REWE Group Detox Program

Hazardous Substances Fact Sheet

Alkylphenols (APs) and Alkylphenolethoxylates (APEOs)

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1 Background

APEOs or alkylphenol ethoxylates are common surfactants used in the apparel, home textile and shoe industry. They are discharged by factories and washed out of the final products ending up in the environment where they hardly break down and can cause severe damage to aquatic ecosystems. Their endocrine (hormone-like) properties may also impair human health. In 2016, REWE Group will initiate an investigation into the status of phase out of APEOs in the production of textiles.

The latest list of hazardous substances that shall be phased out in the production including limit values can be found in the REWE Groups MRSL (Manufacturers Restricted Substance List).

2 Definition

- The most important APEOs for the textile industry are NPEOs (nonylphenol ethoxylates) and OPEOs (octylphenol ethoxylates) due to their detergent properties.[1]
- About 90% of the produced APEO are in fact NPEO[2]. Nonylphenolethoxylates (Polyethylene glycol nonylphenyl ethers), CAS No. 127087-87-0, include substances as[3]:

No.	CAS Number	Name
	9016-45-9	Poly (oxy-1,2-ethanediyl), *alpha*-(nonylphenyl)-*omega*-hydroxy-
	26027-38-3	Poly (oxy-1,2-ethanediyl), *alpha*-(4-nonylphenyl)-*omega*-hydroxy-
	37205-87-1	Poly (oxy-1,2-ethanediyl), *alpha-(isononylphenyl)-omega-hydroxy-*
	68412-54-4	Poly (oxy-1,2-ethanediyl), *alpha*-(nonylphenyl)-*omega*-hydroxy-, branched
	127087-87-0	Poly (oxy-1,2-ethanediyl), *alpha*-(4-nonylphenyl)-*omega*-hydroxy-, branched

- Alkylphenols (APs) like nonylphenol (NP) or octylphenol (OP) are breakdown products of the APEOs. They are formed during waste water treatment and in the environment.

3 Legal Aspects

Suppliers of the REWE Group must assure that they produce in full accordance with the legal requirements of the country where the production takes place, and the legal provisions of the European Union regarding final products. A comprehensive list with international regulation for individual hazardous substances can be found on the website of the American Apparel & Footwear Association's (AAFA).[4]

[1] Eurofins 2012. Alkylphenol ethoxylates (APEO) in textiles. Online available: http://www.eurofins.com/media/17648/apeo%20in%20textiles%20-%20en.pdf
[2] Eurofins 2012. Alkylphenol ethoxylates (APEO) in textiles. Online available: http://www.eurofins.com/media/17648/apeo%20in%20textiles%20-%20en.pdf
[3] ZDHC, undated. NONYLPHENOL ETHOXYLATES (NPEOs). Online available: http://www.roadmaptozero.com/df.php?file=pdf/NPEO.pdf
[4] https://www.wewear.org/rsl/ https://www.wewear.org/assets/1/7/RSL_v16_final_UPLOAD.pdf

Since 1998 use of APEOs in detergents has been forbidden in Germany - and since January 2005 the EU directive 2003/53/EG has forbidden the use of NPEO in higher concentrations than 0.1% in formulations. The EU currently extends its bans of hazardous substances on imported textiles, starting with a prohibition of Nonylphenolethoxylates[5].

4 Hazardous Properties and Exposure

APEOs and APs enter the environment[6] through wastewaters of different industrial branches including the textile industry. Because APEOs and APs are very persistent in nature, they do not degrade readily in sewage treatment and thus are discharged by factory-wastewaters into surface waters[7].

Also, laundry of new textiles in private households is a relevant and geographically wide spread source of APEO-contamination.

In many parts of the world, APEOs are already ubiquitous in the natural and urban environment due to the high and widespread exposure.[8]

4.1 Hazardous Properties

The most significant toxicological characteristics of APs are their endocrine disruptive (hormone-like) properties[9,10]

When APEOs finally break down, they form metabolites like the Alkylphenols (AP) which are more toxic than the original APEO.[11]

APs are toxic to many aquatic organisms. They have estrogenic effects in aquatic ecosystems at concentrations: fertility of fish and other water organisms is affected, stocks decrease and ecosystems are impaired.

APs also impair human fertility and cause harm to unborn children.

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[5] Ecotextile 2015. EU bans NPEs in clothing imports. Online available: https://www.ecotextile.com/2015072221600/dyes-chemicals-news/eu-bans-npes-in-clothing-imports.html

[6] In many parts of the world,APEOs are already ubiquitous in the natural and urban environment due to the high and widespread exposure. Friends of the Earth UK 1995. An Environmental Assessment of Alkylphenol Ethoxylates and Alkylphenols. Online available: http://www.foe.co.uk/sites/default/files/downloads/ethoxylates_alkylphenols.pdf

[7] Eurofins 2012. Alkylphenol ethoxylates (APEO) in textiles. Online available: http://www.eurofins.com/media/17648/apeo%20in%20textiles%20-%20en.pdf

[8] Friends of the Earth UK 1995. An Environmental Assessment of Alkylphenol Ethoxylates and Alkylphenols. Online available: http://www.foe.co.uk/sites/default/files/downloads/ethoxylates_alkylphenols.pdf

[9] The Danish Environmental Protection Agency, undated. The EU list of potential endocrine disruptors. Online available: http://eng.mst.dk/topics/chemicals/endocrine-disruptors/the-eu-list-of-potential-endocrine-disruptors

[10] WWF, DETOX Campaign, undated. Alkylphenols (octylphenol and nonylphenol isomers). Online available: http://assets.panda.org/downloads/fact_sheet___alkylphenols_food.pdf

[11] Friends of the Earth UK 1995. An Environmental Assessment of Alkylphenol Ethoxylates and Alkylphenols. Online available: http://www.foe.co.uk/sites/default/files/downloads/ethoxylates_alkylphenols.pdf

4.2 Exposure

The risk of a chemical for human health and the environment is not only determined by its toxicity but by the degree of exposure, too.

a) Workers

Workers in a facility that manufactures APEOs or in the various formulating and production facilities that use products containing APEOs are exposed during

- handling chemical preparations
- getting in contact with processing liquids
- waste water or treated products or
- when carrying out maintenance, sampling, testing, or other procedures.[12]

b) Consumers

Consumers take up APs and APEOs through

- fish and agricultural products which were fertilized with sludge from waste water treatment
- household chemicals, pesticides, degreasers, paints, and household cleaning products can cause dermal contact with APEOs and APs.
- contact with apparel products and shoes .[13]

5 Sources for APs and APEOs in production of textiles

a) Processing chemicals used in the factory

APEOs may be found in processing chemicals and preparations as:

- o Industrial laundry detergent
- o Scouring agents (e.g., wool and leather)
- o Wetting agents
- o Softeners
- o Spinning oils (yarn and fabric)
- o Emulsifier/dispersing agents for dyes and prints
- o Impregnating agents
- o Degreasing agents for leather hides
- o Leather-finishing preparations
- o De-gumming agents for silk production
- o Dyes and pigment preparations
- o Polyester padding
- o Down/ feather fillings
- o Facility cleaning products

b) Raw materials used in the factory

Materials and pre-products that are bought by a factory and used in production may also contain APEOs and should be controlled. Please refer to the chapter “High risk materials” in factsheet “no. I – Hazardous substances” for further information.

c) Contamination

Chemical impurities or unknown additives in processing chemicals, incoming water

[12] WWF, DETOX Campaign, undated. Alkylphenols (octylphenol and nonylphenol isomers). Online available: http://assets.panda.org/downloads/fact_sheet___alkylphenols_food.pdf

[13] WWF, DETOX Campaign, undated. Alkylphenols (octylphenol and nonylphenol isomers). Online available: http://assets.panda.org/downloads/fact_sheet___alkylphenols_food.pdf

6 Alternative and Substitute Substances

All alternatives used as substitutes for hazardous substances must be free of hazardous properties. Tools to identify hazardous properties of chemicals and to find safer alternatives are listed in “Factsheet I – Hazardous substances”.

The following substances have been identified as examples of safer alternatives by the U.S. Environmental Protection Agency[14] Design for the Environment Program:

CAS number	name
68439-46-3	C9-11 alcohols, ethoxylated (6EO)
68131-39-5	C12-15 alcohols, ethoxylated (9EO)
64366-70-7	Oxirane, methyl-, polymer with oxirane, mono(2-ethylhexyl ether)
68515-73-1	Glucopyranose, oligomeric, decyl octyl glycosides
68411-30-3	Benzenesulfonic acid, C10-13-alkyl derivs., sodium salt
151-21-3	Sodium lauryl sulfate
9004-82-4	Polyoxy(1,2-ethanediyl), alpha-sulfo-omegadodecyloxy-, sodium salt
1338-41-6	Sorbitan monostearate

In order to minimize environmental and health effects and to use resources efficiently the use of best available technology (BAT[15]) in textiles industry is a standard requirement.

Please refer to chapter “Identifying hazardous substances and non-hazardous alternatives” in "factsheet no. 1 – Hazardous substances” for further information on alternatives. In addition the Chemsec Textile Guide offers access to a list of hazardous and safer surfactants and should be taken into account when a chemical inventory is prepared[16].

[14] US Environmental Protection Agency (EPA), undated. Partnership to Evaluate Alternatives to Nonylphenol Ethoxylates. Online available: http://www2.epa.gov/saferchoice/partnership-evaluate-alternatives-nonylphenol-ethoxylates-publications

[15] European Commission: Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for the Textiles Industry July 2003

[16] ChemSec, undated. Textiles come with a toxic footprint. http://textileguide.chemsec.org/find/textiles-come-with-a-toxic-footprint/