

## **Adaptation to Scientific and Technical Progress under Directive 2011/65/EU - Transferability of previously reviewed exemptions to Annex III of Directive 2011/65/EU**

Freiburg, 17.02.2012

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## 1 Introduction

The Commission has requested Öko-Institut and Fraunhofer IZM to assess former evaluation results (carried out under the RoHS I regime – Directive 2002/95/EC) in the light of the new provisions under RoHS II (Directive 2011/65/EU). It was agreed that no further questions would be sent to the stakeholders or to the former applicant and hence that no online stakeholder consultation would be carried out either.

This assessment has been made and the results are summarized below. However, we would like to note that these results were only compiled on the basis of assumptions. I.e. we can give a certain estimation of what the applicant would have brought forward as argument for the specific exemption if it would have been evaluated under the new RoHS II regime. The documentation we have received during the previous consultation does of course only include information according to the old RoHS I criteria.

We would like to stress that hence on the basis of available information and data no sound and fact-based re-evaluation can take place but rather a estimation on the basis of our experience of what could have been a possible scenario.

## 2 REACH-related aspects

In the consultants' opinion, only the inclusion of substances in uses relevant for the below exemptions into the procedures for the authorization or restriction of substances and articles under REACH may weaken the environmental and health protection afforded by REACH if at the same time RoHS grants an exemption for these uses.

When screening the below recommendations / exemptions with regard to their transferability to RoHS II, we have thus checked whether the substance covered is

- on the list of substances of very high concern (SVHCs, Candidate List),
- on the list of substances proposed for the adoption to the Candidate List
- in the recommendations of substances for Annex XIV
- listed in Annex XIV itself (authorization)
- listed in Annex XVII (restrictions).

For both substances covered in the below exemptions – lead and cadmium – we have found that the only relevant entries can be found in Annex XVII, i.e. neither lead nor cadmium (at least in the form used here in EEE) is subject to activities related to authorization.

Annex XVII contains three entries that are of relevance:

- Entry 23 “Cadmium”,
- Entry 28 “Carcinogen substances category 1B (Table 3.1)/carcinogen category 2 (Table 3.2) listed in Appendix 2”; Appendix 2 inter alia lists cadmium oxide.
- Entry 30 “Reproductive toxicant substances category 1A adverse effects on sexual function and fertility or on development (Table 3.1) or reproductive toxicant category 1 with R60 (May impair fertility) or R61 (May cause harm to the unborn child) (Table 3.2) listed in Appendix 5”; Appendix 5 inter alia lists lead compounds with the exception of those specified elsewhere in Appendix 5.

All of these entries list a number of uses / applications for which restrictions exist respectively for which stated restrictions do not apply. With regard to lead and its compounds and with regard to cadmium as stated above, entry 28 and 30 list the following restrictions:

1. Shall not be placed on the market, or used,
  - as substances,
  - as constituents of other substances, or,
  - in mixtures,

for supply to the general public when the individual concentration in the substance or mixture is equal to or greater than:

- either the relevant specific concentration limit specified in Part 3 of Annex VI to Regulation (EC) No 1272/2008, or,
- the relevant concentration specified in Directive 1999/45/EC.

Concerning entry 23 with regard to cadmium, the list is more complex and very lengthy. Hence, not the full list is repeated here but only excerpts that are considered relevant for exemption 30 referring to the use of cadmium alloys:

“8. Shall not be used in brazing fillers in concentration equal to or greater than 0,01 % by weight. Brazing fillers shall not be placed on the market if the concentration of cadmium (expressed as Cd metal) is equal to or greater than 0,01 % by weight. For the purpose of this paragraph brazing shall mean a joining technique using alloys and undertaken at temperatures above 450 °C.”

The use of cadmium in photoresistors as referred to in exemption 40 does not seem to be covered by entry 23.

However, it has to be noted that the assessment undertaken here only has the goal to point out issues where a conflict may exist between the two legislations and that a detailed juridical assessment still needs to be undertaken in order to have legal certainty.

### **3 “Lead in PZT based dielectric ceramic materials for capacitors being part of integrated circuits (ICs) or discrete semiconductors” (proposed as exemption no. 7(c)-IV<sup>1</sup>)**

#### **3.1 Review history of the exemption**

##### **3.1.1 Last reviews**

(Öko-Institut 2010) has reviewed the exemption request for “Lead in PZT based dielectric ceramic materials for capacitors being part of integrated circuits (ICs) or discrete semiconductors” in 2009/2010 in the course of the adaptation of Annex II of the ELV-Directive to scientific and technical progress. It was recommended to grant the exemption, and the Commission followed the consultants’ recommendation. The applicant filed an identical exemption request in 2010/2011 for adaptation of the Annex of the RoHS I to scientific and technical progress. The consultants have evaluated the exemption request based on Art. 5 (1) (b) of RoHS I. Technical arguments the applicant had put forward were found to be also valid for the electrical and electronic equipment under the scope of RoHS I. The consultants hence recommended to adopt the exemption as exemption 7-c (IV) to the Annex of RoHS I without an expiry date prior to the four years’ periodical review of exemptions in RoHS I (Öko-Institut 2011).

##### **3.1.2 Justification for exemption**

The applicant had justified the exemption with technical arguments in (Öko-Institut 2010) and (Öko-Institut 2011). Besides the piezoelectric properties, lead-zirconium-titanate (PZT) shows also ferroelectric properties: It is polarized, and the polarization can be reversed by an external electromagnetic field. PZT ceramic thus has the ability to switch polarisation in the electrical field. It has the highest known dielectric constant ( $k = 1000 - 1200$ ), and a high electrical breakdown voltage of 100 V and more.

PZT ceramics therefore are the most effective technical ceramic material to ensure best filter and electrostatic discharge (ESD) performance as required in automotive and EEE applications. The PZT based materials in combination with NME (noble metal electrode) only (MIM) best meet the ESD performance required in integrated circuits (ICs) or discrete semiconductors. Based on the submitted stakeholder information, at that time (Öko-Institut 2010) could not identify lead-free alternative technologies/materials providing the necessary performance.

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<sup>1</sup> Commission Decision 2011/534/EU.

## **3.2 Transferability to Annex III of RoHS II**

### **3.2.1 Potential disadvantages for the applicant**

The exemption was requested on pure technical grounds. No other than technical arguments were put forward or considered during the review. The consultants had recommended granting the exemption without an expiry date prior to the maximum of four years, when the exemption latest would have become due for review.

The applicant thus has achieved the maximum validity period for the requested exemption. Additional arguments based on socio-economic or any other of the new exemption criteria in RoHS II would thus not have brought a more favorable recommendation for the applicant.

### **3.2.2 Compliance with the new RoHS II criteria**

#### **Duration of the exemption**

The exemption was recommended without an expiry date, as substitution or elimination of lead in this application was not foreseeable at that time. This assumption was based on a four years' time horizon, when the next review of this exemption would have become due under RoHS I.

RoHS II extends this time horizon to five years. As no solutions were foreseeable at the time of the review, the consultants would in this case also have given the same recommendation without an expiry date knowing that the exemption would then have a maximum validity of five years.

#### **Relation to the REACH Regulation**

Referring to section 2, neither lead and its compounds nor lead-containing PZT ceramics or any other use of lead in this context are under consideration with regard to authorization. However, the question arises, whether lead in PZT based dielectric ceramic materials for capacitors would fall under the restrictions mentioned in section 2 or not. Without prejudice to the assessment of a trained lawyer or the respective Commission services, we would conclude that

- i) lead in PZT based dielectric ceramic materials for capacitors could possibly be considered a mixture tackled by the above-mentioned restrictions but
- ii) putting lead in PZT based dielectric ceramic materials in integrated circuits (ICs) or discrete semiconductors, or articles (EEE) containing such devices, on the market is not a supply of lead and its compounds to the general public. The lead-containing PZT-based material is part of an article and as such not covered by entry 30 of Annex XVII.

In turn this would lead to the conclusion that the above-mentioned restriction does not apply (hence not taking into account whether iii) the concentration limits would apply in this case). In case the Commission services do not share the consultants' view, it might become necessary to check in more detail whether any concentration limits are relevant or not in order to decide whether or not the above-described restriction applies in this case. Lead concentrations in the ceramic materials are not available from the past reviews so that the original applicants would have to be requested to provide such information.

The consultants recommend clarifying whether the respective responsible Commission services follow this interpretation of the REACH Regulation to arrive at a final conclusion.

### **3.3 Conclusion**

In the consultants' opinion, the exemption can be included in Annex III of RoHS II. The applicant achieves the maximum validity period for the requested exemption and hence will not be placed at disadvantage. Vice versa, the extended exemption criteria in Art. 5 (1) (a) of RoHS II justify the exemption provided the Commission follows the consultants' interpretation of entry 30 in Annex XVII of the REACH Regulation.

### **3.4 Recommendation**

Following the above-described reasoning, it is recommended to grant an additional exemption under exemption 7c as 7(c)-IV in Annex III with the following wording:

*“Lead in PZT based dielectric ceramic materials of capacitors being part of integrated circuits or discrete semiconductors.”*

## **4 Exemption no. 30 „Cadmium alloys as electrical/mechanical solder joints to electrical conductors located directly on the voice coil in transducers used in high-powered loudspeakers with sound pressure levels of 100 dB (A) and more”**

### **4.1 Review history of the exemption**

#### **4.1.1 Last reviews**

The exemption had been requested in 2006, and (Öko-Institut 2006) evaluated the request based on the exemption criteria in RoHS I. The Commission has adopted this exemption in January 2008, and it became due for review in 2011 as, according to the provisions of RoHS I, each exemption has to be reviewed at least every four years. Neither the company that had requested the exemption originally nor any other stakeholder contributed to the stakeholder consultation, or submitted information otherwise, although the consultants had tried to contact the stakeholders several times. (Öko-Institut 2011) hence concluded that the exemption is no longer required and recommended repealing the exemption with a six months transition period starting with the official publication of the exemption by the Commission.

#### **4.1.2 Justification for exemption**

In 2006, the applicant had requested the exemption based on technical arguments. The main argument was that using cadmium enabled the applicant to produce professional loudspeakers with lower distortion and lower weight, which both were seen as technical properties that could not be provided without this exemption.

(Öko-Institut 2011) recommended to repeal the exemption in 2011 on the basis that no stakeholders participated in the consultation. The consultants concluded from this situation that either scientifically and technically the substitution of cadmium in this application was no longer impracticable, or that the exemption was no longer needed for other reasons. The continuation of the exemption would thus not have been in line with the exemption criteria in Art. 5 (1) (b) of RoHS I.

### **4.2 Compliance with the new RoHS II criteria**

In 2006, the applicant justified the exemption with technical arguments. It can be concluded that the exemption technically is no longer required, as otherwise the original applicant or another stakeholder would have tried to achieve its continuation during the last review.

The stakeholders could now argue that given the RoHS II criteria they would have seen arguments other than technical and scientific practicability against a repeal. Assuming that exemptions based on pure socioeconomic arguments are not justifiable, it might have been possible that stakeholders would have plead for a longer transition period based on socioeconomic issues (SME involvement, etc.). According to the stipulations of RoHS II, the stakeholders will enjoy 12 months minimum transition period anyway. If the Commission wants to go the very safe way it can decide to give 18 months of transition.

In case stakeholders believe the new exemption criteria in RoHS II could justify the continuation of the exemption, they can still apply for it arguing that new facts – the new exemption criteria – would justify taking up the review again.

In case the exemption is continued for whatever reasons, entry 28 and entry 30 of REACH Annex XVII have to be given some consideration as stated in section 2. Entry 30 bans the use of “brazing fillers” containing more than 0.01 % of cadmium. According to the wording of this provision, the consultants assume that the 0.01 % refer to the homogeneous material like in RoHS, not to the weight of the entire article. According to the applicant in (Öko-Institut 2006), the alloy used in exemption 30 contains more than 70 % of cadmium.

Entry 30 defines “brazing fillers” as “a joining technique using alloys and undertaken at temperatures above 450 °C.” (Öko-Institut 2006) report that one reason for the use of the cadmium solder alloy is that it withstands the high operating temperatures of around 250 °C. To allow a long-term reliable solder joint, the solder joint should be operated below 80 to 90% of the homologous temperature. This would require an alloy with a melting point of at least 310 °C. The applicant did not provide information about the temperature of the soldering process in (Öko-Institut 2006). The related soldering process should operate below 450 °C, even though a higher soldering temperature cannot be excluded. The consultants thus believe that entry 30 probably would not conflict with exemption 30, but a check with the original applicant would be required. However, it would be sufficient to clarify this in case an applicant requests the continuation of the exemption beyond the minimum transition period.

With regard to entry 28, we refer back to considerations given in section 2.

### **4.3 Conclusion**

Technically and scientifically, revoking the exemption is still justified. RoHS II requires granting a transition period of 12 months minimum in case an exemption is repealed. This gives stakeholders a chance to file an exemption request based on the exemption criteria of RoHS II in case they believe that these extended criteria compared to the situation under RoHS I would justify the further continuation of the exemption beyond the transition period. In case someone files an exemption request under RoHS II, potential conflicts with REACH could be clarified in the review process.

Under these conditions, the reviewers' believe that keeping exemption 30 in Annex III with a minimum of 12 months to expiry should not conflict with the exemption criteria in Art. 5 (1) (a) of RoHS II.

#### 4.4 Recommendation

Following-up on the above conclusion it is recommended to leave exemption 30 in Annex III but to grant the minimum 12 months transition period as Art. 5 (6) of RoHS II requires:

*“Cadmium alloys as electrical/mechanical solder joints to electrical conductors located directly on the voice coil in transducers used in high-powered loudspeakers with sound pressure levels of 100 dB (A) and more; expires [12 months after official publication of the exemption]”*

### 5 “Cadmium in Photoresistors for Analogue Optocouplers Applied in Professional Audio Equipment until 31 December 2013” (proposed as exemption no. 40<sup>2</sup>)

#### 5.1 Review history of the exemption

Since the existing RoHS I exemption has expired end of 2009, Meyer Sound Laboratories has requested a continuation of the exemption. After a further online stakeholder consultation Öko-Institut e.V together with Fraunhofer IZM (Öko-Institut 2011) had recommended granting this exemption until 31 December 2013. This period of time should allow the stakeholders to carry out the necessary development to gather new solutions to replace the use of cadmium-based photoresistors for analogue optocouplers.

The exemption is described in detail in (Öko-Institut 2011); it is complex, as it has different technical argumentation lines and levels. Additionally, two different applicants, several stakeholders and contradicting RoHS-compliance tests were involved in the former evaluation.

The analogue optocoupler devices include a cadmium-containing semiconductor in the photoresistors that may not be RoHS compliant. This cadmium sulphide semiconductor changes its resistance in proportion to the amount of light that hits it. The maximum rate of change in resistance of the cadmium sulphide has natural characteristics ideal for gain<sup>3</sup>

<sup>2</sup> Commission Decision 2011/534/EU.

<sup>3</sup> Gain is “The power increase of a signal, usually expressed in dB.”

control in professional audio applications. Furthermore the exemption is also needed for voice alarm systems (e.g. evacuation of buildings or ferries) and conference systems.

The documentation we have received during the last evaluation does of course mainly include information according to the old RoHS I criteria. Some stakeholder input included rough information on new RoHS II criteria.

However, socio-economic impacts of possible substitutes or alternative technologies were not determined at that time. Two stakeholders stated that a required period of grace was necessary for the development towards the replacement of cadmium photoresistors for analog optocoupler which is why an expiry date was proposed for 2013.

## **5.2 Compliance with the new RoHS II criteria**

We come to the conclusion that including RoHS II criteria for screening of the documentation would not lead to a different recommendation as the positive recommendation was mainly based on the necessity of a transition period for the implementation of a substitute. Furthermore, the technical necessity for analogue optocouplers was well justified.

However, considering all mentioned above available information there was no useful evidence according the new RoHS II criteria. The contractor cannot take a position on socio-economic effects of substitution as no related information is available. It can only be assumed that the applicant would have tried to use such effects to argue for a longer expiry date.

Furthermore, as stated in section 2, there are no REACH-relevant aspects to be considered for this exemption with regard to entry 23 REACH Annex XVII. For considerations related to entry 28, we refer back to section 2.

## **5.3 Conclusion**

The general positive recommendation would not be different under RoHS II as the technical grounds for justification are still given. However, with regard to the structure of the sector and given the specific economic situation of the stakeholders it could be possible that they would have used the socio-economic criteria or the availability of substitutes to request a longer exemption period.

## 5.4 Recommendation

Based on the available information and following-up on the above conclusion, we recommend including the proposed exemption no. 40 with the expiry date of 31 December 2013 into Annex III with the following wording:

*“Cadmium in photoresistors for analogue optocouplers applied in professional audio equipment; expires on 31 December 2013”*

## 6 Exemption no. 31: “Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for liquid crystal displays, design or industrial lighting)”

### 6.1 Review history of the exemption

OSRAM and the European Lamp Companies Federation (ELCF) had applied for this exemption in 2006 and in 2011 the exemption was subject to a further review process with a view to adapt it to scientific and technical progress. During the first evaluation it was stated that the development of lead-free flat panel lamps could possibly be phased out within a 2-year time frame (Öko-Institut 2006). Nearly 3 years after the exemption 31 came into force OSRAM has pronounced that leaded mercury-free flat panels are no longer manufactured.

Against this background Öko-Institut e.V together with Fraunhofer IZM (Öko-Institut 2011) had recommended to delete the exemption from the RoHS I Annex without transition period.

### 6.2 Compliance with the new RoHS II criteria

According to the new RoHS II criteria listed in Article 5(1)(a) it can be stated that the main documentation we have received during the previous consultation only includes information according to the old RoHS I criteria. In addition, there are no hints that the stakeholder might have achieved a longer transition period under RoHS II on the basis of socio-economic criteria. The cancellation of this exemption should be in line with the exemption criteria in RoHS II, the more as one stakeholder who was also the former applicant<sup>4</sup> has clearly stated that the application is not manufactured and needed anymore.

In case the COM decides the continuation of the exemption, we do not see that this exemption weakens the provisions of REACH. Based on our line of argumentation as in

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<sup>4</sup> See OSRAM 2010

section 3.2.2 we conclude that lead in solders for this application is not restricted under REACH.

### 6.3 Recommendation

On the basis of our review there is no need to reformulate our former recommendation and we consider that the exemption should be deleted from Annex III RoHS II granting just the minimum transition time of 12 months as stipulated in Art. 5 (6) of RoHS II:

*“Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for liquid crystal displays, design or industrial lighting); expires on [12 months after official publication of the exemption]”*

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RoHS Directive 2011

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