

Sustainable Hazardous Substances Management in the Supply Chain

Henk Veenvliet^a, Arjan J. van Weele^b, Wendy van der Valk^c
Eindhoven University of Technology

Summary

Being compliant to legal hazardous substances regulations is difficult for multinational companies that have a global network of suppliers. The presence of these chemicals has to be monitored throughout the supply chain often even up until the raw materials suppliers. Companies have also to deal with regional differences in regulations. This paper describes how the multinational company Philips has dealt with this theme. Basic to the approach is that the process has to be changed from an *only signature* concept (TELL) to a detailed declaration concept (SHOW ME). Selection of a company specialized in hazardous substance knowledge and reporting is essential to realize this. The main result of this program is that using this SHOW ME concept Philips suppliers can be evaluated reliably and quickly on the substance content of the delivered products. This way the supply chain *risk* is drastically reduced leading to more sustainable and safe products at reasonable costs.

Keywords: Hazardous substances, Sustainability, Compliance

1. Introduction

Nowadays sustainability compliance is a major element of responsible behavior of companies. This subject is highly contemporary as companies are continuously searching for cheaper materials and lower labor costs. This results in immense supplier networks stretching across the globe (Davis et al., 2008). Chains are most often dominated by many small- and medium-sized enterprises that are dispersedly located around the globe (Amaeshi et al., 2008; Ciliberti et al., 2010). Buying organizations of multinational companies that wish to be sustainable feel the obligation to control the sustainable behavior of their networks. Transparency in supply is a prerequisite for delivering reliable sustainability information to the stakeholders (Svensson, 2009; Vaccaro and Echeverri, 2010). More generally, transparency in business is becoming more important as “we are moving from a “*TELL ME*” world to a “*SHOW ME*” world” (Wiemer and Plugge, 2007, p. 2).

An actual aspect of the sustainability control of the supply chain is the need to avoid dangerous hazardous substances in delivered products. These substances are harmful to the health of people. Nowadays 400 substances have been identified by NGO’s and governments which are listed in the so called Substitute Immediately Now (SIN) (www.sinlist.org).

Almost all governments have a legislation on banning and or notifying hazardous substances. These legislations are difficult to interpret due to continuous updating. There is no global standardization so that multinational companies are confronted with all kinds of rules when buying and selling all over the world. As an example, there are regulations on the presence of hazardous materials per *article weight* (European Registration and Authorization

^a School of Industrial Engineering; P.O. Box 513, CNT 0.08; 5600 MB Eindhoven, the Netherlands; T: +31 40 247 21 70; F: +31 40 246 80 54; E: h.veenvliet@tue.nl.

^b School of Industrial Engineering; P.O. Box 513, CNT 0.08; 5600 MB Eindhoven, the Netherlands; T: +31 40 247 36 70; F: +31 40 246 80 54; E: a.j.v.weele@tue.nl.

^c School of Industrial Engineering; P.O. Box 513, CNT 0.08; 5600 MB Eindhoven, the Netherlands; T: +31 40 247 26 29; F: +31 40 246 80 54; E: w.v.d.valk@tue.nl.

of Chemicals (REACH)) . At the same time there is a regulation on the *homogeneous material* content in a product (the European Restriction of Hazardous Substances (ROHS)). ROHS simply forbid usage (with exemptions) while REACH (art. 33) only request notification on safe use.

Multinational organizations heavily rely on the quality of the products i.e semi manufactured components, which they buy. How can suppliers demonstrate to their customers that their products do not contain any hazardous materials and/or that hazardous substance information of the delivered components is reliable? Do they need to submit formal statements about the chemical content of *every product, which* they deliver? How far downstream does a customer have to go in the supply chain? These are the questions every big company today is faced with.

Today, large multinationals manage complicated global supply chains. The majority of their supply base is located in the low cost countries like India and China. Although the local first tier suppliers are big companies (e.g. the electronic contracts manufacturer Foxconn, who is a supplier of the iPhone and iPad to Apple, has more than 1 million employees) the second/third tier suppliers usually are small /medium sized and dispersed over different regions. These second/third tier suppliers lack detailed knowledge about the chemical content of the products they deliver. They also lack knowledge of the regulations to which they have to comply.

An actual example of how things can go wrong is the Mattel case. In 2010 this multinational in the toys business had to recall nearly one million toys because products were covered with hazardous and forbidden lead paint. The paint has been delivered by a local paint supplier to a Mattel subcontractor in China. As a result Mattel had to recall millions of products from the US market. In case proper controls are lacking, every multinational company can be confronted with this type of problems. Hence, companies need to take structural measures to reduce the risk that such things will happen. The suppliers have to be tracked and traced to force them to give the detailed information about the chemicals in the delivered products and components.

As a former supplier sustainability officer at Philips Lighting one of the authors had the opportunity to be active in the design and execution of a global supplier sustainability program on hazardous substances for this leading company. This paper deals with the problems, which Philips encountered in this domain and discusses how these problems have been tackled. The results of this paper are not relevant for only Philips; its learnings are also relevant for other multinationals, who manage complex, global supply chains and supplier networks. In dealing with the issues on how to avoid problems related to hazardous materials, we first discuss how Philips selected the platform needed to control and monitor hazardous substances throughout its supply chains. Next, we describe how suppliers are traced and tracked through this platform. Then we describe how Philips systematically implemented the program to make suppliers 100% compliant to environmental legislation. Finally, we conclude with an overview of the results of this program.

2. How to choose a specialized company in monitoring hazardous substances

Confronted with the challenges, which have been described above, Philips felt the need to change in a two years' time frame the supplier hazardous substances program from a *signature only (TELL ME)* model to a detailed declaration (*SHOW ME*) model. In the past only a signed statement from a supplier was required that it was compliant with substance regulations. This has resulted in uncontrollable information from the suppliers. Nowadays, Philips suppliers have to show evidence of being compliant (*SHOW ME*). This new

requirement needs a lot of expertise and resources, since it was decided to build up a unique and detailed, web based and -enabled track and trace system. This system should allow Philips to monitor compliance to hazardous materials laws and regulations at its worldwide supply base. Designing, building and maintaining such a solution is time consuming and a costly affair. Therefore Philips decided to cooperate with a specialized company. Philips has selected the company based on two main criteria.

Firstly, the company should have a detailed knowledge of chemical substances and actual hazardous substances legislation all over the world.

Secondly, the company should have available a web based hazardous substances declaration tool which was easy to be used by a global supply chain partners. Thirdly, the solution should enable to adapt to updating of the regulations. Selecting a company that has both detailed, chemical knowledge and specialized knowledge of how to design, operate and maintain a robust web enabled data management, was not an easy task. There are only a few companies in the world, which have these combined skills in house. Philips selected the company Environ. A major consideration in favor of Environ was that it successfully built a hazardous substances declaration web tool called *BOMcheck* (www.bomcheck.net). For every hazardous substance in a product BOMcheck demands a yes/no statement about its presence in a product or components and, when required by legislation, the weight percentage in the product. BOMcheck gives chemical guidance to the risk, which is represented by the presence of hazardous substances in certain product groups. Hence, it enables suppliers with limited chemical knowledge to prepare and submit declarations with reasonable confidence. BOMcheck allowed Philips to determine the hazardous substances risk profile of supplied products, per individual product and per individual supplier as suppliers had to actually show how their products and components were composed. The process of tracking and tracing hazardous substance information from suppliers

Executing the Philips hazardous substance compliance and risk program throughout its worldwide supplier networks is not only a matter of the supply chain management organization. The design of the program actually was made by a multifunctional team headed by the sustainability department of Philips. The functions, which were represented in the team, included Innovation, Product Quality, Sustainability, ICT, Marketing and Purchasing. This team decided on the following time phased implementation plan:

1 Create an consistent and future proof list of all hazardous substances ,which have to be banned or notified on safe use. Philips decided to push the legal hazardous substance criteria further than regional legislation. The list has been globalized according to the whatever strict regional requirement counts. Every product delivered to Philips should be compliant to the hazardous substances requirements all over the world. This Philips Regulated Substances List (RSL) has been published in www.philips.com/suppliers. Suppliers make declarations in BOMcheck using the criteria in this list.

2 Evaluate the BOMcheck declarations of the products delivered by suppliers and rate the competencies of the suppliers accordingly. Philips uses internal expertise to realize this ranking of supplier capabilities. The detailed analysis per supplier results in the identification of specific risk components. The presence of the hazardous substances in some products, if any, is be investigated throughout the supply chain in order to design specific measures aimed at phasing out these substances.

3 Decide whether additional independent test reports are needed when the supplier demonstrates lack of knowledge. Philips selected reputational test companies where suppliers have to go to in order to obtain objective test reports, if being asked for by Philips.

4 *Track and trace suppliers to push them to compliance.* . Based upon the previous steps, suppliers were pushed to comply to regulations and to implement the measures that were designed. This step has proven to be the most difficult one as a lot of suppliers are not familiar with the need to comply to environmental legislation and the need to submit detailed chemical information. Therefore Philips created a *Philips BOMcheck Support Center* that trains, encourages and engages suppliers to ensure that they upload their declarations in BOMcheck. Philips also made an animation videoclip on its supplier website www.philips.com/suppliers which clarifies the process. The change from a *TELL ME* to a *SHOW ME* process required a mentality change in the supply chain. Therefore the Philips local purchasing and supply managers who have regularly contact with the risk suppliers were trained in a similar way. Purchasing and supply managers throughout Philips were responsible for this supplier mentality change. Figure 2 summarizes schematically the steps that were made.



Fig 2 The Philips hazardous substance supplier risk management process created in 2010

3. Results

The supplier risk management step reduced the scope of Philips suppliers to declare in BOMcheck about 2500. More than 50% have yet uploaded the information. These suppliers have already made more than 200.000 declarations. The critical success factor of the program has been: Create awareness!! The risk suppliers are approached with a unambiguous message. *You, as supplier bring our company in danger.* This *no data, no market* message was the best remedy for suppliers to act.

When suppliers have made a BOMcheck declaration, validation is a critical path in the process. Unreliable supplier information leads to disastrous consequences (as the example of the Mattel case clearly shows). Supplier BOMcheck declarations have thus to be checked and followed up carefully. This can only be done by putting skilled people in the field to check supplier operations. Besides own expertise in the Philips Quality departments Philips formed the Philips BOMcheck Support Center to ensure that all suppliers declarations meet the Philips standard.

Figure 3 pictures a supplier BOMcheck declaration which is incomplete. Substances which are ticked with a question mark indicate that the supplier has no information. A red cross means that the information is not compliant to the legal regulations. A green tick means that the information is compliant to the regulations according to the supplier. It is the task of the Philips validation team to ensure that all substances have a green tick. For this, the suppliers have to disclose extra (test) information.

REACH candidate list	
✓ Anthracene	✓ Anthracene oil
✓ Anthracene oil, anthracene paste, anthracene fraction	✓ Anthracene oil, Anthracene-low
✓ 4,4'-Diaminodiphenylmethane	✓ Anthracene oil, anthracene paste
✓ 3-tert-butyl-2,4,6-trinitro-m-xylene (musk xylene)	✓ Lead hydrogen arsenate
✓ Sodium chromate	✓ Sodium dichromate, dihydrate
✓ Potassium dichromate	✓ 2,4-Dinitrotoluene
✓ Cobalt(II) Carbonate	✓ Potassium chromate
✓ 2-Ethoxyethanol	✓ Cobalt(II) Sulphate
✓ 1,2,3-Trichloropropane	✓ Cobalt(II) Diacetate
✓ Hydrazine	✓ Chromium Trioxide
✓ Calcium arsenate	✓ 1-Methyl-2-pyrrolidone
✓ N,N-dimethylacetamide	✓ 2-Ethoxyethyl acetate
✓ Trilead diarsenate	✓ Potassium hydroxyoctaoxidizincatedichromate
✓ Formaldehyde, oligomeric reaction products with aniline	✓ Arsenic acid
✓ Dichromium tris(chromate)	✓ 1,2-dichloroethane
7 Bis(2-methoxyethyl) ether, also known as Diglyme	✓ 4-(1,1,3,3-tetramethylbutyl)phenol
7 DBP (Dibutyl phthalate)	✓ Lead diazide, Lead azide
7 DIBP (Diisobutyl Phthalate)	✓ Lead styphnate
7 HBCDD (Hexabromocyclododecane)	7 Bis(2-methoxyethyl) phthalate, also known as DMEP
7 Cobalt dichloride	7 DEHP (Di(2-ethylhexyl) phthalate)
7 Aluminosilicate Refractory Ceramic Fibres	7 DIHP (1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7- rich)
7 Zirconia Aluminosilicate Refractory Ceramic Fibres	7 SCCP (Short-chained chlorinated paraffins)
7 Tetraboron disodium heptaoxide (hydrate)	7 Diarsenic pentoxide
	7 Aluminosilicate Refractory Ceramic Fibres
	✗ TBTO (Tributyltin oxide) (<3%)
	7 Boric acid
	7 Lead chromate
	7 Lead chromate molybdate sulfate red

Fig 3 example of a BOMcheck declaration which is incomplete and has to be updated by the supplier

4. Conclusion and recommendations

Multinational companies should be very active in controlling their suppliers whether they comply with legal/industrial laws and regulations on hazardous substances. This will reduce the risk of putting chemical dangerous products on the market which may do harm to people and the environment. Next, noncompliance may damage the brand name reputation of the corporation and, hence, cause considerable financial losses. Philips changed from a *supplier TELL ME* model (supplier only needed to sign the Restricted Substances List) towards a *supplier SHOW ME* model wherein suppliers have to disclose detailed evidence of the chemicals in their products and components. Instrumental for this change has been teaming up with a specialized company Environ who provided Philips with a web-enabled solution for registering information on all hazardous materials in supplier products. BOMcheck enables the gathering of reliable and uniform information across the supply chain. Next, it ensures that this information is compliant with the latest hazardous substance restrictions. Through BOMcheck, all relevant information on hazardous materials can be disclosed when requested by customers, consumers, non-governmental organizations and governments. For Philips use of BOMcheck appear to be very valuable when designing new products and marketing campaigns.

A critical success factor was identification of high risk suppliers. All these suppliers were checked on compliance with hazardous materials. Next, correction measures were taken to make also these suppliers compliant.

Based upon the positive experiences of Philips with the BOMcheck declaration tool, it is recommended to develop this into an industry standard. In the meantime, BOMcheck has already been rolled out by other electronic multinationals like Siemens, GE, Toshiba number of BOMcheck participants is increasing. Twice a year Environ organizes a best practice workshop with the participants wherein best practices are exchanged and steps for alignment

are decided upon. The suppliers to these multinationals will profit from this development. They can make one single BOMcheck declaration for their (catalogue) products to several BOMcheck participants which saves a lot of extra cost.

Acknowledgements

The input by and valuable discussions with Mr. Jan-Willem Scheijgrond, Director Corporate Environment, Health&Safety at Royal Philips Electronics is gratefully acknowledged.

References

- Amaeshi, K., Osuji, O., Nnodim, P. 2008. Corporate Social Responsibility in Supply Chains of Global Brands: A Boundaryless Responsibility? Clarifications, Exceptions and Implications. *Journal of Business Ethics* , Vol. 81, pp. 223-234.
- Ciliberti, F., Pontrandolfo, P., Scozzi, B. 2010. Small Business Social Responsibility in the Supply Chain: A Literature Review. In L. Spence, & M. Painter-Morland, *Ethics in Small and Medium Sized Enterprises* (pp. 291-310). Dordrecht Heidelberg London New York: Springer
- Davis, G., Whitman, M., Zald, M. 2008. The responsibility paradox! *Stanford Social Innovation* , Vol. 6 (No. 1), pp. 31-37.
- Svensson, G. 2009. The transparency of SCM ethics: conceptual framework and empirical illustrations. *Supply Chain Management: An International Journal*, Vol. 14 (No. 4), pp. 259-269.
- Vaccaro, A., Echeverri, D. 2010. Corporate transparency and Green Management. *Journal of Business Ethics*, Vol. 95, pp. 487-506.
- Wiemer, J., Plugge, L. 2007. Briefing paper 'Transparency in the Supply Chain'. GRI/GTZ Transparency in the supply chain project (pp. 1-3). Amsterdam: Global Reporting Initiative
- www.sinlist.org
- www.bomcheck.net
- www.philips.com/suppliers