Eco-Labels: Their Impact on Toner Colorants

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Abstract

The term environmental label covers hundreds of existing programs worldwide. They could be roughly divided into first party approved labels (criteria verification by the introducer) and third party approved labels (verification by an independent source according to an evaluation process). Third party approved labels could be mandatory or voluntary (figure 1).

Under the voluntary classification, the so-called "Seals of Approval" play a key role as a sustainable marketing instrument to promote products like printers, copiers, etc. on the market. Some seals even restrict the use of certain colorants in their basic criteria. For instance, certain azo colorants are banned.

The most important seals cover products which are related to NIP (non-impact printing) technologies: Blue Angel/Germany, White Swan/Scandinavia, Eco-Mark/ Japan, Austrian Eco Label, etc. But the individual criteria may be different.

Consequently for awarding, only selected colorants can be applied which have to be verified according to the label requirements.

Unfortunately, these labels are in effect only for a specific country or region.

Introduction

During the last two decades environmental issues have become more and more important. Today consumers are much more sensitive regarding the environmental impact of products in use. The consumers demand can be summarized by the following wish: "Use of environmentally safe and friendly products only". Basically, this wish is relative and not related to fixed values. It is dynamic because the state-of-the-art knowledge continues to expand worldwide. Furthermore, the total environmental impact of a product is quite complex (e.g. cradle-to-grave concept, assessments, etc.) which could not be judged easily by the consumer himself.

However, the need was a simple classification (label, symbol) which distinguishes "environmentally improved" products from others.

During the last years the so-called voluntary, third party approved seals have become an important marketing instrument for NIP related products.

Scope of Environmental Labels

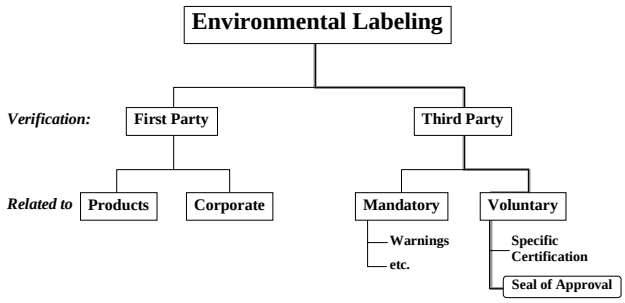

Figure 1. Typical classification of environmental labeling.[1] Eco-labels like Blue Angel/Germany, White Swan/Sc. or Eco-Mark/Japan could be classified as third party, voluntary "Seals of Approval".

For awarding, detailed requirements regarding ingredients in use e.g. for the printing ink (toner/ink jet ink, etc.) have to be fulfilled. Because color printing is and will be tomorrow's standard, specific requirements regarding colorants are fixed.

The paper will be focused on the "Seals of Approval" (figure 1) and will discuss the impact on colorants by giving the example of the Blue Angel seal procedure for printers, copiers, fax-machines and refillable cartridges.

International Environmental Labels

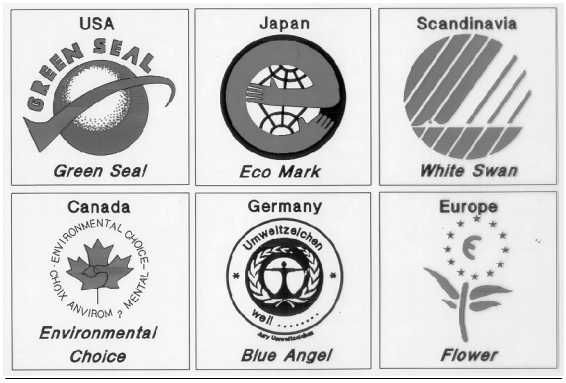

Figure 2. Examples of worldwide established "Seals of Approval".

Environmental Labels: The Blue Angel and Related Labels

The Blue Angel was established in 1978[2,3] and was the first label under the category "Seal of Approval" (father of seals). Since then, several additional labels (figure 2) have been introduced worldwide as a "soft instrument for environmental policy". The basic criteria for awarding include detailed requirements and test procedures regarding materials, working conditions, emissions, etc. which have to be verified by an independent institute (third party).

Table 1. Substance related standards[2] for electrophotographic toners and inks (e.g. ink jet inks, matrix printer ribbon inks). The toner/ink must not include:

Part 1
Heavy Metals
Substances based on: - mercury – lead – cadmium – chromium VI
Part 2
Colorants (Azo Dyes)[a)]
Azo colorants based on amines classified as carcinogenic or suspected carcinogenic: MAK III A1, MAK III A2, MAK IIIB [b)]
Part 3
Other Hazardous Substances
Substances classified as carcinogenic or suspected carcinogenic: MAK III A1, MAK III A2, MAK III B [4,5)] and marked with the risk phrases: R26: very toxic when inhaled R40: possible irreversible damage R42: possible sensitization by inhalation R45: may cause cancer R46: may cause genetic damage R49: may cause cancer if inhaled R62: may possibly impair reproduction R63: may possibly be harmful to embryo R64: may be harmful to the infant via the mother's milk

a) The term azo dyes is used in the sense of azo colorants. Therefore pigments a well as dyes are included.

b) In 1999 the classification of the MAK listing system was reconsidered. Instead of III A1, A2 and B the categories are named 1,2, 3 and in addition the categories 4 and 5 are added (for further details see [(5)].). In certain former issued awarding publications still the old MAK nomenclature is mentioned.

Companies decide according to their individual marketing objectives whether awarding of an eco label for distinct products provides market advantages. It is a voluntary decision by the manufacturers whether they expose their products to the basic criteria.

The aim of environmental labels is to mark (easily recognizable by consumers) and promote products which, from the overall environmental standpoint, distinguish themselves by a special environmental compatibility as compared with other products serving the same purpose.

In general, two levels of a product are considered:

1. the various phases of life of a product (production, use, disposal: cradle-to-grave concept)
2. the product impact on the environment (hazardous substances, emissions, waste aspects)

Consequently, the labels include distinct requirements regarding product raw materials, application behavior (emissions, etc.) as well as consumed materials during use (inks, etc.).

Today, several eco labels describe NIP-related products. In general, they are following the requirements of the Blue Angel, but differences exist concerning the detailed requirements according to opinions in the various countries.

The Impact on Colorants: Blue Angel[2]

Commercially available goods/products are separated into product groups with respect to a target application family (e.g. printers). For each product group a defined UZ-number (UZ = Umweltzeichen/-Environmental Label) is allocated.

The following product groups are related to NIP printing technologies and consider requirements regarding colorants for printing inks (toners, ink jet inks).

UZ 55a: Reusable Ribbon and Toner Cartridges
UZ 62: Copiers
UZ 85: Printers
UZ 95: Fax machines (recently established in 1999)

During the last two years the requirements for the inks (toners, ink jet inks, etc) have been harmonized and today they are identical. The requirements do not distinguish between different printing technologies. The colorant criteria are valid for electrophotography as well as for ink jet; they are substance related.

In general part 1-3 of the substance related standards are relevant for all ingredients including colorants. In addition, the restrictions (part 2 azo colorants) cover the amine raw materials on which azo colorants are based.

Those colorants are banned which are based on amines listed in the so-called MAK list under the sections carcinogenic or suspected carcinogenic. This list is updated continuously, typically once a year. If additional amines are listed, the seal applicant has to check whether his colorant decision is influenced. A simple way for determining this is imploying a kind of "retrosynthetic procedure" based on the colorant structure (figure 3). However, a statement/ confirmation from the colorant manufacturer which is accepted by the third party (see award criteria guidelines: verifications) should be requested.

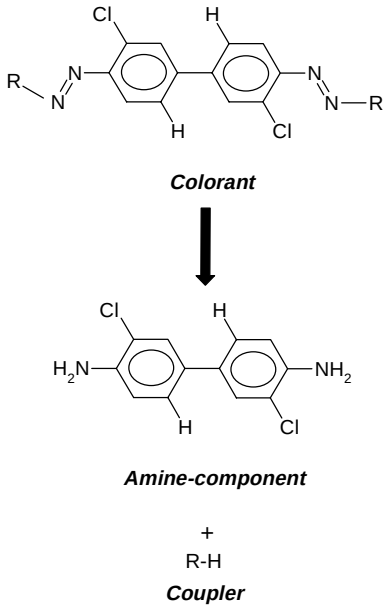

Figure 3. Retrosynthetic procedure: Idealized retrosynthetic bond cleavage in order to identify the basic amine components for list check.

But it is quite clear that non azo-colorants as well as all azo pigments have to fulfill part 1 and part 3 of the substance related standards.

As a consequence of the award criteria the number of allowed colorants out of hundreds available is reduced according to their eco/tox behavior. An individual examination of each colorant in use is necessary according to the criteria.

Furthermore, this has to be done according to the changes of the basic criteria as well as taking into account any additional listing systems (e.g. MAK) on which some of the criteria might be based.

Typically such eco-labels like Blue Angel will be reconsidered after about 4-5 years. But the additional listing systems are often changing continuously or frequently e.g. once a year.

Because no worldwide standardized eco-labeling procedure as well as basic criteria exist, this work has to be done for each awarded label frequently.

Conclusions

The term eco-labels covers a wide range of worldwide programs in order to describe the environmental impact on products/processes. Of special interest are the “Seal of Approval“ labels (Blue Angel, Eco Mark, White Swan) which are relying on third party verification according to fixed criteria. These type of labels are so-called positive labels and they are voluntary. Labels are existing for product groups like photocopiers, printers, fax-machines and refillable cartridges (e.g. Blue Angel) requiring specific properties for the toner/ink ingredients, especially the colorants. Different national labels could demand different award criteria for the same product group.

The impact on toner (ink) colorants will be summarized on the basis of the Blue Angel requirements as follows:

- exclusion of azo colorants based on amines which are listed in defined reports (e.g. MAK, etc.)
- exclusion of colorants based on certain heavy metals (e.g. Cd, etc.)
- exclusion of colorants which are in general eco/toxicologically problematic (see individual award criteria, e.g. may cause cancer)

Consequences

- limitation of useful colorants by the criteria
- development of new colorants
- frequent reconsideration whether the used colorant fulfills the partly changing requirements in the individual countries/regions.

Finally, as an result of the last 20 years, environmental thinking and behavior is becoming more and more important as well as influencing the consumer’s decision.

Therefore such labels have become a strong marketing and advertising instrument in several regions. International standards like ISO 14000 are supporting this kind of thinking.

But unfortunately no globally standardized eco-label instrument exists. This would make the colorant decision much more simple and convenient for those who have to apply them.

References

1. EPA-report 742-R-98-009, Environmental labeling Issues, Policies and Practices Worldwide, 1998; EPA contract no 68-W6-0021, Pollution, Prevention Division, US. Environmental Protection Agency (7409) 401 M Street, SW; Washington, DC 20460
2. Environmental label German "Blue Angel": Product Requirements, RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V., Siegburger Straße 39, 53757, St. Augustin, Germany
3. Further information is available via Internet
   a) http:\www.ral.de
   b) http:\www.blauer-engel.de (English and German)
4. Technical details are given in the UZ-no. related basic criteria.
5. MAK- und BAT-Werte-Liste 1999, Senatskomission zur Prüfung gesundheitsschädlicher Arbeitstoffe, Wiley-VCH, VCH Verlagsgesellschaft, ISBN 3-527-27589-4, see also: Greim, H, Occupational Toxicants Critical Data Evaluation for MAK Values and Classification of Carcinogens, Volume 12, Wiley-VCH ISBN 3-527-27043-4.

Biography

Ruediger Baur studied chemistry at the Johann-Wolfgang Goethe University, Frankfurt/Main, from 1980 until 1986

(master degree). In 1990 he received his Ph.D in Inorganic Chemistry at the same university. In 1990 he joined the R+D-department for organic color pigments of Hoechst AG. Since the merger between Clariant/CH and Speciality Chemical Divsion/Hoechst has been founded in 1997, he is working for the Technical Marketing Department of the Business Unit Pigments at (new)Clariant.

His main responsibilities are focused on R+D and technical service of charge control agents as well as color pigments for toner applications. Over years, he is a member of the Gesellschaft Deutscher Chemiker (German Chemical Society).