

To whom it may concern
 Consortium: Bio Innovation Service, UNITAR,
 Fraunhofer IZM

Your sign	Our sign	Contact	Date
Consultation Questionnaire Exemption No. 4(f) of RoHS Annex III	PM UV 2021	+49 6221 842 1451	18.05.2021

EU consultation on the continued use of mercury-containing UV lamps

ProMinent is a manufacturer of water treatment systems and in particular of UV systems for the disinfection of water, based in Heidelberg and employing 2700 people in more than 100 countries with around 50 own subsidiaries and 11 production sites.

We manufacture the following products: low-pressure and medium-pressure UV disinfection systems for water treatment in many applications, such as well water, drinking water, process water and swimming pool water.

Answers to the five questions in the Questionnaire:

1. We agree with the wording, scope and requested duration of the exemption. For our purpose of water disinfection with UV light it is essential to use high power lamps that have a high UV-C light yield. Technical it is not possible to replace a discharge lamp at this point with a different kind of UV light emitting device for many reasons. A few of them are listed below:

- Mandatory validation protocol established only for mercury discharge lamps are available. Alternative UV-C-light sources are not allowed for municipal potable water disinfection.
- No validated disinfection monitoring strategy available for alternative lamps. The sensors for mercury discharge lamps use filters for the specified wave

length spectrum. The sensor technology is not developed for the characteristics of the UV LEDs and corresponding wavelength ranges would not be detected correctly.

- Disinfection performance of alternative lamps at wavelengths different than 254 nm is unclear.
- Ecological alternatives (efficiency, lifetime, cooling requirements, etc.) are not available.
- Alternative UV-C light sources consume much more electrical power.

From the industry's point of view, shortening the period of validity does not make sense because development on the basis of UV LEDs or other mercury free UV-C light sources requires a lot of time and development in the UV-C sector in particular still faces major challenges. It can also be assumed that not all specific UV applications are known. The current wording of the exemption: "Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex" should therefore be retained.

Currently, investigations of more efficient mercury lamp types for a use in water disinfection systems are executed by some of our suppliers. The mercury lamps cannot be replaced by any kind of available or near future technology.

2. Information about possible substitutes of mercury lamps.

- a. Some low energy mercury lamps could possibly be exchanged by different kind of lamps, such as excimer lamps or UV LEDs, in the far future. Currently, these possible substitutes lack the amount of energy for the disinfection processes at large, medium, or even small scale treatment plants. Only point of use applications are emerging recently. The point of use applications are not regulated such as drinking water treatment plants. Disinfection systems in municipal drinking water supply applications are regulated by local drinking water directives which strictly limit the disinfection technologies which are allowed to be used. All UV-disinfection units need to be DIN 19294 or ÖNORM M5873 validated in Germany and Austria. The validation protocol does allow only mercury discharge lamps. Any other UV-emitting devices are not allowed because there is no legal framework available.
- b. Some excimer lamps with a wave length of 222 nm are used for the disinfection of air e.g. in hospitals. ProMinent as a supplier of water disinfection systems cannot

use such excimer lamps due to the regulation by law and German or European norms that restrict and regulate the use of UV light to a certain wave length between 240 nm and 290 nm (DIN 19294: "Radiation below 240 nm must be excluded from either the bulb or the envelope by using doped quartz glass.") that is emitted by mercury gas discharge lamps that have the main peak at 254 nm.

3. Ushio is an example of a manufacturer of excimer lamps that emit a wavelength of 222 nm. Those excimer lamps cannot replace the gas discharge lamps for many reasons, e.g. disinfection capacity in water treatment capacity is too low and the use is restricted by law because of possible human health influencing side products that can be produced with such a low and energy rich wave length. Such side products have not been analysed until today nor the influence of these possible side products on human health has been investigated.

LASER COMPONENTS GmbH is an example of a manufacturer of UV-C LEDs. In the possible UV-C wavelength that is used for water disinfection plants one UV-C LED has an optical power of only 100 mW but with an electrical power consumption of 3,3 W which shows that the radiant efficacy of UV-C LEDs is about 3%. In comparison, low-pressure mercury lamps have an optical yield of over 30%-40%. Even hundreds of LED spots would lead to only a few Watts optical power.

For water disinfection purposes it is necessary to reach a high dose of 400 J/m² of every molecule and particle that passes through the UV reactor to induce a logarithmic reduction for the target germ (2 log-steps) which cannot be reached by both systems, UV-C or excimer lamps, with the current technology in an ecological way.

A replacement of mercury gas discharge lamps by available products is not possible due to the mentioned reasons above which is not going to change in the near future of the next exemption periods.

4. Socio-economic impacts:

- a. Statistical data describing the total market 4(f) exactly is not available. The lamp quantities were estimated on the basis of studies.¹ The estimated market value of

¹ Niehues, B., DVGW survey Regelwerk Wasser - Ergebnisse der Umfrage aus 2008. DVGW energie | wasser-praxis 3/2009.

all mercury discharge lamps in the water and waste water industry is around 400 to 500 million € for the year 2020.²

- b. If UV lamps are no longer available, processes and even entire machines may no longer be usable in the industry that use water disinfection plants for example municipal water suppliers, food and beverage suppliers and many more. Thousands of UV water treatment plants will have to be taken out of operation. Other light sources do not have the optical power for the purpose of disinfection. Other systems like UV-C LEDs have a very short lifetime and power so that the possible waste will be orders of magnitude larger if the exemption is not renewed.

Alternatively, chemical disinfection technologies that might often generate harmful by-products are not an adequate replacement.

- c. A not renewed exemption would result in the shut down of the production line of UV water treatment plants and leads to the installation of chemical disinfection methods with the risk for harmful by-product formation, taste and odour problems, and poor disinfection results. Parasites like Cryptosporidium and Giardia can possibly survive chemical treatment. This violates the minimization requirement, the use of chemicals in the EU.

A not renewed exemption would also lead to a loss of many jobs in the EU and a transfer of the fabrication of these products and the jobs outside of the EU.

- d. (see c.)

5. Technically, it is not possible to replace mercury gas discharge lamps in the next years. The gas discharge lamps are established, much more ecologically, energy saving and mature than other light systems.

We release these answers for free disposal.



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² Commissioned market analysis: "Global UV Disinfection Equipment for Water and Waste Water Treatment Market Size, Share and Forecast to 2020-2026" by Market Reports Zone, 2021.