

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-quested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation³.

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),*

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/rohs-annex-iii-exemption-evaluation-stakeholder-consultation)

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

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

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 manufacturer of UV-Curing systems.

Our company “baier-uv-technologie” is based in 48346 Ostbevern, Von-Siemensstrasse 5, Germany

We manufacture custom tailored UV-curing systems for OEM customers in the automotive, printing and furniture industries.

The owner of this company is as well Co-founder and shareholder of the following company:

Alpha-Cure Ltd.

Great Central Way, Woodford Halse, Daventry, Northants, NN11 3PZ

United Kingdom

This company is a well known manufacturer of UV-curing lamps worldwide with production facilities in the UK and China. The total amount of mercury vapour lamps produced by this company is approx. 190.000 pieces per year. The lamps are supplied worldwide and used in various application fields.

Both companies are working in UV business for over 25 years and have gathered extensive experience from customers around the globe in many applications.

We are confident that a mercury ban on industrial UV processes will cause significant problems for the majority of companies involved in products that use mercury vapour lamps to generate UV radiation. We have explained the reasons for this in our answers to the questions under “2. Fragen”.

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 re-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).

We support the existing wording. An extension should be requested beyond 2026 for the following reasons:

The elimination/ substitution of mercury in UV-curing lamps is currently technically impracticable for most of the existing industrial processes.

The total environmental effect and the reliability of substitutes is not ensured to be positive compared to the existing lamp technology.

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

The development of UV-LEDs as an alternative solution will take a long period of time. This will be different for the various spectral regions of UV radiation. UVC radiation sources based on LED are still dealing with major challenges. Therefore it does not make any sense to shorten the period from an industrial point of view.

Furthermore, it can also be assumed that not all specific UV applications are well-known to VDMA and Lighting Europe 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.

There are current applications which may not have been taken into account (Ballast Water Treatment on ocean ships, for example) This process does require high power rates of UV.

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.

There is no chemical element to supersede mercury in discharge lamps (i.e., an "alternative filling") that would be a 100% compatible replacement. The physical properties of mercury make this material quite unique and ideally suited for discharge lamps (high vapour 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.

Other available mercury-free types of discharge lamps and other light sources like UV-LEDs 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

- Regarding varnishes, replacement technologies based on LEDs can usually not provide the same degree of surface hardness, scratch resistance and product durability (automotive industry, furniture and flooring industries)

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.

UV-LED technology is already used in some curing applications. However, so far it is only suitable for slow production processes like ink jet printing. In some faster applications which require high UV power and UV intensity, combinations of UV-LED followed by mercury vapour lamps (low or medium pressure lamps) give in some cases reasonable results but require special formulations for inks / coating materials usually causing higher costs and/or slower production speed. Due to the design of existing machines in use it will in many cases not be possible to fit this solution into faster running production processes.

- 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.

Based on the feedback of our lamp customers experience, replacement of existing UV lamp systems with available alternatives lead to a manifold of problems including quality issues, process downtime, productivity decrease, high investment costs or 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.

From our experience we do not see an existing 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. We cannot see significant progress in the development of UV LED Technology over the last years that would lead to a general substitution for mercury vapour curing lamps in the foreseeable future.

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-treatment, etc.), can have comparable features and performance in some applications (e.g., ink jet printing, general printing) but by far not in all other applications which need the specific spectral output 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 existing market is very large and global widely spread over many industrial applications.

UV-Curing:

Automotive industries, all fields of printing industries, PCB manufacture and optical media, Flat screen manufacture, furniture and flooring industries, steel tube coating for pipelines, inside repair sleeves of sewers for example.

Disinfection:

Water treatment for drinking, industrial process and ballast waters, packing material and surfaces in food industries, ozone generating with UV lamps, air and surfaces in laboratories, hospitals and air ducts, treatment of contaminated soil.

We do not know exact figures describing the whole market of 4(f) exactly.

We estimate the annual global need for these lamps will be several hundred thousand pieces.

- 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?

The amount of additional generated waste would be huge worldwide.

The majority of 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:

Lots of the existing UV processes in printing and coating industries as well as in most fields of UV disinfection and automotive applications would have to be redesigned if at all possible. The machines currently used would have to be partly or fully replaced long before their planned lifetime.

For our company this would be the end of our business as it is now.

Already pre manufactured components for our UV-Systems as well as replacement lamps held in stock would have to be scrapped. For our OEM customers in the printing, furniture, disinfection and automotive industry this would be a disaster as well as for their customers.

- 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 significant amount of unemployment and loss of products and productivity. Many companies and factories would stop existing.

We don't have exact figures 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 up to 100% on the availability of mercury lamps (e.g., lamp manufacturers, power supply manufacturers, quartz suppliers, UV measuring device manufacturers, printers, coaters, furniture and flooring manufacturers).

- 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.

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.

Being aware of the environmental needs, since many years our company offers sufficient recycling for used UV-Lamps carried out by specialized companies to all our customers to do everything possible to meet our responsibility.

We would like to strongly encourage policy makers to invest their strong effort into a well-organised recycling system including increasing the public awareness on the necessity of actively participating in the recycling loop. This would create 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.

All information given in this document can and should be made public.