Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Adaptation to scientific and technical progress under Directive 2002/95/EC

Monthly Report 1

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Content

1 Background and Objectives

Article 4 (1) of Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment provides “that from 1 July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, PBB or PBDE.” The annex to the Directive lists a limited number of applications of lead, mercury, cadmium and hexavalent chromium, which are exempted from the requirements of Article 4 (1).

Article 5 (1) (b) of the Directive provides that materials and components can be exempted from the substance restrictions contained in Article 4 (1) if their elimination or substitution via design changes or materials and components which do not require any of the materials or substances referred to therein is technically or scientifically impracticable, or where the negative environmental, health and/or consumer safety impacts caused by substitution outweigh the environmental, health and/or consumer safety benefits thereof.

On the basis of this provision the Commission has received (and is still receiving) from industry additional requests for applications to be exempted from the requirements of the directive. These requests need to be evaluated in order to assess whether the request for exemption fulfil the above mentioned requirements of Article 5 (1) (b). Where the requirements are fulfilled the Commission propose a draft decision amending the RoHS Directive.

Against this background Öko-Institut e.V. and Fraunhofer Institute for Reliability and Microintegration IZM have been commissioned by the Commission for technical assistance for the evaluation of requests for exemptions submitted according to Article 5 (1) (b). The main objective of this technical assistance consists in a clear assessment of whether the requests for exemptions are justified in line with the requirements listed in Article 5 (1) (b).

2 General Procedure

In order to provide the required clear assessment and evaluation of whether a request for exemption is justified in line with Article 5 (1) (b) the following procedure is used:

(A) Basics: Description of the application requested to be exempted	• Check: application covered by RoHS Directive? • For the specific application requested to be exempted a precise and clear wording will be provided in order to avoid misunderstanding and misuse • Determining specific reasons for using the restricted substance, analysing the essential characteristics • Ascertainment of the quantity of the restricted substance in the specific application
(B) Assessment of technical conditions	• Identifying possible alternative materials and components including adaptability from substitutes in similar applications to the application in question • Determining possible substitution through alternative materials: effects on characteristics and performance (e.g. appearance, reliability, manufacturing yield) • Determining possible substitution through alternative production procedure: effects on characteristics and performance (e.g. appearance, reliability, manufacturing yield) • Determining alternative product design providing the same function • Assessment the availability of alternatives by 1 July 2006
(C) Assessment of possible environmental, health and / or consumer safety impacts	Comparing potential assets and drawbacks caused by substitution regarding • Environmental impacts • Impacts on occupational health • Consumer safety and protection
(D) Over-all assessment and conclusions	• Summarising the findings of tasks (A) to (C) • Evaluating efforts made by the applicant • Drawing conclusions and proposals for the Commission including guidelines to define the scope of exemptions

The main sources for data and information to conduct the above described procedure are:

- Analyses of data and information gathered by a questionnaire from parties who submitted request for exemptions
- Consultations with applicants of exemptions
- Review of scientific and patent literature
- Consultations with relevant scientific and research bodies within and outside the EU
- Expert consultation, esp. component and equipment manufacturers

3 Scope of Set 1

In the first period of the technical assistance (from 12/08/2005 to 09/09/2005) the following requests of exemptions belonging to the following groups were analysed:

1. Lead in tin whisker resistant coatings for fine pitch applications,
2. Lead bound in glass, crystal glass, lead crystal or full lead crystal in general,
3. Chromium (also in oxidation state (VI)) and Cadmium as colouring batch addition each form up to a content of 2 % in glass, crystal glass, lead crystal or full lead crystal used as decorative and / or functional part of electric or electronic equipment,
4. Solders containing lead and/or cadmium for specific applications,
5. Hexavalent chromium (CR VI) passivation coatings,
6. Lead in lead oxide glass plasma display panels,
7. Lead in connectors, flexible printed circuits, flexible flat cables,
8. Lead oxide in lead glass, bonding materials of magnetic heads and magnetic heads,
9. Cadmium as doping material in avalanche photodiodes (APDs) for the optical fiber communication systems,
10. Lead in optical isolators,
11. Lead in sheath heater of Microwaves,
12. Cadmium pigments except for applications banned under Directive 91/338/EEC amending Directive 76/769/EEC relating to the restriction on the marketing and use of certain substances,
13. High Intensity Discharge (HID) lamps for professional U.V. applications, containing lead halide as radiant agent,
14. Discharge lamps for special purposes containing lead as activator in the fluorescent powder (1% lead by weight or less),
15. Discharge lamps containing lead in the form of an amalgam,
16. Mercury free flat panel lamp,
17. Special purposes Black Light Blue (BLB) lamps, containing lead in the glass envelope,
18. Low melting point alloys containing lead,

19. Galvanised steel containing up to 0.35% lead by weight and aluminium with an unintended lead content up to 0.4% lead by weight in electrical and electronic equipment,

20. Lead in solder and hexavalent chromium in surface treatment, in parts recovered from production printers and copying equipment, sold, rented or leased or otherwise returned from professional users other than private households, originally put on the market before 1 July 2006, and reused for the same purpose within the original manufacturer's closed loop system until 1 July 2011. In this context a closed loop system means a system whereby the equipment remains the property of the manufacturer or is subject to other contractual arrangements and is returned to the manufacturer either when the contract expires or at end of life,

21. Cadmium sulphide photocells.

Due to the fact that in some groups requests for exemptions include different applications the total number of requests was 33.

Each request for exemption was analysed and evaluated. The main data and information given by the applicants were collected in checklists in order to get an efficient overview about completeness and quality of the data given in the requests. In order to cover all information adequately this task was carried out simultaneously by Öko-Institut as well as Fraunhofer IZM.

The data set entries of the checklists reflect the criteria of Article 5 (1) (b) of the Directive. The principal information covered by the checklist is listed in the following table.

Administrative Data				
Group				
Number				
Applicant				
Contact person				
Adress				
Phone				
Fax				
Email				
WWW				
Date of document				
File name of document				
Description of exemption				
Requested exemption				
Substance				
Function (according to applicant)				
Specific application				
Identical/similar to other exemption request?				
Justification of request for exemption	**Yes**	**No**	**Not mentioned**	
A. technically or scientifically impracticable				
B. negative environmental impacts				
C. negative health impacts				
D. negative consumer safety impacts				
(E. negative economic impact)				
	available?		**sufficient for assessment?**	
Data and information available to justify request	**Yes**	**No**	**Yes**	**No**
A. Unambigous wording available?				
B. Specific and plausible reasons available for using restr. substance?				
C. Data on quantity of the restricted substance in the specific application?				
if technically or scientifically impracticable				
D. possible alternative materials and components mentioned? Why not applicable?				
E. effects on characteristics and performance (e.g. appearance, reliability, manufacturing yield) mentioned?				
F. Product design changes mentioned? Why not applicable?				
G. Alternatives known to ÖI/IZM?				
H. Availability of alternatives by 1 July 2006 mentioned?				
if negative environmental, health and / or consumer safety impacts				
I. Potential assets and drawbacks caused by substitution regarded?				
Status of assessment	**Yes**	**No**		
Final recommendation possible:				
Close to final recocommendation - minor clarifiations still necessary				
Not yet ready for recoommendation - additional information required				

4 Results and Outlook

The checklist for the 33 requests for exemptions which were analysed in the first period of the technical assistance are summarised in annex 1 to this report. In fact no request for exemption was ready for final recommendation, 20 requests were close to final recommendation because minor clarification is still necessary while 13 requests are not yet ready for recommendation as additional information is required.

During week 36 the applicants were asked to provide further information; this was done via email and the missing data and information was requested specifically (see annex 2 to this report). Some applicants have already sent additional information but due to reason of time this information could not be taken into consideration in this report. Considering the additional information in the next monthly report some requests will be probably ready for final recommendation.

5 Appendix 1: Checklist Request Set 1

(See file Checklist-Report1_120905.pdf)

6 Appendix 2: Specific Questions Request Set 1

1a_FCI

- Which concrete applications / product groups are covered by this exemption request?
- In your application you stated that the tin (?) content would be less than 0.000002 g/terminal. As the exemption request is on lead, could you please quantify the annual amout of lead needed for the application(s) under exemption request on the total EU market (2004 figures)?
- Furthermore, you stated that "viable substitutes" (gold or gold flashed palladium) would be 100 times more expensive than Sn / Pb. Is this factor applicable for both gold and gold flashed palladium? Please indicate absolute costs for typical connectors, both for the current Sn/Pb coating as well as the gold and gold/palladium substitute.
- Moreover, Article 5 (1) b of Directive 2002/95/EC provides that materials and components can be exempted from the substance restrictions if their elimination or substitution via design changes or materials and components is technically or scientifically impracticable, or where the negative environmental, health and / or consumer safety impacts caused by substitution outweigh the environmental, health and / or consumer safety benefits thereof. Within your application, you stated that there are “viable substitutes”, which – of course – are very costly though. However, this justification is not in line with Article 5 (1) b and therefore we ask you to describe and quantify possible other reasons, which might show that gold and gold/palladium are inapplicable as substitutes.

1b_HP

- Which concrete applications / product groups are covered by this exemption request?
- Concerning the substitute Ni / Au you stated that this alternative would be "cost prohibitive". Could you please quantify the cost aspect?
- Concerning the substitute Sn / Bi you indicated these platings do not prevent whisker growing? However, from other coherences Sn / Bi is qualified as a possible alternative for whisker prevention, which is currently under development. Could you please further explain why Sn / Bi is not suitable for your application?

- How would you assess the ecological performance of the Nickel based platings mentioned as alternatives?

1c_JBCE

- Which concrete applications / product groups are covered by this exemption request?
- Concerning the substitute Au plating you stated that this alternative would cause "high costs". Could you please quantify the cost aspect?
- Moreover, you stated that the lead content would be 10 wt%. Could you please indicate the correspondent reference value. Furthermore, please quantify the annual amount of lead needed for the application(s) under exemption request on the total EU market (2004 figures)?
- Finally, Article 5 (1) b of Directive 2002/95/EC provides that materials and components can be exempted from the substance restrictions if their elimination or substitution via design changes or materials and components is technically or scientifically impracticable, or where the negative environmental, health and / or consumer safety impacts caused by substitution outweigh the environmental, health and / or consumer safety benefits thereof. Within your application, you stated that there are viable substitutes like Au plating, which – of course – are very costy though. However, this justification is not in line with Article 5 (1) b and therefore we ask you to describe and quantify possible other reasons, which might show that gold and gold/palladium are inapplicable as substitutes.

1d_Sony

- Which concrete applications / product groups are covered by this exemption request?
- You stated that the lead content would be 5-10 wt% in Sn coating and in total (i.e. for SONY products) 3.39 kg/a. Does this apply only for EU market? If not, could you please quantify the annual amount of lead needed for the application(s) under exemption request on the total EU market (2004 figures)?
- How would you assess the ecological performance of the Nickel based platings mentioned as alternatives?

2a_CPIV

- It is stated that substitutes are not applicable because they do not meet the properties of lead materials. Could you please denominate the substances, which were considered as substitution candidates?

- Moreover, you quantified the total amount of lead as 145 tons/a? Does this figure apply for total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!
- As the figure of 145 tons/a appears rather high, are these all products affected by RoHS Directive?
- Furthermore, you pointed out, that there probably is no existing substitutes for lead. On the other hand, it is argued that the consequences for conversion of the production processes would be too cost-intensive. This appears to be a contradiction. Thus, could you please clarify the used wording?

2b_ESGA

- Could you imagine any design options for any of the applications mentioned (e.g. etching, engraving). If not, which circumstances hinder these design options?

2c_Swarovski

- It is stated that substitutes are not applicable because they do not meet the properties of lead materials not. Could you please denominate the substances, which were considered as substitution candidates?
- Moreover, you quantified the total amount of lead as 145 tons/a? Does this figure apply for total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!
- As the figure of 145 tons/a appears rather high, are these all products affected by RoHS Directive?
- Furthermore, you pointed out, that there probably is no existing substitutes for lead. On the other hand, it is argued that the consequences for conversion of the production processes would be too cost-intensive. This appears to be a contradiction. Thus, could you please clarify the used wording?

3a_CPIV

- The total amount of Cadmium is quantified with 0.275 tons/a and for Chromium-VI the total amount is stated with 0.025 tons/a? Do these figures apply for total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!
- Are all of these products represented by these figures affected by RoHS Directive?

3b_Swarovski

- The total amount of Cadmium is quantified with 0.275 tons/a and for Chromium-VI the total amount is stated with 0.025 tons/a? Do these figures apply for total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!
- Are all of these products represented by these figures affected by RoHS Directive?

4a_Syfer

- Is Syfer the only producer of the application under exemption request?
- The total amount of lead used for this application under exemption request is quantified with 4 kg/a. Does this figure apply for total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)! If Syfer is not the only producer, please provide figures for all producers (if possible)!
- When using lead solders with a lead content greater than 90% an increased energy consumption due to higher soldering temperatures, inert processing atmosphere is assumed. Could you please quantify the increased energy consumption per application?

4b_Coherent

- The total amount of Lead is indicated with 20-25 kg/a and for Cadmium the total amount is quantified with 3 kg/a? Could you please state the correspondent figures for EU market?
- It is indicated that research on alternative solders has to be carried out by Coherent solely, as no other manufacturer uses this process. Is Coherent willing to do the research mentioned? If so, could you try and roughly estimate the time frame until viable substitutes are available?
- Furthermore, it is stated that solders with a higher content of noble metals (Ag, In) might be an option to be researched, however energy consumption for raw material extraction and processing would be higher. Could you please quantify the estimated increase in energy consumption environmental impact?

4c_JBCE

- The total amount of Lead is indicated with 985 kg/a and for Cadmium the total amount is quantified with 370 kg/a? Do these figures apply for total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!

- Which of the 12 types of temperatures could not be produced if lead and cadmium were not available as basic components? Why?
- Could you imagine any changes in product design (e.g. using another functioning principle) that would provide the same functionality without using restricted substances?
- It is stated that research and development has been done on possible substitute materials, e.g. Sodium, Indium and Iodine. However, they were regarded as not applicable and "hardly" available. Could you please provide correspondent research results approving this statement?
- Could you please estimate the timeline until new alloys (e.g. Sodium, Indium and Iodine) are commercially available as viable substitutes?

5_HP

- Could you imagine replacement of the base material (Cu-screw instead of Fe-screw, etc…) or any other design / process changes?
- Can you prove that Ni and Cr-0 coatings are not available?

6a_JBCE

- The total amount of Lead is indicated with 90 tons/a. Does this figure apply for total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!
- Do the difficulties of substitution described only refer to flat panel displays, or do they also refer to other flat panel technologies?
- It is indicated that there are alternatives only for barrier ribs. Could you please denominate these alternatives?
- Furthermore, it is stated that alternatives are too difficult to apply commercially until 1 July 2006. Could you please estimate the timeline until alternatives are commercially available as viable substitutes? Will there also be substitutes for the other components of the flat display panels?
- Finally, it is pointed out that power consumption will increase when using substitutes. Could you please quantify this aspect?

6b_JEITA

- Concerning the total amount of lead there are reported different figures for two companies. Could you please quantify the total amount of lead used in PDP on the EU market?

- It is indicated that there are alternatives only for barrier ribs. Could you please denominate these alternatives?
- Furthermore, it is stated that alternatives are too difficult to apply commercially until 1 July 2006. Could you please estimate the timeline until alternatives are commercially available as viable substitutes? Will there also be substitutes for the other components of the flat display panels?
- Finally, it is pointed out that power consumption will increase when using substitutes. Could you please quantify this aspect?

7_JEITA

- Could you please define your understanding of fine pitch?
- It is stated that one “proposal substitution technology" would be gold plating, which would increase costs. Could you please quantify this aspect for both FPC and its connectors?
- Please explain why gold plating is not applicable for FFC and its connectors!
- Furthermore, it is pointed out that the capacity of gold plating suppliers is inadequate for FPC and its connectors. Could you please quantify the amount of gold needed to substitute lead in FPC and its connectors.
- Could you please indicate when there will be enough capacity available from the gold suppliers?
- Moreover, Article 5 (1) b of Directive 2002/95/EC provides that materials and components can be exempted from the substance restrictions if their elimination or substitution via design changes or materials and components is technically or scientifically impracticable, or where the negative environmental, health and / or consumer safety impacts caused by substitution outweigh the environmental, health and / or consumer safety benefits thereof. Within your application, you stated that there are “possible solutions, which – of course – are very costly though. However, this justification is not in line with Article 5 (1) b and therefore we ask you to further describe and quantify possible other reasons (e.g. environmental aspects), which might show that gold are inapplicable as substitutes.

8_JEITA

- Within your exemption request VTR are mentioned as the only application. Are there any other applications to be exempted? If not, is it possible to confine the title of the exemption request on VTR?

- It is stated that the annual amount of lead oxide needed for the application(s) under exemption request would be 18 kg/a in Japan. Could you please quantify the correspondent total amount for the EU market (2004 figures)?
- Furthermore, it is pointed out that possible substitutes would be (among others) alkali metal, bismuth, vanadium, tellurium, thallium. Are they technologically viable alternatives already by 1 July 2006? If not, when will they be sufficiently available?
- Which circumstances make it “extremely difficult” to use the possible substitutes mentioned? Is it any fundamental technological aspect or rather a problem concerning the timeline of the availability of the substitutes?
- Moreover, could you please further describe and quantify the negative aspects concerning toxicity, cost and resource quantity for each of possible substitutes (alkali metal, bismuth, vanadium, tellurium, thallium). Are there any studies available?

9a_JEITA

- It is stated that the total annual amount of cadmium needed for the application(s) under exemption request would be 2 E-7g. Could you please quantify the correspondent total amount for the EU market (2004 figures)?
- Furthermore it is pointed out that “there is not the device which achieves the long distance optical fiver communication system cheaply besides APD.” Could you imagine any alternative component / design change, which might be more cost-intensive, but technologically viable?
- If there is any technologically viable alternative component / design change, could you imagine any other circumstances that are speaking against this substitute and are mentioned in Article 5 (1) b of Directive 2002/95/EC?

9b_JBCE

- It is stated that the total annual amout of cadmium needed for the application(s) under exemption request would be 2 E-7g. Could you please quantify the correspondent total amount for the EU market (2004 figures)?
- Furthermore it is pointed out that “there is not the device which achieves the long distance optical fiver communication system cheaply besides APD.” Could you imagine any design change or alternative technology, which might be more cost-intensive?
- If there is any technologically viable alternative component / design change, could you imagine any other circumstances that are speaking against this substitute and are mentioned in Article 5 (1) b of Directive 2002/95/EC?

10a_JEITA

- It is stated that the total annual amount of lead in garnet crystal on the world market would be 60g. Could you please quantify the correspondent total amount for the EU market (2004 figures)?
- Did you carry out any research and development to find any modified / alternative production process? If so, please provide relevant studies!

10a_Sumitomo

- Could you please quantify the total annual amount of lead in garnet crystal for the EU market (2004 figures)?
- Did you carry out any research and development to find any modified / alternative production process? If so, please provide relevant studies!

11_JBCE

- Furthermore, the total annual amount of lead needed for the application(s) under exemption is quantified with 1,200 kg. Does this figure apply for the total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!
- The cited attachment No 9 is missing. Could you please provide this attachment?
- Could you please provide information whether design changes are possible?
- Could you please indicate when Bi or other possible substitutes under study will be available as alternative?
- What are the specific reason why Bi is considered of having less performance?
- How much Bi would be necessary to fulfil the same functionality (amount / application and in EU total)?
- Could you indicate, if there are any environmental draw-backs of Bi as substitute. If so, please quantify these draw-backs!

12_ICdA

- It is pointed out, that the total EU usage of Cd as pigment in all appliances is equivalent to about 350,000 kg/a. Why is it not possible to specify this figure for electric and electronic appliances? Please try!
- It is stated that there are inorganic and organic alternatives. Could you please specify the different substitutes, which would cover the colour range of Cd?
- Which of the different possible alternatives are available until 1 July 2006?

- Are there any applications known, which make it indispensable to use Cd redarding functional (i.e. non-decorative) reasons?
- Could you please provide reports mentioned (WS Atkins, RPA, EU cadmium risk assessment)

13_ELCF

- It is stated that the total annual amount of lead needed for the application(s) under exemption request would be less than 10 kg/a. Does this figure apply for PbI2 and the total EU market? If not, please state the total annual amount of PbI2 used in the application(s) under exemption request for the EU market (2004 figures)!
- Does the Lead content of < 100 ppm pply for the homogenous material or the product in a whole?
- Please indicate, whether design changes are possible, e.g. using different exposure films?
- Would possible design changes be available until 1 July 2006? If not, please indicate a realistic timeline!

14_ELCF

- What is your understanding of special purposes? Suggest a wording for the title of your application that refers explicitly to those applications which are subject of exemption?
- It is pointed out that possible substitutes are less efficient, have a less optimal spectrum and cause a higher electricity consumption. Could you please denominate these possible substitutes?
- Could you please quantify the increase in electricity consumption caused by the possible substitutes per application?
- Could you please quantify the increase in production costs caused by the possible substitutes per application?
- Overall, you stated that intensive studies have shown that a replacement is not achievable. Could you please provide these studies!

15_ELCF

- It is stated that the total annual amount of lead needed for the application(s) under exemption request would be less than 10 kg/a. Does this figure apply the total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!

- Furthermore, it is pointed out that substitution is only possible for 50% of all applications. Could you please indicate, which applications would be affected and definitely no substitute is available? Please provide the typical use patterns?
- Then, the energy saving aspects due to miniaturized energy saving lamps is mentioned. Could you please quantify the overall energy saving potential?

15_JEITA

- It is pointed out, that possible substitutes cannot control the mercury vapour properly. Could you please denominate these possible substitutes?
- Furthermore, we know from other coherences, that substitution is actually possible for 50% of all applications. Could you please indicate, which applications would be affected and definitely no substitute is available?
- Then, the energy saving aspects due to miniaturized energy saving lamps is mentioned. Could you please quantify the overall energy saving potential?

16_ELCF

- Please provide a construction plan or other documents making clear the link between the lamp and the FPD.
- It is stated that the total annual amount of lead needed for the application(s) under exemption request would be less than 350 kg/a. Does this figure apply the total EU market? If not, please state the total annual amount of lead used in the application(s) under exemption request for the EU market (2004 figures)!
- Please provide more specific reasons why there is no alternative to lead-oxide containing glass solders and lead containing solders. What are the unique properties of these materials that substitutes cannot provide?
- You indicate that the next generation of lamps will be lead-free, and that the substitution of lead is under development. Are these two independent developments, or is it the same? Please indicate the timeline, when lead free alternatives and/or the next generation of lamps will be available.

17_ELCF

- It is pointed out, that re-development efforts have not reached satisfactory technical results. Could you please provide relevant studies, which prove this fact?
- Do you expect any change in this situation after 1 July 2006?

18_Cookson

- Which substitutes and / or design options are available until 1 July 2006?
- Furthermore, higher energy use is assumed because of additional processes concerning the substitutes. Could you please quantify the additional energy use per jumper lead?

19_Eurometaux

- Could you please give information on the quantity of the restricted substance in the specific application (total EU figures)?
- Basically, on the current basis, the exemption request cannot be assessed. Could you please re-edit your exemption request by referring to the criteria and aspects given in Art. 5 (1) b of RoHS directive?

20_Xerox

- It is stated that the total annual amount of lead and chromium needed for the application(s) under exemption request would be equivalent to 2,000 kg/a. Does this figure apply the total EU market? Could you please specify this value for Pb and Cr for the total EU use (2004 figures)?
- Could you please indicate, which specific components and parts are affected (number of components/parts p.a., specific Pb/Cr content in components/parts)?
- It is pointed out, that substitution would spoil the opportunity to realise the environmental benefits from reuse. Could you please roughly quantify the environmental benefits from re-using the affected components?
- How long are non-RoHS compliant components intended for being re-used?

21_Perkin/Elmer

- It is stated that the applied thin film or thick film paste contains 0.1% Vol CdS. Could you please quantify the amount of the restricted substance in the specific application in absolute figures and also quantify the total Cd use for this application in the EU market (2004 figures)?
- You only mention alternative technologies (photodiodes, phototransistors) as substitute. What about CdS-free photoresistors?
- You mention that the ban of lead would mean the redesign of electronic circuits for the respective control device, which would cause a multi-million Euro additional cost. Please specify how many million, and how you calculate this number.

- You mention that the ban of lead in this application would leave you without a marketable solution for at least 5 years. Please specify why and for what you would need 5 years.

21_Philips

- Please provide information about the amount of CdS used for applications on EU market, if not mentioned in the referenced environmental study.
- You only mention alternative technologies (photodiodes, phototransistors) as substitute. What about CdS-free photoresistors?
- You say that photodiodes may be a less environment-friendly solution. Please send us the referenced report “Life cycle assessment of CdS photoresistors and photodiodes” and explain/highlight the relevant points in the report.
- You mention that the substation would be costly. Can you please specify the cost, and how you calculate it?