

Consultation Questionnaire Exemption No. 4(f) of RoHS Annex III

Current wording of the exemption:

Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex

Requested validity period: Maximum (5 years and 7 years (cat. 8 and 9) respectively)

ACRONYMS AND DEFINITIONS

UV	Ultra Violet
LED	Light-Emitting-Diode
Hg	Mercury
LEU	LightingEurope

1. INTRODUCTION

1.1. Background

Bio Innovation Service, UNITAR and Fraunhofer IZM have been appointed¹ by the European Commission through for the evaluation of applications for the review of requests for new exemptions and the renewal of exemptions currently listed in Annexes III and IV of the RoHS Directive 2011/65/EU.

VDMA and Lighting Europe submitted requests² for the renewal of the above-mentioned exemption. The request has been subject to a first completeness and plausibility check. The applicant has been re-requested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation³.

¹ It is implemented through the specific contract 070201/2020/832829/ENV.B.3 under the Framework contract ENV.B.3/FRA/2019/0017

² Exemption request available at [RoHS Annex III exemption evaluation - Stakeholder consultation \(biois.eu\)](https://biois.eu)

³ Clarification questionnaire available at [RoHS Annex III exemption evaluation - Stakeholder consultation \(biois.eu\)](https://biois.eu)

The stakeholder consultation is part of the review process for the request at hand. The objective of this consultation and the review process is to collect and to evaluate information and evidence according to the criteria listed in Art. 5(1)(a) of Directive 2011/65/EU.⁴

To contribute to this stakeholder consultation, please answer the below questions until the 27th of May 2021.

1.2. Summary of the Exemption Request

According to VDMA: *“The application for prolongation of the existing exemption refers to mercury-containing UV discharge lamps which are used for curing (e.g. of layers of inks and coatings, adhesives and sealants), for disinfection (e.g. of water, surfaces and air) and for other industrial applications (surface modification, surface activation) The application includes the following lamp types:*

- **UV medium-pressure discharge lamps (MPL) for curing, disinfection and other industrial applications** (internal operating pressure > 100 mbar). The UV medium-pressure lamps can be doped with iron, gallium or lead in addition to the mercury they contain.
- **UV low-pressure discharge lamps for special purposes in the high power range.**
[...]

Typical applications to be covered by this application include curing, e.g. of inks and coatings, disinfection of water etc., and other industrial applications like surface activation and cleaning.

It is technically not possible to replace mercury in special UV lamps with other materials/chemicals in order to achieve the same widespread radiation distribution. LED-based technologies are increasingly being used, which in certain applications (e.g. curing) also offer many advantages over mercury-containing UV lamps. Nevertheless, LED technologies cannot be used as an equivalent replacement in many applications. ”

According to LightingEurope, “[...] The renewal application concerns lamps and UV light sources defined as:

- High Pressure Sodium (vapour) lamps (HPS) for horticulture lighting,
- Medium and high-pressure UV lamps for curing, disinfection of water and surfaces, day simulation for zoo animals, etc...
- Short-arc Hg lamps for projection, studio, stage lighting, microlithography for semiconductor production, etc...

Replacement of mercury and mercury containing lamps is impracticable:

- *The lamps covered by exemption 4(f) must remain available on the EU market:*
 - o *For new equipment for certain applications where no functionally suitable alternatives are available*
 - o *As spare parts for in-use equipment as replacing end-of-life lamps avoids having equipment become electronic waste before due time”*

General Statement

- We are a producer of glass items based in Italy and employ more than 500 people.
- We manufacture the following products: glass packaging for perfumery, cosmetic, food and beverage.

⁴ Directive 2011/65/EU (RoHS) available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT>

- We use UV lamps for the following applications: curing of UV inks and glue polymerization.
- The percentage of UV-based products in our total production is: more than 80%
- Our annual consumption of lamps is: about 100 lamps
- Our experiences with alternatives to UV lamps are as follows: we are studying several alternative such as LED lamps.
- UV lamps are still required for the following reasons: the investment to be made to replace all the lamps is very expensive and not all ink suppliers ensure a supply of products comparable to the traditional UV line. We have 36 UV-Hg lamps in 14 process lines. The total investment that we done with Hg lamps is about 20-25k€ per lamp.

2. QUESTIONS

1. VDMA and LightingEurope² requested the renewal of the above exemption for the maximum validity periods with the same scope and wording for all EEE of cat. 3 and 5 (VDMA) and cat. 1-10 (LEU).
 - a. Please let us know whether you support or disagree with the wording, scope and requested duration of the exemption. To support your views, please provide detailed technical argumentation / evidence in line with the criteria⁴ in Art. 5(1)(a).

The wording should be retained, and an extension should be requested at least until 2026 and beyond. The reasons are that we need to enable LED, ink and adhesive manufacturers to obtain products that are comparable to the current ones.

Reference to RoHS Art. 5(1)(a): Exemptions for materials and components may be considered, if:

“their elimination or substitution via design changes or materials and components is scientifically or technically impracticable”

“the reliability of substitutes is not ensured”

- b. If applicable, please suggest an alternative wording and duration and explain your proposal.

From an industrial point of view, the shortening of the period of validity does not make sense, because the development of alternative solutions (e.g., based on UV LEDs) takes a lot of time. Especially, the development for new applications in the UVC area is still facing major challenges.

Furthermore, it can also be assumed that not all specific UV applications are well-known to VDMA and LightingEurope and have therefore been neglected to be investigated and considered in detail. The previous wording of the exception: “Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex” should therefore be retained unchanged.

With regard to the following current and future developments/processes/products, the availability of UV lamps containing mercury is indispensable for our company: Cerve for specific curing processes.

2. Please provide information concerning possible substitutes or elimination possibilities at present or in the future so that the requested exemption could be restricted or revoked.
 - a. Please explain substitution and elimination possibilities and for which part of the applications in the scope of the requested exemption they are relevant.

The periodic system of the elements offers no alternative to mercury in discharge lamps (i.e., an “alternative filling”) that would be a direct 100% compatible replacement. The physical properties of mercury make this material quite unique and ideally suited for discharge lamps (high vapor pressure, low boiling point, specific spectral lines in areas that are ideal for disinfection and photochemical reactions). Scientific and industrial approaches to compatibly replace mercury with an alternative substance while maintaining the specific beneficial properties of mercury discharge lamps have been ongoing for decades and have all failed. There are other mercury-free types of discharge lamps and other light sources like UV-LEDs available, which can, to some extent, be used for similar processes. There are, however, some very severe limitations:

- Direct replacement (exchanging only the lamp) is in most cases technologically not possible

- Replacement of existing machines/processes with alternative light sources (if available) usually requires additional steps, which may include:

- Replacement of power supplies and peripheral electrical components
- Replacement or alteration of inks and varnishes
- Use of other substrates
- Necessity for (other) pre-treatment technology
- Necessity for inert production environments (expensive use of nitrogen or carbon dioxide)
- Change of UV measurement equipment (different spectral sensitivity)
- Change of process speeds (usually substantial speed and productivity decrease)
- Heavy redesign of machine equipment
- Complications like cross-sensitivity to daylight and/or artificial lighting

- With respect to varnishes, replacement technologies based on LEDs can usually not provide the same degree of surface hardness, scratch resistance and product durability (automobile industry, wood industry)

- The use of replacement technologies usually has a heavy impact on the underlying chemistry of curable inks and varnishes, requiring high amounts of (toxic) photoinitiators

In our sector the alternatives are UV LED and electron beam. Both could certainly replace mercury lamps but the investment costs are high. Just think of the changes to be made in the machines, the limited availability of LED inks for glass decoration. In addition to being less available on the market, LED curing inks also have resistance problems that require the use of different surface pre-treatments.

- b. Please provide information as to research to find alternatives that do not rely on the exemption under review (substitution or elimination), and which may cover part or all of the applications in the scope of the exemption request.

According to our experience, replacement of existing UV lamp system with alternatives leads to a manifold of problems including quality issues, process downtime, productivity decrease, high investment costs, higher overall operational costs.

- c. Please provide a roadmap of such on-going substitution/elimination and research (phases that are to be carried out), detailing the current status as well as the estimated time needed for further stages.

For the moment we don't see the existence of a roadmap for the complete substitution/elimination of mercury-based discharge lamps in most fields of application. There are other technologies available (see above point ...) which might justify investment into new machines and which might gain market share with respect to conventional UV applications over time. But for numerous existing machines/processes/applications, there is no reasonable replacement available. What could be done is a partial replacement of the Hg lamps but at the moment for all the aforementioned reasons a total replacement is not possible. This operation would take many years.

3. Do you know of other manufacturers producing devices of comparable features and performance like the ones in the scope of this exemption request that do not depend on RoHS-restricted substances, or use smaller amounts of these substances compared to the applications in the scope of this exemption? Since 100% replacement on existing installations is not possible, there is also no comparable product or device available with comparable features and performance.

Alternative products, when used with the alternative peripherals (other inks, varnishes, pre-treatments, ...), can have comparable features and performance in some applications (e.g., ink jet printing, general printing) but by for not in all other applications which need the specific spectrum of mercury for their performance.

4. As part of the evaluation, socio-economic impacts shall also be compiled and evaluated. For this purpose, if you have information on socioeconomic aspects, please provide details in respect of the following:

- a. What are the volumes of EEE in the scope of the requested exemptions which are placed on the market per year?

- b. What are the volumes of additional waste to be generated should the requested ex-emption not be renewed or not be renewed for the requested duration?

Most existing machines on the market running with mercury discharge lamps would have to be considered as additional waste and would have to be disposed of. In many cases, it is economically and/or technologically not feasible to retrofit existing equipment with alternative light sources. If UV lamps are no longer available, the following processes and entire machines are no longer usable. This would have the following effects for our company. Stored UV materials, replacement lamps and machinery would have to be

scrapped.

- c. What are estimated impacts on employment in total, in the EU and outside the EU, should the requested exemption not be renewed or be renewed for less than the re-requested time period? Please detail the main sectors in which possible impacts are expected – manufacturers of equipment in the scope of the exemption, suppliers, re-tail, users of MRI devices, etc. Most employers of mercury-based UV technology would be confronted with a professional ban, leading to huge amount of unemployment and loss of products and productivity. Many companies and factories would stop existing. We don't have exact figure and can only state to the best of our knowledge that thousands of companies exist only in the EU that employ UV technology based on mercury lamps. Some of them rely to up to 100% on the availability of mercury lamps (e.g., lamp manufacturers, power supply manufacturers, quartz suppliers, UV measuring device manufacturers, printers and coaters).

- d. Please estimate additional costs associated should the requested exemption not be renewed, and how this is divided between various sectors (e.g. private, public, industry: manufacturers, suppliers, retailers). Unemployment costs for thousands of personnel.

Heavy investment costs for companies into new machinery/equipment, at the same time costs for disposal of no longer usable machines and equipment. As told before we have 36 lamps. If we assume to replace all 36 lamps, the 720k € spent to buy the current lamps would be lost. Furthermore we should buy at least 50 LED lamps with a price of about 15k€ each for a total cost of about 750k €. To these we should add the cost of replacement such as downtime, lost production and production losses due to the current inefficiency of LED lamps compared to Hg lamps.

We would have to perform investments in systems and machinery to a total value of several hundred thousand euros for the replacement and scrapping of old plants

5. Any additional information which you would like to provide?

We believe that the responsible authors of the pending mercury ban dramatically underestimate the global impact of a mercury ban on industries, products, markets, and lastly employment opportunities and end consumers.

The dramatic socio-economic outcome of a mercury-ban bears no meaningful relation to the comparatively very small amount of mercury that is really brought into the market by mercury-containing discharge lamps. Used lamps can be recycled and the mercury content can be reused for new lamps. If all participants in the market actively use the recycling opportunities, the mercury content for discharge lamps can be confined to closed-loop processes without damage or impact to the environment and personal health.

We would like to strongly encourage policy makers to invest their effort into a well-organised recycling system including increasing the public awareness on the necessity of actively participating in the recycling loop. This is a win-win situation for all involved parties to the best outcome of having the best technologies available for the specific needs and without banning certain products, machines, technologies or markets for “the worse”.



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