Questionnaire for Further Clarification

Exemption Request "Mercury in cold cathode fluorescent lamps for general lighting purposes (Category 5).

Background

The Öko-Institut together with Fraunhofer IZM has been appointed within a framework contract for the evaluation of applications for granting, renewing or revoking an exemption to be included in or deleted from Annexes III and IV of the new RoHS Directive 2011/65/EU (RoHS 2) by the European Commission.

You have submitted the above mentioned request for exemption which has been subject to a first completeness and understand ability check. As a result we have identified that there is some information missing and a few questions to clarify before we can proceed with the online stakeholder consultation on your request. Therefore we kindly ask you to provide answers for the following questions and to reformulate your request if necessary.

Questions

1. In your proposal you mentioned that CCFLs are used for **general lighting purposes**. Please describe more detailed for which applications a further exemption from the requirements of the RoHS-Directive will be needed. Please clarify the scope of the exemption request.

   General lighting provided by this kind of lamps is something which is different from Standard product; in fact such kind of solution is used in specific installation (custom solutions) and not relevant to products for large scale production. This kind of solution is characterized by 1 – hand made lamps and 2 – long tubes (often longer then 1,5m), rounded shapes.

2. Could you please indicate the relation between your request for exemption on the one side and the current exemptions of Directive 2011/65/EU in Annex III on the other side?

   Do not find the specific use of the lamps object of this request in any of the currently categories; here some further details:

   - point 1 (single capped fluorescent lamps) – not applicable because of CCFLs are double capped
   - point 2 (double-capped linear fluorescent lamps …) – not applicable because of they can be rounded/curved and not linear (straight) types

- Point 3 (cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for special purposes) – They are not for special purposes – for length > 1500 mm, the limit fixed at 13 mg is not sufficient to meet functional needs for such type of CCFLs (1 mg / 100 mm is a **minimum** for having a proper operation).

From the technical point of view CCFLs for general lighting are basically CCFLs but the specification of the group 3 do not include typical uses of this family because they were born for source with destination completely different (monitor back-lighting)

3. Please explain the technical and constructional characteristic difference between handicraft luminous discharge tubes (HLDT) and regular fluorescent tubes, CCFLs and other known light sources based on the discharge technology and using mercury.

The main difference is the absence of standards (IEC, EN, ...). The cold cathode discharge lamps for general lighting are in response to customer needs; the goal is not only to illuminate, but also to ensure high durability and reliability. From the technical point of view CCFLs differ from traditional FL lamps and their main parameters are:

- current lamp from 15mA to 100mA
- lamp temperature (during operation) very low
- lamp length defined according to the use and not according to datasheets / standards
- diameters between 5mm and 38mm; it depends on use
- operating voltage (range) from 250V to 1500V
- unlimited numbers of switching
- filling pressure around 8-10mbar

Just as a result of low pressure filling, the electrodes are completely different. They are larger and they shall be activated, not by cesium, but the activation is provided by the triple carbonate; in CCF lamps for monitor back-lighting, the electrodes cannot be activated or if activated, it's by cesium.

4. Why are lamps according to the exemptions 3(a), 3(b) and 3(c) 2(b)(3) of Annex III of the RoHS Directive already agreed whereas, in your new proposed exemption "**Lamps for other general lighting and special purposes"** that may not happen? Please describe the differences between their technical and constructional characteristic in more detailed.

Because the limit refers to preheated hot cathode lamps. The cold-cathode lamps require more mercury for ignition to ensure reliability and life expectancy.

Today, CCF lamps for general lighting are designed for much longer durability (100000 h by new production techniques). For other details, see answers above.

5. Please describe on the basis of existing lamps the performance and characteristics (in terms of ratio of light output versus energy absorption, colour spectrum, aesthetics and longevity) of CCFLs for **general lighting purposes.**

   CCF lamps for general lighting are hand-made and specifically for each use (lamps are not made on series and do not follow dimensional and performance parameters) according to the user specifications, and then change the efficiency, the spectrum of colour and aesthetics according to the realization. With regard to the expected life, today, the reference value for lamps properly produced is around 100000 h and efficiency is comparable to hot-cathode fluorescent lamps and to CCF lamps used for monitor back-lighting.

6. You proposed 1mg per 100mm length. Could you please disclose your assumptions and provide test results/protocols to support this limit?

   The proposed value corresponds to the possibility and reality of today's construction. The functional problems that characterize the CCF lamps for general lighting compared to conventional CCF lamps are substantially related to the lower filling pressure that requires larger electrodes and activated in a different way. These electrodes interact with mercury more than standard types, hence the need for different limits. Than the interaction is linked to electrodes types and to their quantities and to the powders and to glass types used. Furthermore, the need for creating “continuous light pipes” requires an electrode folding (with small radius curve), in addition to the need for different bending of lamps: this requires the use of greater amounts of mercury.

7. Please indicate if the negative environmental, health and/or consumer safety impacts caused by substitution are likely to outweigh the environmental, health and/or consumer safety benefits. If existing, please refer to relevant studies on negative impacts caused by substitution.

   As of today do not exist, for the reasons already given, substitutes for these lamps, especially in terms of colorimetric performance and for the possibility of being constructed according to any geometry required.

8. Please provide detailed technical evidence why there is no LED-technology-based alternative as LEDs are known to work well in outdoor environment providing high efficiency as well as a very long lifetime.

   LED is a small source (lighting point). Discharge lamps, cold cathode are linear and continuous: in applications with a “lamp on sight”, it is not possible to obtain (exactly) the same result by LED strips. In specific lighting applications (when small space available) cold cathode lamps can be shaped on each of three dimensions; currently there are not LED strips on the market which can be shapeable on three dimensions, but only linear.

CCFLs can emit light of any colour by acting on powder mix in the tube, without filters, with a single lamp, and then with higher efficiency.

Often, the illumination realized in small spaces or in equipment of small size, more so in Mediterranean countries, has the problem of high temperature inside the enclosures/premises: CCF lamps do not have problems of operation at high temperatures, while the LED (and their power supplies) may have, especially where the enclosure is made, by plaster or similar material having low coefficients for heat spreading. Finally, LED sources, when having performance and efficiency comparable to CCF lamps, are much more expensive.

9. Please provide test results/protocols that clearly indicate that CCFLs containing mercury delivers significant technical advantages over LEDs.

   Wide variation in the colour of the light emitted from LED sources that may not be accepted in specific case where absolute colour consistency and maximum compliance with customer specifications are required.

   The quality of light emitted from the sources CCFLs is the same as that of the hot-cathode fluorescent lamps, to which is added the total elasticity in producing any colour is required.

10. Could you please elaborate more detailed the efforts which have been made to reduce mercury and/or respectively to manage the performance with the existing exemptions in CCFLs for the **general lighting purposes** during the last three years?

    The technological efforts today have the aim to increase the life of the lamps at the same quantity of mercury used, which corresponds to a reduction of the mercury used. The major efforts concern the choice of materials to reduce the interaction between mercury and other materials of the lamp (electrodes, powders, glass).

11. When did you start with efforts to redesign of CCFLs for the **general lighting purposes** and how many years are assumed to be needed for the long term reliability?

    The studies began 5 years ago, the long-term reliability is already there and is a defining characteristic of CCF lamps enough to prefer them for the backlight of the monitor. CCF lamps follow the same construction technology of hot cathode fluorescent lamps combining the best performance in both categories to constructive flexibility necessary to meet specific application. As per the hot cathode fluorescent lamps, some suitable exemptions should be allowed also for **CCFLs for general lighting purposes**.