Department
for Environment
Food & Rural Affairs

Atomic absorption spectroscopy lamps: exemption for lead and cadmium

15 March 2024

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Introduction

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (the RoHS regulations) restricts the use of 10 hazardous substances in electrical and electronic equipment (EEE), with a view to contributing to the protection of human health and the environment, including the sound recovery and disposal of waste.

Industry can apply for exemptions to allow the supply of products using one or more of the restricted substances above the threshold limits set down in the RoHS regulations where specified criteria are met. Applications for exemptions are made to the Secretary of State under regulation 6 of the Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020 (the 2020 regulations). Any exemption that is granted can be used across industry, not just by the business that applied for the exemption. Exemptions are granted where it is determined that the necessary criteria have been met following a detailed evaluation conducted in accordance with regulation 5 of the 2020 regulations.

Following the UK's withdrawal from the EU, the function of granting, renewing and revoking exemptions were, in relation to Great Britain, transferred to the Secretary of State by the 2020 regulations, using powers in section 8 of the European Union (Withdrawal) Act 2018 (the Withdrawal Act).

Part of the evaluation process is an 8-week consultation to collect contributions from stakeholders.

A request for renewal for an exemption was submitted for the use of lead and cadmium in atomic absorption spectroscopy lamps used in industrial monitoring and control instruments. These lamps are used in line source atomic absorption spectroscopy (LS-AAS) which is a widely used analytical method for precise measurement of the amount of specific elements present in a sample. The instruments rely on the presence of a reference sample of the element being measured, therefore in order to measure lead, cadmium or mercury then these elements must be included within the lamp. Example uses of these instruments include testing for contaminants and pollutants in mining and metal processing industry; for quality control in the pharmaceutical industry; testing contaminants in food manufacturing processes; using for industrial purposes, and; for clinical testing.

The requested duration of the exemption is for 7 years and according to the application it would be expected to lead to the introduction of 189g of cadmium, 627g of lead and 0.1g of mercury to the GB market annually. The applicant states that elimination or substitution of cadmium, lead or mercury whilst maintaining the current technical performance is scientifically or technically impracticable.

The exemption covers monitoring and control instruments in industry under category 9 (industrial) of electrical and electronic equipment (EEE), as covered in the 2012 RoHS regulations.

The applicant proposed the following change in the wording of the current exemption entry: Lead, cadmium, and mercury in atomic absorption spectroscopy lamps.

The original wording is: Lead and cadmium in atomic absorption spectroscopy lamps.

Purpose of this consultation

The purpose of this consultation is to seek views on the request for the renewal of an exemption to the substance restrictions in the RoHS regulations, to collect additional data and information, and to inform stakeholders about the application.

Geographical extent

We are consulting on proposals applicable to England, Wales and Scotland only. The Secretary of State's transferred function only applies in relation to England, Scotland and Wales.

Northern Ireland is out of scope of this consultation. This is because the EU RoHS Directive is covered under the Windsor Framework agreement with the EU. As such, the EU RoHS Directive continues to apply in Northern Ireland and Northern Ireland continues to be bound by exemption decisions made by the EU.

Audience

This is a public consultation, and we welcome all views, particularly views from the electrical and electronic equipment manufacturing and supply industry for medical devices, and relevant trade bodies, medical organisations who use the equipment in question, research institutions and universities, NGOs and public administrations.

Responding to this consultation

Please respond to this consultation in one of the following ways:

Online using the Citizen Space consultation hub at Defra.

For ease of analysis, responses via the Citizen Space platform would be preferred, but alternative options are provided below if required.

By email to: rohs@defra.gov.uk or consultation.coordinator@defra.gov.uk

Please note responses by the closing date of the consultation (10 May 2024) to be counted. Unfortunately, any responses received after this date will not be analysed. To ensure your response is included in the analysis, please consider responding online via Citizen Space.

Further exchange with stakeholders will be held after the consultation has ended for those issues where further need for information or (technical) discussion has been identified.

Duration

This consultation will be open for 8 weeks from 15 March 2024 until 10 May 2024.

Confidentiality and data protection information

A summary of responses to this consultation will be published on the Government website at: www.gov.uk/defra. An annex to the consultation summary will list all organisations that responded, but will not include personal names, addresses or other contact details. Defra may publish the content of your response to this consultation to make it available to the public without your personal name and private contact details (for example, your home address or email address).

If you would like anything in your response to be treated as confidential, please say so clearly in writing when you submit your response to the consultation and explain why you require these details to be kept confidential. The reason for this is that information in response to this consultation may be subject to release to the public or other parties in accordance with access to information laws. These are primarily the Environmental Information Regulations 2004 (EIRs), the Freedom of Information Act 2000 (FOIA) and the Data Protection Act 2018 (DPA).

We have obligations, mainly under the EIRs, FOIA and DPA, to disclose information to particular recipients or to the public in certain circumstances. In view of this, your explanation of your reasons for requesting confidentiality for all or part of your response would help us balance these obligations for disclosure against any obligation of confidentiality. If we receive a request for the information that you have provided in your response to this consultation, we will take full account of your reasons for requesting confidentiality of your response, but we cannot guarantee that confidentiality can be maintained in all circumstances.

If you select ‘No’ in response to the question asking if you would like anything in your response to be kept confidential, we will be able to release the content of your response to the public, but we won’t make your personal name and private contact details publicly available.

There may be occasions when Defra will share the information you provide in response to the consultation, including any personal data with external analysts. This is for the purposes of consultation response analysis and provision of a report of the summary of responses only. This consultation is being conducted in line with the Cabinet Office Consultation Principles.

Please find our latest privacy notice uploaded as a related document alongside our consultation document.

If you have any comments or complaints about the consultation process, please address them to consultation.coordinator@defra.gov.uk using the heading below:

Consultation on amendments to the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations – lead and cadmium in atomic absorption lamps

After the consultation

A summary of the non-confidential responses to this consultation and the government response will be published and placed on government websites at www.gov.uk/defra

The summary will include a list of respondents and organisations that responded, but not personal names, addresses or other contact details. However, information provided in response to this consultation document, including personal information, will be shared with the Devolved Administrations and may be subject to publication or release to other parties or to disclosure in accordance with the access to information regimes, for example Freedom of Information Act 2000 (FOIA) and the Data Protection Act 2018.

About you

A wide range of businesses, organisations and individuals are involved with or take an interest in the supply of electrical equipment. The questions below are intended to put your responses in perspective with those of other respondents.

Q1. Would you like your response to be confidential?

Yes or No.

- If you answered ‘Yes’, please provide your reason.

Q2. What is your name?

Q3. What is your email address?

This is optional, but if you enter your email address you will be able to return to edit your consultation response in Citizen Space at any time until you submit it. You will also receive an acknowledgement email when you submit a completed response.

Q4. Which best describes you?

Please provide the name of the organisation or business you represent and the approximate size or number of staff (where applicable). (Please tick one option. If multiple categories apply, please choose the one which best describes the organisation you are representing in your response).

- Business representative organisation or trade body
- Producer of electrical and electronic equipment
- Business end-user of electrical or electronic equipment
- Public end-user of electrical or electronic equipment (for example, NHS, educational institution)
- Distributor (including Online Marketplaces)
- Local government
- Community group
- Non-governmental organisation
- Charity or social enterprise
- Consultancy
- Academic or research
- Individual
- Other
- If you answered ‘Other’, please provide details:

Background

The EU RoHS Directive limits the use of specified hazardous substances in the manufacture of certain electrical and electronic products. The UK played a key role in developing the original European legislation, and the RoHS Regulations transposed the EU RoHS Directive into UK law. The RoHS Regulations limits the use of 10 substances and maximum concentration values tolerated by weight in homogeneous materials as follows:

- lead (0.1%)
- mercury (0.1%)
- cadmium (0.01%)
- hexavalent chromium (0.1%)
- Polybrominated biphenyls (PBB) (0.1%)

- polybrominated diphenyl ethers (PBDE) (0.1%)
- bis(2-ethylhexyl) phthalate (DEHP) (0.1 %)
- butyl benzyl phthalate (BBP) (0.1%)
- dibutyl phthalate (DBP) (0.1%)
- diisobutyl phthalate (DIBP) (0.1%)

The scope of the RoHS Regulations is wide ranging, covering most types of electrical and electronic equipment intended for household or commercial use. A limited list of products is exempt, such as large-scale fixed installations, large-scale industrial tools, military equipment, items designed specifically for research and development, most forms of transport and active implant devices.

As explained above, businesses can apply for exemptions that allow the manufacture and supply of products that exceed these threshold limits where it can be proven that alternative less hazardous substances are not available or not reliable or the total environmental, health and safety impacts of the substitution would outweigh the benefits thereof. Following the UK withdrawal from the EU, the Secretary of State now has the power to determine applications for exemptions for products supplied to or in Great Britain. Businesses can apply to the Secretary of State for new exemptions and renewal of existing exemptions. A list of existing exemptions can be found in Table 1, Schedule A2, of the Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020.

Under Regulation 5, an exemption may only be granted where the following conditions are satisfied:

1. The exemption does not weaken the environmental or health protection afforded by UK REACH; and
2. The elimination or substitution of the material or component, via design changes or use of materials or components which do not include any restricted substances, is scientifically or technically impracticable.
3. The reliability of substitute materials or components is not ensured; or
4. The total negative environmental, health and consumer safety impacts caused by substitution of another material or component is likely to outweigh the total environmental, health and consumer safety benefits of that substitution.

The exemption request

Entry 70 in Table 1, Schedule A2 of the 2020 regulations is for lead and cadmium in atomic absorption spectroscopy lamps. The exemption for category 9ind (monitoring and control instruments in industry) applications is due to expire by 21 July 2024; the applicant, Perkin Elmer Inc. has requested a renewal for the maximum duration of 7 years.

Granting the renewal of this exemption would lead to the continued introduction of 189g of cadmium, 627g of lead and 0.1g of mercury to the GB market annually. The applicant states that no suitable substitutes for use of lead, cadmium or mercury as reference materials in line source AAS lamps.

Proposed change to exemption wording

The applicant proposed the following change in the wording of the exemption entry: Lead, cadmium, and mercury in atomic absorption spectroscopy lamps.

Original wording: Lead and cadmium in atomic absorption spectroscopy lamps.

Currently the mercury contained within this equipment is covered under a separate exemption (entry 5 in Table 1, Schedule A2 of the 2020 regulations) which would remain in place as it covers a wide variety of applications.

The rationale from the applicant is to capture all the restricted materials for this specific application under a single exemption. This, however, would lead to having two exemptions that would cover the mercury used in this application.

Details on the exemption application

Line Source Atomic absorption spectroscopy (LS-AAS) is a widely used analytical method for precise measurement of the amount of specific elements present in a sample. The lamps in the instruments rely on the presence of a reference sample of the element being measured, therefore in order to measure lead, cadmium or mercury then these elements must be included within the lamp. Example uses of these instruments include testing for contaminants and pollutants in mining and metal processing industries; for quality control in the pharmaceutical industry; testing contaminants in food manufacturing processes; industrial testing, and; for clinical testing.

Alternatives and substitutes

According to the applicant, there are no alternatives for the restricted substances (lead, cadmium, mercury) in atomic absorption spectroscopy (AAS) as they work as reference materials to produce the required specific light spectra for determining the concentration. The substances work as a reference material in the cathode of the hollow cathode lamps (HCL) or in the bulb of the electrodeless discharge lamps (EDL). EDL lamps require much less reference material and so use of EDL lamps would be preferred to reduce the amounts of restricted materials on the market. This switch would require the development of new equipment which it is estimated will take 10 years.

The following alternative technologies have been identified by the applicant: Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS). ICP-MS and ICP-OES are similar technologies, both analyse sample by spraying the sample onto a high-temperature plasma. The only difference

is that ICP-OES uses an optical spectrometer to measure the light emitted from elements when sprayed onto the plasma, while ICP-MS directly measures the mass of the elements by using a mass spectrometer as the detecting unit. Being an emission technique, rather than absorption, ICP has a higher propensity for interference in test results and as a result operators must have a higher level of training. This interference also means ICP is not suitable for detection of very low levels (parts per billion) of the reference elements.

AAS is specified in numerous global test standards and this is a major impediment to the widespread switch to the use of ICP for metals testing. The process for changing test standards is long and complex as there is a requirement for global consensus across all governing bodies. The applicant has provided an example of an ASTM change which took 6 to 8 years which is a typical timeframe for the entire process for just one test standard.

This consultation aims to collect opinions on the current state of play regarding alternatives and substitutes, at a substance and a device level, and to further understand the alternatives and any limitations that the alternatives currently available might have for end users.

Socio-economic and Environmental impacts

This consultation is also looking to further understand how the granting or revocation of this exemption request may impact on business, from manufacturing through to end user applications, as well as wider society and social impacts (for example, human health impacts). The consultation also aims to understand the effects on the environment of granting or revoking this exemption (for example, additional waste generation caused by enforced equipment changes). We welcome opinions and supporting evidence for any viewpoints associated with the socio-economic and environmental impacts of this exemption.

Consultation specific questions

Q5. Do you agree or disagree that the exemption under RoHS for lead and cadmium in atomic absorption spectroscopy lamps should be renewed?

Agree

Disagree

Don’t know

Please provide evidence to support your answer, explaining why you either support the applicant’s request or object to it. To support your views, please provide detailed technical argumentation or evidence in line with the criteria in regulation 5 of the 2020 regulations. to support your statement.

Q6. Do you agree or disagree with the proposed length (7 years) of the exemption renewal?

Agree

Disagree

Don’t know

Please provide evidence to support your answer, explaining why you either support the applicant’s request or object to it. To support your views, please provide detailed technical argumentation or evidence in line with the criteria in regulation 5 of the 2020 regulations. to support your statement.

Q7. Do you agree or disagree that the wording of the exemption should be changed*?*

Existing wording: Lead and cadmium in atomic absorption spectroscopy lamps.

Proposed wording: Lead, cadmium, and mercury in atomic absorption spectroscopy lamps.

Agree

Disagree

Don’t know

Please provide evidence to support your answer. Please suggest an alternative wording and explain your proposal if you do not agree with the proposed exemption wording.

Q8. In your view, do you think the replacement of all Hollow Cathode Lamps (HCL) by Electrodeless Discharge Lamps (EDL) in AAS instruments is technically feasible and practicable? This would be expected to reduce the amount of restricted substances placed on the GB market.

Yes, I do think replacement of HCLs with EDLs is technically feasible and practicable for the industry.

No, I do not think replacement of HCLs with EDLs is technically feasible and practicable for the industry.

Please provide evidence to support your answer and if possible, links to supporting or non-supporting information on the technical feasibility and practicality of such a switch.

Q9. The applicant has identified ICP (Inductively Coupled Plasma) as an alternative technology which does not rely on use of restricted substances. In your view does ICP have the technical capability to replace AAS in all testing scenarios?

Yes, I do agree that ICP can replace AAS in all testing scenarios.

Yes, I do agree that ICP can replace AAS in some or most testing scenarios.

No, I do not agree that ICP can replace AAS in any testing scenarios.

Please provide an explanation to support your answer and if possible, links to supporting information. Please provide any thoughts on why ICP is, or is not suitable for use by your organisation.

Q10. Amending test standards to implement the ICP method and thereby eliminate the need for the restricted substances is expected to be a long process. In your opinion, does the effort required outweigh the benefits of removing/reducing the requirement for the use of RoHS restricted substances? Please include any information you have on the expected timescales and costs associated with this process.

Yes, I do agree that changing the test standards away from AAS (where appropriate) is worth the effort.

No, I do not agree that changing the test standards away from AAS is worth the effort in any case.

Q11. Rejecting the exemption could lead to premature obsolescence of the existing AAS equipment already on the market. Please provide any information you have on the expected timescales and costs of changing to new ICP equipment, including the costs of additional staff training.

Q12. Are you aware of any research initiatives (past, present or planned) which are looking into possible alternative test methods to AAS other than the ICP?

Yes, I do know of research initiatives which will help in the eventual production of RoHS compliant devices.

No, I do not know of research initiatives which will help in the eventual production of RoHS compliant devices.

Please provide evidence to support your answer and if possible, links to supporting information. If you answered yes, please provide an estimate of the time required until the technology will be available for use in the market.

Q13. Can you estimate how many lead, cadmium or mercury-containing atomic absorption lamps your organisation places on the GB market or purchases per year, or it is planning to place on the GB market or purchase over the next 7 years?

Please provide quantitative data to support your view.

Q14. Please summarise your view on the potential impacts on the environment, if this exemption was or was not granted.

Please provide quantitative data to support your view.

Q15. As part of the evaluation, socio-economic impacts shall also be assessed. Please estimate possible impacts on employment in total, in Great Britain and outside Great Britain, both where the exemption is and is not granted. Please tick to indicate the main sectors in which possible impacts are expected:

- manufacturers
- importers, distributors or professional sellers
- end-users
- other (please state)

Please provide any quantitative data available to support your view.

Q16. Please estimate additional costs associated with a forced substitution should the exemption not be granted, and how this is divided between various sectors:

- manufacturers
- supply chain (for example, distribution)
- distributors or retailers (selling devices)
- end-users
- other (please state)

Please provide any quantitative data available to support your view.

Q17. Please summarise your view on the potential impacts on human health, if this exemption was or was not granted.

Please provide quantitative data to support your view.

Q18. Please provide any further information and/or data that you think is of importance to substantiate your views.