

## Questionnaire for Further Clarification

### **Exemption Request 9 “Mercury in cold cathode fluorescent lamps for luminous sign for advertising or decorative 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 understandability 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 **luminous sign for advertising or decorative purposes**. Please describe the specific technical criteria and parameters which are relevant for luminous sign for advertising or decorative purposes.

Luminous sign for advertising or decorative purposes are different from products realised by using standardized tubes; these kind of solution are used in specific installation (custom solutions) and they are characterized by 1 – hand made lamps and 2 – long tubes (often longer than 1,5m), rounded shapes, to create pictures or letters, mainly for outdoor installations under harsh conditions, also with very low ambient temperature (e.g. – 20° C).

Specific constructional characteristics for CCFLs for Advertising or decorative purposes:

1. **Dimensions:** Lamps often are curved tubes. Diameters and lengths varies a lot from case to case. In most cases, diameters vary from 6 to 38 mm and lengths are not definable in advance.
2. **Electricals:** Current intensity in-between 20 and 100 mA in order to emit the proper flux according to the intended use and the dimensions of the lamps. Operating voltage varies from 250 V to 1500 V.

3. **Switchings** do not affect CCFLs electrodes so these lamps are suitable for *unlimited* switches
4. **Lamp life** is longer than hot cathode fluorescent lamps and not less than 50000 h

2. Could you please clarify 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?

The specific use of the CCF lamps object of this request maybe covered by exemption under point 3 (3a, 3b and 3c) and 4 (f), but they are very different, as per technical and constructional characteristics and electrical values from the CCFLs to which the present Directive refers in id. 3(a), 3(b) and 3(c); such differences are because of applications (environmental harsh conditions). The limits set out as in present points 3a, 3b and 3c are too stringent because they are suitable only for CCFLs intended for monitor back-lighting, so new criteria and values are proposed.

In the spirit of the Directive, however, the proposed new limits are intended to improve the current state of the art by introducing specific regulation and limit on the content of mercury in the CCFL for signs; in fact the present request is relevant to a suitable limit to be applied to **Cold Cathode Fluorescent Lamps for Luminous Sign for Advertising or decorative purposes** and consequently they may be excluded from the current full exemption under the generic category as in 4(f). Doing so, it would be also possible to stop every discussion still open on the proper reference to the exemption as in 4(f) for this kind of tubes.

3. Please explain the technical and constructional differences 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, ...). 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 very low during the operation
- 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 CCFL lamps for monitor back-lighting, the electrodes cannot be activated or if activated, it's by cesium.

4. Why are lamps according to exemption 2(b)(3) of Annex III of the RoHS 2 Directive “Non-linear tri-band phosphor lamps with tube diameter > 17 mm” already agreed whereas, in your new proposed exemption “**Lamps for luminous sign for advertising or decorative purposes**” that may not happen?

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, CCFL lamps are designed for much longer durability (100000 h with new production techniques). For other details, see answers above.

5. Please explain why you compare your request with three-phosphor lamps?

Cold-cathode lamps use “powder three-phosphor” identical to one used in traditional fluorescent lamps for the emission of white light as well as for the emission of coloured light.

6. Please describe on the basis of existing lamps the performance and technical and constructional characteristics (in terms of ratio of light output versus energy absorption, colour spectrum, aesthetics and longevity) of CCFLs for **luminous sign for advertising or decorative purposes**.

The CCFLS lamps are hand-made and specifically for each use (lamps are not made in series and do not follow dimensional and performance parameters) on the basis of indications of the user, 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 constructed is around 100000 h and the efficiency is comparable to hot cathode fluorescent lamps and to CCFL lamps used for monitor back-lighting.

7. You proposed 1.3mg mercury per 100mm length. Could you please disclose your assumptions and provide test results/protocols to support this limit? Why you suggest 0.3mg mercury more than in your exemption request No. 8?

Because the lamps for general lighting are normally straight or curves with constant curvature wide-ranging, not only but the CCF lamps may be inserted into lighting fixtures with small dimensions or specifically formed in the walls so to contain the number of

variable parameters in their operation. The CFF lamps are always very shaped, with pronounced corners in the three dimensions and operate most of the time without envelope capable of maintaining known and constant the temperature of the lamp during operation. Hereafter some pictures showing examples for applications:



8. 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, real substitutes for these lamps for every application, especially in terms of colorimetric performance and for the possibility of being constructed according to any geometry required at a affordable price.

9. 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.

In applications with a "lamp on sight" it is not possible to obtain (exactly) the same result by LED strips. In the 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: CCFL 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 with performance and efficiency comparable to CCFL sources are much more expensive.

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

For specific use in banners where absolute colour consistency is required, CCFLs allow the achievement of the objective, not LED light sources. The quality of light emitted by CCFLs is comparable to that emitted by hot cathode fluorescent lamps.

11. 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 **luminous sign for advertising or decorative purposes** during the last three years?

It should be noted that because of the present 4(f) no limits may be applied to mercury contents for these type of sources, if a common interpretation of the law lead to consider CCFLs for advertising under the definition for “*other discharge lamps for special purposes not specifically mentioned in this Annex*”. Doing so, no efforts would be needed to reduce further mercury and/or respectively to manage performances.

Efforts in technology improvements have the aim to increase the life of lamps with a reduction of the content of mercury used. The major efforts concern the right choice for elements to reduce the interaction between mercury and other materials of the lamp (electrodes, powders, glass).

12. When did you start with efforts to redesign of CCFLs for **luminous sign for advertising or decorative 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 it is a defining characteristic of CCF lamps. This is enough for being preferred for e.g. the backlight of monitors. CCF lamps have the same construction technology of hot cathode fluorescent lamps and they combine the best performance in both categories to constructive flexibility which is necessary to meet needs in special applications. As per hot cathode fluorescent lamps, suitable exemptions should be also issued for **CCFLs for luminous sign for advertising or decorative purposes**.