword

Several times a year in the world's fashion capitals, willowy models in dazzling outfits sashay down the catwalk to present the coming season's trends. Each year a handful of designers set the tone, says what's in and what's not. Chain-stores and mass retailers then adapt their ideas for the man and woman in the street. Also, most of the clothes in our wardrobes contain polyester, elastane or Lycra.

India's textile industry has shown a remarkable dynamism in terms of growth, development and export performance during last few years. These cheap and easy-care fibres are becoming the textile industry's miracle solution. However, their manufacture creates pollution and they are hard to recycle (with nylon taking 30 to 40 years to decompose).The textile and clothing industry is a diverse one, as much in the raw materials it uses as the techniques it employs. At each of the six stages typically required to make a garment, the negative impacts on the environment are as numerous as they are varied. Spinning, weaving and industrial manufacture undermine air quality. Dyeing and printing consume vast amounts of water and chemicals, and release numerous volatile agents into the atmosphere that are particularly harmful to our health.

It is important for the consumers and the manufacturers to know the adverse effects posed by the textiles on health and environment from its cradle to grave. The present issue of ENVIS-CERC elucidates the information on textile industry, the processes with the respective waste streams. It also enhances the knowledge of the new technologies in India and abroad in the textile sector.

Editorial Team

Pritee Shah
Sr. Director & Editor
INSIGHT- The Consumer Magazine

Jose Emmanuel
Project Coordinator

C. G. Pandya
Project Consultant

Manoj Bhavsar
Design & Graphics

Published by:

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Since 1978

Consumer Education and Research Centre

"Suraksha Sankool" Thaltej,
Sarkhej-Gandhinagar Highway
Ahmedabad 380 054,
Gujarat, India.
Phone : 079-27489945/46,
27450528, **27438752/53/54**
Fax : 079-27489947
Email : *cerc@cercindia.org*
Website. *www.cercindia.org*

Textiles – An Introduction

Indian textile industry largely depends upon the textile manufacturing and export. It also plays a major role in the economy of the country. It has shown a remarkable dynamism in terms of growth, development and export performance during last few years. India earns about 27% of its total foreign exchange through textile exports. Further, the textile industry of India also contributes nearly 14% of the total industrial production of the country. It also contributes around 3% to the GDP of the country. Indian textile industry is also the largest in the country in terms of employment generation. It not only generates jobs in its own industry, but also opens up scopes for the other ancillary sectors. It currently generates employment to more than 35 million people. It was also estimated that, the industry would generate 12 million new jobs by the year 2010.

Currently it is estimated to be around US$ 52 billion and is also projected to be around US$ 115 billion by the year 2012. The current domestic market of textile in India is expected to be increased to US$ 60 billion by 2012 from the current US$ 34.6 billion. The textile export of the country was around US$ 19.14 billion in 2006-07, which saw a stiff rise to reach US$ 22.13 in 2007-08. The share of exports is also expected to increase from 4% to 7% within 2012.

The textile industry is shared between natural fibres such as wool, silk, linen, cotton and hemp, and man-made ones, the most common of which are synthetic fibres (polyamide, acrylic) made from petrochemicals. Most of the clothes in our wardrobes contain polyester, elastane or Lycra. The textile and clothing industry is a diverse one, as much in the raw materials it uses as the techniques it employs. At each of the six stages typically required to make a garment, the negative impacts on the environment are as numerous as they are varied. Spinning, weaving and industrial manufacture undermine air quality. Dyeing and printing consume vast amounts of water and chemicals, and release numerous volatile agents into the atmosphere that are particularly harmful to our health. The environment pays a heavy price too. To improve conditions for workers and stem pollution, textile producers, manufacturers and distributors are launching the first initiatives built around sustainable development: who knows, ecology may be the next new trend! The world of fashion may be stylish, glamorous and exciting, but its impact on environment is worsening day by day.

Textile industry:

Waste Streams. The government authorities and textile industry have taken a number of measures to reduce the pollution and potential health hazards originating from textile industry.

A) Air Emission Sources

- Oil and Acid Mists: They are produced during evaporation and degradation of textile materials containing oil (spinning oil), plasticizers and other materials. Whereas, acid mists are produced during wool carbonization and volatilization or organic acid like acetic acid. These mists are corrosive.
- Solvent Vapours: They are produced due to toxic chemicals (Kerosene, MTO etc) involved dyeing & printing processes.
- Odour: It is often associated with oil mists or solvent vapours. Problem of this type arises from the carriers used for polyester dyeing, resin finishing, sulphur dyeing of cotton, dye reduction or dye stripping with hydrosulphite, and bleaching with sodium hypochlorite.
- Dust and Lint: These are produced during the processing of natural fibres and synthetic staple fibres prior to and during spinning, napping, carpet shearing etc. To a lesser extent most other textile processes produce lint.

B) Water Pollution Sources and Characteristics

Waste generated in textile industry can be classified into four categories:

- Hard-to-Treat Wastes: These include primarily colours, metals, phenol, toxic organic compounds, phosphates, etc. Also include non-biodegradable organic materials such as certain surfactants and solvents. Resist biological effluent treatment process. Since the primary problem associated with these wastes is toxicity, they can also be included in hazardous or toxic category.

- Hazardous or Toxic Wastes: Include materials such as metals, chlorinated solvents, non-biodegradable surfactants and volatile organic materials.
- Dispersible Wastes: These include waste stream from continuous operations print pastes, wastes from back coating operations batch dumps of unused process chemicals, etc.
- High Volume Wastes: The most common high volume wastes include wash water from preparatory, dyeing and printing operations and the exhausted dye baths. These can be reduced by recycle process and equipment modification.

Environmental issues: Textile Industry

In general impacts of textile industry on environment are:

1. The pesticides that farmers use to protect textiles as they grow can harm wildlife, contaminate other products and get into the food we eat.
2. The chemicals that are used to bleach and colour textiles can damage the environment and health of people.
3. Old clothes that we throw away take up precious space in landfill sites, which is filling up rapidly.
4. Most of the textile machineries cause noise, sound and air pollution.
5. Over-usage of natural resources like plants, water, etc depletes or disturbs ecological balance.
6. The working conditions in the textile and clothing industry are of sub- standard.
7. Exploitation of animals often goes hand in hand with intensive farming practices that damage the environment as a whole.

Textile processing industry is characterised not only by the large volume of water required for various unit operations but also by the variety of chemicals used for various processes. There is a long sequence of wet processing stages requiring inputs of water, chemical and energy and generating wastes at each stage. Textile processing generates many waste streams, including liquid, gaseous and solid wastes, some of which may be hazardous. The nature of the waste generated depends on the type of textile facility, the processes and technologies being operated, and the types of fibres and chemicals used.

Dyeing alone can account for most of the water used in producing a garment; unfixed dye then often washes out of garments, and can end up colouring the rivers, as treatment plants fail to remove them from the water. Dye fixatives - often heavy metals - also end up in sewers and then rivers. Cloth is often bleached using dioxin-producing chlorine compounds. And virtually all polycotton (especially bedlinen), plus all 'easy care', 'crease resistant', 'permanent press' cotton, are treated with toxic formaldehyde (also used for flame proofing nylon).

Cotton is the most pesticide intensive crop in the world. These pesticides injure and kill many people every year. It also takes up a large proportion of agricultural land, much of which is needed by local people to grow their own food. The development of genetically modified cotton adds environmental problems at another level. Growing enough cotton for one t-shirt requires 257 gallons of water. On top of that, bleaching and then dyeing the resulting fabric creates toxins that flow into our ecosystem.

Wool: Both agricultural and craft workers exposure to organophosphate sheep dip problem.

Nylon and polyester - made from petrochemicals, these synthetics are also non-biodegradable, and so they are inherently unsustainable on two counts. Nylon manufacture creates nitrous oxide, a greenhouse gas 310 times more potent than carbon dioxide. Making polyester uses large amounts of water for cooling, along with lubricants which can become a source of contamination.

Rayon (viscose), another artificial fibre, is made from wood pulp, which on the face of it seems more sustainable. However, old growth forest is often cleared and/or subsistence farmers are displaced to make way for pulpwood plantations. Often the tree planted is eucalyptus, which draws up phenomenal amounts of water, causing problems in sensitive regions. To make rayon, the wood pulp is treated with hazardous chemicals such as caustic soda and sulphuric acid. The use of rayon for clothing is contributing to the rapid depletion of the world's forests. Petroleum-based products are detrimental to the environment on many levels.

Eco-standards and Ecolabels

Many Indian textiles and clothing exporters have already started answering to developed countries environmental concerns by awarding foreign ecolabels-largely the Oekotex- on their products. The EU is a major market for India and hence these certifications have brought several market advantages including market access, higher price and overall quality improvements.

In order to promote the concept of eco-friendly textiles, a comprehensive system of eco labels is advocated by European and other Western countries. For the purpose of issuing eco labels, certain norms/criteria are stipulated in respect of textile products, on the basis of Cradle-to-Grave approach. These criteria are developed on analysing the product's entire life cycle commencing with extraction of raw materials, progressing through the stages of production, distribution and utilisation and disposal after use. The norms are also referred to as Eco Standards. By and large, these standards are voluntary in nature.

While formulating eco-norms for the issuance of eco labels, at present the use of 7 different classes of chemicals in textile production and processing are taken into consideration. These are:

- Formaldehyde
- Toxic pesticides
- Pentachlorophenol (PCP)
- Heavy metal traces
- Azo dyes which release carcinogenic amines
- Halogen carriers
- Chlorine Bleaching

The eco standards stipulated by (i) MST, the German Textile Association, (ii) OTN 100,the famous OEKOTEX Institute from Austria, (iii) Clean fashion and (iv) Steilmann. The two private eco-label issuing organisations in Germany are popular in European countries. In addition to the four eco labels specified above, a number of private and national labels are operating in Europe. In some cases these labels are used solely as a marketing instrument and have little factual and technical substance. In the face of the proliferation of eco labels, the Coordination Committee for the Textiles Industries in the EEC (COMITEXTIL), supports a single European label. Further, it is learnt that the European Union is finalizing the criteria for a common "European Community Eco label" (EC-Eco label) after taking into consideration the criteria specified by other eco labels.

The Government of India has also evolved eco standards for the eco labeling of the textile items in consultation with the Indian Textile Trade and Industry. The criteria for the environment friendly textiles including Cotton, Woolen, Man-made, Jute and Silk products was notified in the Gazette on October 8, 1996 by Ministry of Environment and Forests. The eco labeling of textiles notified in the Gazette is a voluntary scheme. This scheme aims at distinguishing through the agency of Eco-Mark, any product which is made, used or disposed of in a way that significantly reduces the adverse effect, it would otherwise have on the environment. The Earthen Pot is being used as the logo of this scheme.

A comparison of the norms/criteria stipulated for eco parameters in the popular eco labels operating in Europe and in the Indian Eco Mark Scheme for textiles are as under:

S. No	Eco Parameter	Criteria/Norms stipulated in ppm					
		MST	OTN 100	Clean Fashion	Steilmann	COMIT EXTIL	Indian Eco Label
	Formaldehyde		20	25	80	250	20
	a) Baby Clothing	20	75	75	300	75	75
	b) [illegible]	75	300	300	450	300	300
	c) Other wear	300					
	Toxic Pesticides	1	1	1	1	0.1	1
	Pentachlorophenol	0.5	0.5	0.5	0.5	0.25 or 0.5	0.5
	Heavy Metals						
	a) Arsenic	0.2 to 0.2					
	b) Lead	0.2 to 0.2					
	c) Cadmium	0.1 to 0.1					10.0 ppm (of heavy metals)
	d) Mercury	0.02 to 0.1					
	e) Copper	0.1 to 100.0					
	f) Chromium	1 to 50					
	g) Cobalt	5 to 50					
	h) Zinc	0.5 to 50					
	i) Nickel	0.25 to 50.0					
	Azo dyes containing carcinogenic amines	Ban	Ban	Ban	Ban	Ban	50.0
	Halogen Carriers	Ban	—	—	Ban	Ban	50.0
	Chlorine Bleaching	—	—	—	To avoid	Ban	—

ECOMARK CRITERIA FOR TEXTILES

All the textile products manufactured shall meet relevant standards of Bureau of Indian Standards.

The product manufacturer must produce the consent clearance as per the provisions of Water (Prevention and Control of Pollution) Act 1974 and Air (Prevention and Control of Pollution) Act 1981, Water (Prevention and Control of Pollution) Cess Act,1977 respectively, along with the authorisation, if required under Environment (Protection) Act, 1986 and the rules made thereunder to BIS while applying for Ecomark. Additionally, the manufacturer shall produce documentary evidence on compliance of the provisions related to noise level and occupational health under the provisions of Factories Act, 1948 and Rules made thereunder.

The product packaging may display in brief the criteria based on which the product has been labelled environment friendly.

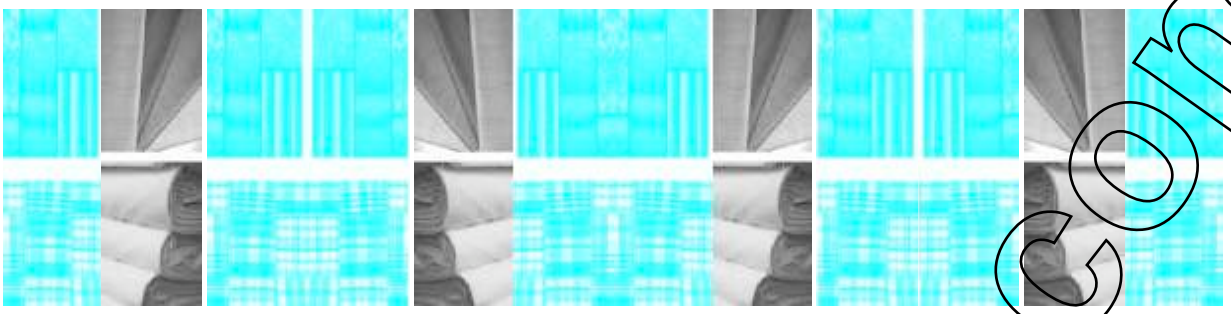
The material used for product packaging shall be reusable or made from recyclable or biodegradable materials.

Fatty alcohol based non-ionics as emulsifier should be sued wherever required Polyhalogenated based phenolic fire retardants shall not be used.

PRODUCT SPECIFIC REQUIREMENTS:

A.	COTTON, WOOL, MAN-MADE FIBRE & BLENDS			
S. No.	Parameters*	Max. limit, mg/kg (ppm)		
		Baby Clothing	Close to Skin	Outer
1)	Free & Releasable Formaldehyde	30	75	300
2)	Extractable artificial sweat/salvia Heavy Metals Mercury	0.1	0.1	0.1
3)	Chromium III	0.1	0.1	0.1
4)	Chromium VI	Nil	Nil BDL	Nil
5)	Sum Parameters (as lead)	10.0	10.0	10.0
6)	Pentachlorophenol (PCP)	0.5	0.5	0.5
7)	Volatile Hydrocarbons (non-halogens)	150	150	150
8)	AAHOs	200	200	200
9)	Pesticides (Sum Parameter)	1.0	1.0	1.0
10)	Banned Pesticides	Nil	Nil BDL	Nil
11)	pH of aqueous extract	4.0-7.5	4.0-7.5	4.0-7.5
12)	Coupled Amines released from Azo-dyes (Sum parameters)	30	30 (Detectable limit using GC-MS)	30

* The methods of tests for Eco-parameters are being developed by BIS and Textiles Committee. Till the methods of test are standardised, the manufacturer shall declare conformance taking into consideration the chemicals, auxiliaries and dyes used.



B.	JUTE AND JUTE PRODUCTS		
S. No.	Parameters *	Max. Limit, mg/kg	
		Home Textiles & Clothing	Hessians & Sockings
1)	Free and Releasable Formaldehyde		
	Close to skin	75	NA
	Outer Fabrics	300	NA
2)	Extractable artificial sweat/salvia		
	Heavy Metals		
	Mercury	0.1	NA
	Chromium III	0.1	NA
	Chromium VI	Nil BDL	NA
	Sum parameters(as lead)	10.0	NA
3)	Non-halogenated Hydrocarbon	NA	3%
4)	Fatty esters based oil	2%	NA
5)	Pesticides (Sum Parameter)	1.0	1.0
	Banned Pesticides	Nil BDL	Nil
6)	pH of aqueous extract	6.0-7.0	6.0-7.0
7)	Coupled amines released from Azo-dyes (Sum parameters)	50	50 (Detectable limit using GC-MS)

* The methods of tests for Eco-parameters are being developed by BIS and Textiles Committee. Till the methods of test are standardised, the manufacturer shall declare conformance taking into consideration the chemicals, auxiliaries and dyes used.

C.	SILK AND SILK PRODUCTS			
S. No.	**Parameters***	**Max. limit, mg/kg (ppm)**		
		Baby Clothing	Close to Skin	Outer Fabrics
1)	Free & Releasable Formaldehyde	20	75	300
2)	Extractable artificial sweat/salvia Heavy Metals Mercury	0.1	0.1	0.1
	Chromium III	0.1	0.1	0.1
	Chromium VI	Nil	Nil BDL	Nil
	Sum Parameters (as lead	10.0	10.0	10.0
3)	Pentachlorophenol (PCP)	0.5	0.5	0.5
4)	Volatile Hydrocarbons (non halogens)	150	150	150
5)	Pesticides (Sum Parameter)	1.0	1.0	1.0
	Banned Pesticides	Nil	Nil BDL	Nil
6)	pH of aqueous extract	4.0-7.5	4.0-7.5	4.0-7.5
7)	from Azo-dyes (Sum parameters)		(Detectable limit using GC-MS)	

* The methods of tests for Eco-parameters are being developed by BIS and Textiles Committee. Till the methods of test are standardised, the manufacturer shall declare conformance taking into consideration the chemicals, auxiliaries and dyes used.

CLEAN TECHNOLOGY DEVELOPMENTS

These technologies vary in their acceptance and adoption by industry. "Clean technologies" are defined as "manufacturing processes or product technologies that reduce pollution or waste, energy use, or material use in comparison to the technologies that they replace."

The following clean technologies are generally being adopted by the industry.

1. Pad-batch dyeing	2. Low bath ratio dyeing
3. Low salt/high fixation dyeing	4. Dye-bath reuse
5. Continuous dyeing for knits	6. Automated colour mix kitchen
7. Automated chemical dosing	8. Transfer printing
9. Laser engraving of printing screens	10. Surfactant substitution
11. Recovery of synthetic sizes	12. Counter current washing
13. Low add-on finishing	14. Mechanical finishing
15. Waste reclamation systems for spinning	

Emerging Technologies

Several clean technologies and processes have proved effective on a pilot scale but are not yet ready for full-scale implementation. These include:

- **Direct dyebath monitoring and control systems.** A control strategy that adjusts the dyeing process in real time to account and correct for uncontrollable parameters.
- **Real-time adaptive control systems.** Control strategy to adjust dyeing or other processing steps in real time to account and correct for uncontrollable parameters.
- **Ink-jet printing.** Droplets of dye solution are directed onto fabric to form a pattern, eliminating photographic screen making and color mix kitchen activities.
- **Supercritical fluid dyeing.** Uses carbon dioxide (CO_2) as the fluid medium on disperse-dyed synthetics, eliminating aqueous effluent.
- **Ultrasound dyeing.** Uses ultrasound waves to impart dyes to fabric, eliminating aqueous effluent.
- **Radio frequency drying.** Uses radio waves rather than ovens to dry yarn or fabric.

Solid Waste Reduction

All researchers continue to look at ways to reduce solid waste generation, to use less packaging or packaging that is reusable (such as IBCs for chemical storage), to reuse reworkable fiber, to find new markets for nonreworkable and hard fiber waste, and to train and educate workers to reduce selvage, cuttings, and trim waste. Reduction of solid waste generation coupled with strategies to reuse or sell wastes has widespread economic appeal due to cost savings and cost recovery realized by these efforts

Mechanical versus Chemical Finishing

Mills will increasingly consider using mechanical methods for fabric finishing. Mechanical finishing can be used to perform many of the same functions as chemical finishing, including stabilization, shrinkage reduction, optical finishing, and softening. The costs and benefits of using mechanical compared with chemical finishing will be further quantified to aid in decision making

Chemical Substitutions

Mills will continue to research the use of more-benign chemicals in all areas of textile processing, including sizing, dyeing, and finishing. Ancillary operations such as solvent-based dry cleaning and maintenance and operation of machinery will also be targeted as a focus area for chemical substitution.

Approach towards Ecofriendly textiles:

Eco Textiles are those which do not contain any hazardous or toxic substance and are biologically degradable, so that they do not cause any damage to the environment and ecology. The environmental problem associated with production of eco-textile has to be simultaneously viewed from following two angles:

1) Meeting the stricter requirements of the permissible amount of harmful substances and avoiding the use of banned dyes and chemicals
2) Meeting the local requirements stipulated by Pollution Control authorities

A systematic and scientific approach to achieve production of eco-textiles in Indian conditions involves:

1) Identification of the harmful chemicals and their probable sources like PCP in sizing ingredients, pesticides in natural fibres, certain dyes, preparation chemicals and finishing chemicals etc.
2) Avoiding the use of banned dyes and chemicals like azo dyes which can release toxic and carcinogenic amines, chlorine based bleaching agents and chlorinated solvents which give rise to the problem of AOX and other toxic pesticides and chemicals which persists biodegradation and thus are bioaccumulative.
3) Minimising the quantities off restricted chemicals like formaldehyde, sulphides and heavy metal salts etc.
4) Recycling wherever possible.

ECO NEWS

HHF to partner with textile industry to promote eco-friendly practices & products

Helping Hand Foundation's Green Industrial Evolution – Farm to Fashion knowledge series, has taken an important step in guiding the Indian textile industry towards a greener future. The very informative seminar, organised in Mumbai, on January 15, 2010, highlighted the various processes and inputs that can help the industry make its current production a little more eco-friendly, and also showed the potential of marketing these textiles in the international, and more importantly, the very difficult and price sensitive domestic market. (The Indian Textile Journal, March 2010)

The 'Coffee-Break' for Taiwan's Textile Industry and Eco-Friendly Fashion.

The S. Cafe fabric, made by small firm Singtex Industrial, incorporates recycled coffee grounds from Starbucks and 7-Eleven, and has proved a hit with heavyweight international brands including Nike and North Face.

Industry figures say the fibre -- more than three years in development, and sold under the slogan 'Drink it, wear it' -- shows how the sector might reinvent itself as green, savvy, and even cool. (Medindia, July 11, 2011)

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Environmental Labels World - Wide

India
E-mail: cpcb@alpha.nic.in or cpcb@sansad.nic.in
Homepage: envfor.nic.in/cpcb/ecomark/ecomark.html

People's Republic of China
E-mail: info2@zhb.gov.cn
Homepage: www.zhb.gov.cn/english

Hong Kong (People's Republic of China)
E-mail: info@greencouncil.org
Homepage: www.greencouncil.org/

Hong Kong (HKFEP)
E-Mail: hkfep@hkfep.com
Homepage: www.hkfep.com

Israel
E-mail: gitaie@sii.org.il
Homepage: www.sii.org.il/siisite.nsf/Pages/GreenMark

Japan
E-mail: ecomark@japan.email.ne.jp
Homepage: www.ecomark.jp/english/

Philippines
E-mail: greenchoice@i-manila.com.ph
Homepage: www.epic.org.ph/product.htm

Singapore
E-mail: info@sec.org.sg
Homepage:
www.sec.org.sg/greenlabel_htm/greenlable_frameset.htm

South Korea
E-mail: ecomark@chollian.net
Homepage: www.kela.or.kr/english/

Taiwan (People's Republic of China)
E-mail: ningyu@edf.org.tw
Homepage: greenmark.epa.gov.tw/english/index.asp

Thailand
E-mail: info@tei.or.th
Homepage: www.tei.or.th/bep/GL_home.htm

Australia
E-mail: office@aela.org.au
Homepage: www.aela.org.au/homefront.htm

New Zealand
E-mail: info@enviro-choice.org.nz
Homepage: www.enviro-choice.org.nz

Blue Angel (Germany)

France
E-mail: patricia.proia@afnor.fr
Homepage: www.afnor.fr/portail.asp?Lang=English

Croatia
E-mail: web@mzopu.hr
Homepage: www.mzopu.hr/default.aspx?id=5145

The Netherlands
E-mail: milieukeur@milieukeur.nl
Homepage: www.milieukeur.nl

Austria
E-mail: josef.taneburger@bmlfuw.gv.at
Homepage: www.umweltzeichen.at

Scandinavia
E-mail: svanen@sismab.se
Homepage: www.svanen.nu/Eng/default.asp

Sweden
E-mail: gbg@snf.se
Homepage: www.snf.se/bmv/english-more.cfm

TCO (Sweden)
E-mail: development @tco.se
Homepage: www.tcodevelopment.com

Slovakia
E-mail: kobzova.darina@lifeenv.gov.sk

Spain
E-mail: info@aenor.es
Homepage:
www.aenor.es/desarrollo/certificacion/productos/tipo.asp?tipop=2#1

Czech Republic
E-mail: Petr.Saifrid@ceu.cz
Homepage: www.ekoznacka.cz/ENG/

Hungary
E-mail: kornyezetbarat.termek@axelero.hu
Homepage: okocimke.kvvm.hu/public_eng/?ppid=2200000

Canada
E-mail: ecoinfo@terrachoice.ca
Homepage: www.environmentalchoice.ca/

USA
E-mail: greenseal@greenseal.org
Homepage: www.greenseal.org

Brazil
E-mail: fcabral@abnt.org.br
Homepage: www.abnt.org.br

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