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 appointed[1] 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 requests[2] for the renewal of the above-mentioned exemption. The request has been subject to a first completeness and plausibility check. The applicant has been requested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation[3].

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] 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)

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

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

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:*
  - *For new equipment for certain applications where no functionally suitable alternatives are available*
  - *As spare parts for in-use equipment as replacing end-of-life lamps avoids having equipment become electronic waste before due time"*

We are Barberan S.A. company, producers of coating and drying machinery based in Barcelona, Spain, and we employ around 180 people.
As part of our product portfolio, we supply UV drying equipment in many different types and formats. We supply UV lamps for surface treatment and as spare for our customers which are located around world.
We use different doped lamps based in mercury for UV drying, in different wides and we provide industrial lines to fulfil many different capacities.
We use UV technology for packaging and digital printing and to cure Low Migration inks where there is no LED alternative now.
The UV equipment is involved in at least 1/3 of our machinery portfolio and we have more than 50 models of different UV dryers combining different lamps, power, and sizes.
We use more than 500 lamps/year built in our drying systems or sold as spare for our customers all over the world.
We also use UV LED technology in some specific applications, but this is limited to certain sizes and to specific chemistries and it is not an alternative to the standard UV lamps due to performance restrictions and compatibility restrictions with lacquers and inks which are not suitable for LED drying.

2. QUESTIONS

1. VDMA and LightingEurope[2] 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 criteria[4] 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 substitution is technically impracticable since no real alternative has been presented.

Reliability and availability of alternatives are 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.

Until now it has been demonstrated the limitation of alternative technologies which not only are lower in performance, but they also have technical limitations in photochemical reactions.

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 mainly in Specific curing processes , but also in air disinfection an surface treatments.

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) photo initiators

- With respect to UV disinfection (water/air/surfaces), there currently is no real replacement available with a similar cost efficiency. The affected markets include general (drinking) water treatment plants, the beverage industry (bottling plants for PET bottles, glass bottles, or other containers), the food industry (sterilizing and packaging), fish farming plants, health industry, Covid-19-countermeasures, vessel ballast water treatment, and many more.

Electron Beam curing technology as alternative to UV it also presents many difficulties in the implementation and other high risk due to the dangerous radiations making it only possible in certain type of productions normally related with flexible substrates but very difficult to implement in rigid boards or rigid substrates.

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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.

The LED lamps do not cover all the applications, for instance fail in achieving good surface hardness when a topcoat is used and create colour stability problems due to the need of dedicated photo initiators, most of the times more dangerous than the ones used for mercury UV lamps.

The huge availability of lacquers adapted to hundreds of different processes are limited to a very few formulations very basic that only cover a very specific range of products.

The equipment is still too expensive, and the energy efficiency is less when it is compared to real performance of the product specially in short wave LEDs necessary to initiate certain photochemical reactions.

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.

> We do not 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 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.

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.
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> Alternative products, when used with the alternative peripherals (other inks, varnishes, pre-treatment, ….), 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?

> The market is huge. Flooring manufacturers, board manufacturers, decorative panels, MDF, particleboard industry, furniture, tabletops, kitchen….
>
> We do not know exact figures describing the whole market exactly.
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> For our company/our customers more than 500 pieces of lamps are used per year.

b. What are the volumes of additional waste to be generated should the requested exemption 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: Full range of UV dryers, Flooring lacquering processes, high gloss panels, roller coaters, levelling tunnels,

This would have the following effects for our company: 25% of the current technology will not be longer available.

Stored UV materials, replacement lamps and machinery of a total value of more than 1M € 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 requested time period? Please detail the main sectors in which possible impacts are expected – manufacturers of equipment in the scope of the exemption, suppliers, retail, 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 do not 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, ……).

It would have the following the impact on our company/ on our customers: Around 25 % of the activity of the company depends on this kind of lamps, an additional 20% could be substituted by LED or alternative technology.

The following business area would be transferred to locations outside of the EU/EEA: 90 % of the lacquering equipment manufacture will be stopped and therefore transferred outside EU.

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

Loss of product diversity since no longer all products can be produced for technological and/or economic reasons.

We/our customers would have to perform investments in systems and machinery to a incalculable value.

Part of our business would cease to exist.

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”.

Please note that answers to these questions can be published in the stakeholder consultation, which is part of the evaluation of this request. If your answers contain confidential information, please provide a version that can be made public along with a confidential version, in which proprietary information is clearly marked.

Please do not forget to provide your contact details (Name, Organisation, e-mail and phone number) so that the project team can contact you in case there are questions concerning your contribution.