IN THE SPOTLIGHT

Substitutes for contaminants: The EU's Restriction of Hazardous Substances (RoHS) Directive

Cadmium in TVs, mercury in compact fluorescent lamps … various electrical and electronic devices contain hazardous substances such as heavy metals and brominated flame retardants (BFRs). The purpose of the EU's Restriction of Hazardous Substances (RoHS) Directive is to prohibit the use of these substances or at least to limit them to applications for which there are no safer alternatives. The Directive currently prohibits the use of six substances in electrical and electronic devices, including lead and hexavalent chromium. In July 2019, its provisions will additionally apply to four phthalates, which are mainly used as plasticisers (softening agents).

Exemptions for hazardous substances under the RoHS Directive

The RoHS Directive permits exemptions from the substance restriction if substitution is not possible from a scientific and technical point of view, or if there is no permitted alternative, or if the negative environmental or health impacts caused by substitution are likely to outweigh the human and environmental benefits thereof. The exemptions are time-limited and must be renewed at regular intervals.

Since 2006, the Oeko-Institut has conducted various studies which reviewed more than 100 exemption requests in order to determine whether they were justified and complied with the relevant criteria. As part of the review process, the researchers assessed information and data from the request applicants, from stakeholders and from publicly accessible sources. They then submitted their recommendations to the European Commission.

Project website: RoHS Evaluations of exemption requests and other topics

Exemptions for mercury in CFLs and fluorescent tubes

In its study to assess renewal requests for 29 RoHS 2 Annex III exemptions, for example, the Oeko-Institut and its partner, the Fraunhofer Institute for Reliability and Microintegration (IZM), assessed a number of exemption requests, including those dealing with mercury in compact fluorescent lamps (CFLs) and fluorescent tubes. In relation to CFLs, the researchers recommended not renewing two existing exemptions for lamps used for general lighting purposes with power input of less than 30W and 50W respectively.

The argument is that more energy-efficient alternatives based on LED technology are now available. Three exemptions for CFLs with higher power input (50W and above), generally used in non-residential settings, should be renewed for three years initially pending the development of more energy-efficient alternatives, according to the recommendations made by the Oeko-Institut in its 2015 study.

Extend or end? Recommendations for fluorescent tubes

The project team also looked at mercury in linear fluorescent lamps and submitted recommendations to the European Commission. As linear fluorescent lamps (LFLs) with a tube diameter of less than 9 mm are only sold in small quantities nowadays, the researchers expect that they will be gradually taken off the market, with no further action needed. They therefore support the renewal of the exemption for a five-year period.

The Oeko-Institut also recommends the renewal of the mercury exemption for long-lifetime LFLs. For two other types – T5, with a tube diameter between 9 and 17 mm, and T8, with a tube diameter between 17 and 28 mm – the study recommends an end to the exemptions in view of the current availability of LED technology and long-lifetime LFLs as substitutes.

Study to assess renewal requests for 29 RoHS 2 Annex III exemptions

Toxic cadmium in quantum dot technologies

The Oeko-Institut's researchers also focused on the Directive in their 2016 study to assess 2 RoHS exemption requests. In this study, they assessed two exemption requests for cadmium, a highly toxic and carcinogenic substance, in quantum dot applications. Quantum dot technology can be used to achieve high-quality colour performance in televisions and monitors. The Oeko-Institut had previously analysed the relevant exemption requests in 2014, but with the rapid development of this market segment, an update was required in 2015.

Cadmium quantum dots and their alternatives

The study also looked at alternatives, such as indium phosphide technology. One particular challenge is that different measurement standards exist for the assessment of cadmium quantum dot technology and its alternatives in display applications. Energy consumption is determined not only by the technology itself but also by the degree of energy efficiency in the electronics required for the operation of the displays.

So while some models available on the market may in theory offer a technological advantage, this is not always achieved in practice; indeed, the displays may consume more energy than other comparable devices. For the purposes of the assessment, the Oeko-Institut conducted a consultation to gather information from the applicants and from competitors engaged in the development of similar technologies. However, no firm conclusions could be drawn from the data, so the study was based on a comparison of the technologies and current standards for the assessment of image quality.

Study to assess 2 RoHS exemption requests

Avoiding hazardous substances at source: Incentives for display innovations

Based on their assessment of the requests, the researchers recommended the renewal of the RoHS exemption allowing the use of cadmium quantum dots in displays for a period of three years. One consideration was that from a toxicological perspective, the alternative substances offered no significant benefits or disadvantages. The key factor, however, was the 20 per cent higher energy consumption of cadmium-free displays – such alternative technologies merely displace the environmental impacts. The short exemption period, however, is specifically intended to support green innovations in display technology which avoid the use of hazardous substances while achieving high-quality colour performance.

Study to assess renewal requests for 29 RoHS 2 Annex III exemptions

Further Information

Article: „Cadmium in TV screens. Exemption requests under the RoHS Directive“ in the Oeko-Institut's 2016 Annual Report

Project website: RoHS Evaluations of exemption requests and other topics

Report on the Study to assess 2 RoHS exemption requests

Contact

Yifaat Baron
Senior Researcher
Sustainable Products & Material Flows

Oeko-Institut e.V., Office Freiburg
Phone: +49 761 45295-266
Mail: y.baron@oeko.de

Carl-Otto Gensch
Head of Division
Sustainable Products & Material Flows

Oeko-Institut e.V., Office Freiburg
Phone: +49 761 45295-241
Mail: c.gensch@oeko.de

Oeko-Institut is a leading independent European research and consultancy institute working for a sustainable future. Founded in 1977, the institute develops principles and strategies for realising the vision of sustainable development globally, nationally and locally. Oeko-Institut is represented at three locations in Germany – Freiburg, Darmstadt and Berlin.