Department for Environment Food & Rural Affairs

Authorisation Decision

by Marc Casale

Deputy Director, Chemicals, Pesticides and Hazardous Waste (DEFRA)

On behalf of the Secretary of State for Environment, Food and Rural Affairs

Decision date: 29 July 2025

Application Ref: AFA055-01

Authorised use

Industrial use of chromium trioxide for functional chrome-plating with decorative character on metallic objects.

UK REACH authorisation number:

Authorisation number	Authorisation holder
UKREACH/25/16/00	C&E Plating Limited

Preliminary Matters

- The substance, chromium trioxide is listed in Annex XIV to assimilated Regulation (EC) No 1907/2006 concerning the registration, evaluation, authorisation and restriction of chemicals (UK REACH).[1] As such, chromium trioxide is subject to the authorisation requirement referred to in Article 56(1) of UK REACH.

[1] References to Regulation (EC) No 1907/2006, referred to in this decision as UK REACH, are to the assimilated law available online at https://www.legislation.gov.uk/eur/2006/1907/contents

- Chromium trioxide was included in Annex XIV due to its intrinsic carcinogenic and mutagenic properties (Article 57(a) and Article 57(b) of UK REACH).
- Hexavalent chromium (Cr(VI)) is the form of chromium in chromium trioxide to which the hazardous properties are attributed.
- The application is made by C&E Plating Limited (the 'Applicant'), with the company number 01283575, whose registered office is at 16 Well Street Hockley, Birmingham, West Midlands, United Kingdom, B19 3BJ.
- Article 127GA of UK REACH applied to this application. The latest application date for chromium trioxide for this use was extended to 30 June 2022. The sunset date for this use was 30 June 2022. The Applicant did not submit an application by 30 June 2022 but was allowed to continue its chrome-plating activities on certain conditions set by Health and Safety Executive (the 'Agency'), including that an application for this use should be submitted to the Agency by the deadline of 1 November 2023.
- On 1 November 2023, the Applicant submitted an application for authorisation (the 'Application') to the Agency, for the industrial use of chromium trioxide for functional chrome-plating with decorative character. Plated products include automotive badges, civic and state regalia, electrical fittings, jewellery, and clothing accessories. Many of the products are small batches or single pieces due to the nature of the work.
- On 14 February 2025, the Agency sent its opinion (the 'Opinion') to the Secretary of State for Environment, Food and Rural Affairs, and Scottish and Welsh Ministers.

Decision

1. This decision is addressed to the Applicant.
2. In accordance with Article 60(4) of UK REACH, authorisation is granted to the Applicant as set out under the following authorisation number UKREACH/25/16/00 for the following use:
    a. UKREACH/25/16/00 for the industrial use of chromium trioxide for functional chrome-plating with decorative character on metallic objects.
3. The review period referred to in Article 60(9)(e) of UK REACH is set at 12 years from the sunset date. The authorisation will cease to be valid on 30 June 2034 unless a review report is submitted in accordance with Article 61(1) of UK REACH by 30 December 2032.
4. The authorisation is subject to the following monitoring arrangements:

a. The authorisation holder must implement annual monitoring capable of providing at least 10 personal inhalation exposure monitoring measurements per year within the duration of the review period, for each similar exposed groups (SEG), that covers all of the relevant Worker Contributing Scenarios (WCSs) within the exposure scenario for the chrome-plating, stripping and chromate dispensing processes (WCSs 2, 4 and 7). Air sampling surveys must be undertaken by a suitable competent person at least once per year provided that the measured personal exposures are below the Agency's internal benchmark of 5 μg/m^3 as an 8-hour Time Weighted Average (TWA) (the 'Agency Benchmark'). In every case, these exposure measurements should:

    i. be based on the methodology specified in BS ISO 16740:2005;[2]

    ii. include personal inhalation exposure sampling measured within the 30cm breathing zone of the wearer, and with samplers positioned on the outside of any Respiratory Protective Equipment (RPE) that may be worn;

    iii. be representative of the range of tasks with possible exposure to Cr(VI) and of the total number of workers that are potentially exposed;

    iv. include gathering adequate contextual (and observational) information for each sampling event sufficient to interpret and inform the results (as detailed within BS EN689:2018[3]).

b. If, while undertaking annual inhalation exposure monitoring, any exposures are found to exceed the Agency Benchmark of 5 μg/m^3 as an 8-hour TWA then the cause should be thoroughly investigated and appropriate action taken to reduce exposure to below the Agency Benchmark. This should be done within 12 months from the date of receipt of the result;

c. If the Risk Management Measures (RMMs) of the authorisation holder have been modified to reduce exposures in accordance with the requirement in paragraphs 4.a. and 4.b. the authorisation holder must undertake a new series of air sampling surveys on the chrome-plating operator using the methodology that is given in BS ISO 16740:2005 such

[2] BS ISO 16740:2005 specifies a method for the determination of the TWA mass concentration of hexavalent chromium in workplace air. This international standard is applicable to the personal sampling of the inhalable fraction of airborne particles, as defined in ISO 7708, and to static (area) sampling. The analytical method is applicable to the determination of masses of 0.01 μg to 10 μg of hexavalent chromium per sample, without dilution.

[3] BS EN689:2018 specifies a strategy to perform representative measurements of exposure by inhalation to chemical agents in order to demonstrate compliance with occupational exposure limit values and, in this case, that Cr(VI) exposure values are below the Agency Benchmark.

that within no more than 6 months after changing the RMMs they have obtained a minimum of 10 new personal exposure data points, from which the new 90th percentile of the chrome-plating operator's personal exposure to Cr(VI) after the change in the RMMs shall be determined. The authorisation holder shall repeat this cycle of modifying the RMMs and carrying out a further series of air sampling surveys using the methodology that is given in BS ISO 16740:2005 until the 90th percentile exposure has been reduced to below the Agency Benchmark. Once that objective has been achieved, the minimum frequency for further air sampling surveys can be reduced to at least annually;

d. The authorisation holder must fully characterise the potential for short duration (peak) exposures during the dispensing and weighing of solid black chromate formulation. To do this, the authorisation holder must conduct:

    i. wipe samples on surfaces to assess any contamination spread within the dispensing area; and

    ii. direct measurement of airborne Cr(VI) dust (via appropriate real-time particulate monitoring equipment).

e. The full reports of the exposure measurements referred to in paragraph 4, including the relevant contextual and observational information referred to in paragraph 4.a.iv., must be documented, included in a subsequent review report and, upon request, be provided to the Agency.

5. The authorisation is subject to the following conditions, some of which are triggered by unsatisfactory results from monitoring arrangements (as well as the requirement in Article 60(10) of UK REACH to ensure exposure is reduced to as low a level as is technically and practically possible):

    a. The authorisation holder must adhere to the operational conditions (OCs) and RMMs described in the chemical safety report referred to in Article 62(4)(d) of UK REACH[4], subject to the conditions and monitoring arrangements set out in this decision;

    b. The authorisation holder must, with the guidance of a competent professional (e.g. professionally qualified occupational hygienist[5]), implement improved RMMs for the prevention of exposure to Cr(VI) for contract workers and visitors (for example; engineering maintenance personnel, waste removal personnel, or other external visitors attending

[4] This is a reference to the chemical safety report dated August 2024 submitted by C&E Plating Limited, as part of the Application. The risk management measures, and operational conditions are described in sections 7 (exposure assessment) and 8 (risk characterisation related to combined exposure).
[5] Throughout this decision report, a 'professionally qualified occupational hygienist' refers to professionals who are entitled to put LFOH after their name or professionals of verified equivalent qualifications and status

the site). Improvements must include provision of hazard awareness training, a process for provision of Personal Protective Equipment (PPE) where appropriate, and a safe system of work (e.g. Permit to Work dynamic risk assessment process) to ensure their potential for exposure to Cr(VI) is either eliminated or well controlled;

c. Should the results from the monitoring for the 'Operation of Chrome-Plating Process' (WCS 4) and the 'Operation of Chrome-Stripping Process' (WCS 7) conducted under the monitoring arrangements in paragraph 4. exceed the Agency Benchmark, the authorisation holder must, with the guidance of a competent professional (e.g. professionally qualified occupational hygienist), install a suitable, purpose designed Local Exhaust Ventilation (LEV) at the plating tank and stripping tank as appropriate (or implement other RMMs that would achieve the same or better control of Cr(VI) worker exposure). This must be completed within 12 months from the date of receipt of monitoring results which trigger this condition;

d. Should the monitoring for the 'Decanting and Transfer of Materials to Plating Tanks' (WCS 2) conducted under the monitoring arrangements in paragraph 4. exceed the Agency Benchmark, then the authorisation holder must, with the guidance of a competent professional (e.g. professionally qualified occupational hygienist), install a suitable purpose designed LEV (or implement other RMMs that would achieve the same or better control of Cr(VI) worker exposure) at the black chrome solid formulation dispensing and weighing station. This must be completed within 12 months from the date of receipt of monitoring results which trigger this condition;

e. If monitoring results relating to WCS 2, WCS 4 or WCS 7 collected as a part of the monitoring arrangements in paragraph 4. exceed the Agency Benchmark, the authorisation holder must, as soon as practicable, review RPE provision with the intent of increasing protection as an interim solution until any non-engineering and engineering RMMs improvements can be put into place. This should be done with the guidance of a competent professional (e.g. a professionally qualified occupational hygienist).

6. The Agency has set out recommendations for the authorisation holder in section 10 of its Opinion, should the authorisation holder submit a review report in accordance with Article 61(1) of UK REACH. These recommendations are not conditions of authorisation or conditions for any review report.

Background

7. This decision is made under Article 60(4) of UK REACH and having obtained the consent of Scottish and Welsh Ministers.

8. In making this decision I have taken into account:

    a. the Application submitted to the Agency;

    b. the provisions of Article 60 of UK REACH, including the elements referred to in Article 60(4) and the requirements of Article 60(5);

    c. the Agency's Opinion.

Reasons

9. In its Opinion, the Agency concluded that it is not possible to determine a derived no-effect level for the carcinogenic and mutagenic properties of chromium trioxide. Therefore, for chromium trioxide, it is not possible to determine a threshold in accordance with section 6.4 of Annex I of UK REACH.

10. Therefore, and in accordance with Article 60(3)(a) of UK REACH, this means that Article 60(2) of UK REACH does not apply to the Application and authorisation may only be granted on the basis of Article 60(4) of UK REACH.

11. Authorisation may only be granted under Article 60(4) of UK REACH if it is shown that the socio-economic benefits outweigh the risk to human health or the environment arising from the use of chromium trioxide and if there are no suitable alternative substances or technologies.

Risk to human health

12. Chromium trioxide presents a risk to human health due to its carcinogenic and mutagenic properties.

Workers

13. To assess worker exposure to Cr(VI), the Applicant modelled inhalation exposure and collected biomonitoring (BM) samples from workers. The collected BM data was below the UK biomonitoring guidance value (BMGV) of 10 µmol Cr/mol creatinine[6] and the modelled inhalation data was below the Agency Benchmark.

14. The Agency considered that the 90th percentile values from the modelled inhalation data reflected a reasonable worst-case exposure scenario. These values ranged from 0.004 µg/m^3 to 0.28 µg/m^3 using an 8-hour TWA.

[6] Two BM data samples were collected by the Applicant, these were 1.6 µmol Cr/mol creatinine (plater) and 0.3 µmol Cr/mol creatinine (jigger).

15. The Agency noted concern regarding the use of general ventilation rather than LEV. While the modelled inhalation data suggests that the existing OCs and RMMs are effective, the Agency noted there is a level of uncertainty inherent in modelled data. Noting that the Applicant recently moved site and has had little time to collect data, the Agency recommended monitoring arrangements (see paragraph 4.) to collect measured exposure data in order to obtain a more accurate estimation of worker exposure. The Agency also recommended conditions to review and improve RMMs where exposure values obtained from the monitoring arrangements are above the Agency Benchmark (see paragraph 5.c. to 5.d.), and to ensure that protection for contractors is improved (see paragraph 5.b.)

16. The Applicant has OCs and RMMs in place to manage the risk of Cr(VI) exposure to workers. These include chemical mist suppressants, mechanical mist suppressants[7], mechanical ventilation, access restriction and segregation of process areas, PPE tailored to specific work tasks, and health surveillance and BM.

17. The Agency assessed the monetised human health impacts to workers to be up to £1,000 over the 12-year review period. This accounts for 3 directly exposed workers across the single site in Great Britain.

18. In its Opinion, the Agency concluded that the Applicant has in place most of the necessary OCs and RMMs to reduce Cr(VI) exposures to workers to an appropriate and effective level and thereby minimise the risk.

19. Having evaluated the Agency's assessment, I agree with its conclusion that the Applicant has in place most of the necessary OCs and RMMs to reduce Cr(VI) exposures to workers to an appropriate and effective level and thereby minimise the risk. Given the limited data as a result of the new site, I also agree with the monitoring arrangements and conditions recommended by the Agency which would ensure that the OCs and RMMs are appropriate and effective.

Humans via the environment

20. In its assessment of the appropriateness of the OCs and RMMs, the Agency noted some uncertainty about the exposure estimates being modelled rather than real measurements. While acknowledging the uncertainty, the Agency also noted that the exposure values are likely to be overestimated and result in a conservative calculation of the exposure risk.

21. According to the Applicant, Cr(VI) may be released to the environment via the atmosphere and wastewater[8]. However, the Agency noted that the Applicant has the necessary OCs and RMMs in place to manage the risk of Cr(VI) exposure to

[7] Mechanical mist suppressants include croffles; hollow plastic balls covering the liquid surface of the plating and stripping tanks to further minimise airborne mist evolution during the electrolytic process

[8] Using the method MDHS52/4 the Agency estimated that 0.00108 kg of Cr(VI) per year is released to the atmosphere. The Applicant used one data point collected from the new site to calculate that 0.0017 kg of Cr(VI) to wastewater per year.

humans via the environment. These include ventilation, mist suppressants, on-site wastewater treatment prior to release of wastewater to the foul sewer, regular monitoring of total chromium emissions to wastewater, and a discharge consent limit for total chromium of 3 mg/L.

22. The Agency assessed the monetised health impacts to humans via the environment to be up to £2,000 over the 12-year review period. This accounts for an estimated local population of 100,000 people.

23. In its Opinion, the Agency concluded that the OCs and RMMs which the Applicant has in place are appropriate and effective in limiting the risk of human exposure via the environment. Having evaluated the Agency's assessment, I agree with this conclusion.

Socio-economic analysis

24. In its Opinion, the Agency assessed the socio-economic benefits arising from the applied for use of chromium trioxide and the socio-economic implications of a refusal to authorise. The expected socio-economic benefits of authorisation are based on the avoided profit losses and avoided social costs of unemployment if authorisation is not granted. The Agency estimated this to be at least £0.79 million over 12 years.[9]

25. The non-monetised benefits include the avoided temporary losses in consumer surplus for Customer X's clients due to the disruption in supply and potentially some permanent loss if replacement suppliers are inferior.

26. Having evaluated the Agency's assessment, I agree with its conclusions on the quantitative and qualitative benefits.

Conclusion on whether the benefits outweigh the risk

27. In its Opinion, the Agency concluded that the Applicant has demonstrated that the socio-economic benefits of granting authorisation (at least £0.79 million over a period of 12 years) are greater than the risks to human health (up to £2,500 over a period of 12 years).

28. I consider that the Applicant has shown that the socio-economic benefits outweigh the risk to the environment because of:

    a. the likely quantitative benefits in respect of the avoided producer surplus loss and avoided social cost of unemployment to the Applicant;

    b. the likely qualitative benefits in respect of avoided losses to customers and avoided costs of customer relocation outside of GB;

[9] This figure consists of £0.26 million in avoided profit loss, made up of £0.14 million based on 3-years of losses to the Applicant and Customer X and £0.12 million based on 3-years of losses to suppliers. The cost of unemployment is expected to be £0.53 million based on 11 jobs lost.

c. The assessed risks from the use of chromium trioxide.

29. Having evaluated the Agency's assessment, I agree with the Agency's conclusion that the socio-economic benefits of authorisation outweigh the risk

Alternatives

30. In its Opinion, the Agency concluded that there are no available alternative substances or technologies with the same function and a similar level of performance that were technically and economically feasible for the Applicant by 1 November 2023 (the date the Application was submitted to the Agency).

31. In its Opinion, the Agency noted that the Applicant has a workforce of fewer than 15 people and is therefore reliant on the R&D activities carried out by major chemistry suppliers and universities. The Applicant carried out data searches and consultations with alternative providers and technical experts and identified six possible alternatives to chromium trioxide.[10] Of these, one possible alternative was shortlisted for further trials with the Applicant's major customer but the results from these trials were rejected.

32. For an alternative to be suitable, the technical functionalities and desired finish achieved by chromium trioxide must be met. The essential criteria that must be met include corrosion resistance, chemical resistance, hardness and resistance to wear and abrasion, colour and shine stability and consistency, surface consistency and smoothness.

33. Most of the potential alternatives identified were up to 10 times more expensive than chromium trioxide and were reported to not meet the essential criteria to a standard equivalent to that of chromium trioxide.

34. The Applicant tested the shortlisted chromium (III) alternative, but the finish and durability did not meet the required standards. Furthermore, chromium (III) would require the use of boric acid, which is also listed on Annex XIV of UK REACH. For these reasons, the Applicant ultimately rejected chromium (III) as a feasible alternative. Because of the lack of a feasible alternative, the Applicant did not include a substitution plan in its Application, which the Agency accepted as reasonable.

35. The Agency considered that the Applicant's analysis of alternatives was detailed and that the Applicant's justifications behind the rejected possible alternatives were reasonable. The Agency also noted that, although the shortlisted alternative was ultimately rejected, the Applicant's view on its availability at an industrial scale was likely optimistic.

[10] Alternatives which the Applicant considered comprise of: chromium (III) chloride plating on nickel (shortlisted for further testing), chromium (III) sulphate plating on white bronze, physical vapour deposition (PVD), chemical vapour deposition (CVD), lacquering/painting, powder coating and stainless steel.

36. Having evaluated the Agency's assessment, I agree with its conclusion that there were no available alternatives by 1 November 2023 (the date the Application was submitted to the Agency) and consider that the Applicant has discharged its burden of proof in demonstrating the absence of suitable current alternatives. In reaching this conclusion, I have considered the Agency's assessment of the technical and economic feasibility of alternative substances already on the market.

Review period

37. In its Opinion, the Agency recommended the review period referred to in Article 60(9)(e) of UK REACH should be set at 10 years.

38. In the Application, the Applicant requested a 12-year review period.

39. When considering the Applicant's request, the Agency considered that the Applicant did not make as strong a case that there are no alternatives to Cr(VI) for some of the Applicant's minor components (other than automotive badges). This was because the Applicant only tested the shortlisted alternative with its major client (customer X). The Agency further noted that, if the Applicant was only plating automotive badges, the requested 12-year review period would be appropriate, but that this would extend the available time for using Cr(VI) to plate other components for which substitution may occur in less than 12 years. As such, the Agency recommended a 10-year review period. The Agency noted that this would allow the Applicant sufficient time to maintain main production without unduly extending the period for components for which an alternative may become available sooner.

40. Having considered the Agency's Opinion and the relevant information specified by Article 60(8) of UK REACH for determining the duration of a review period, I instead consider the 12-year review period requested by the Applicant to be more appropriate for the following reasons:

    a. The risks posed by the applied for use of chromium trioxide were assessed by the Agency to be low. The Agency also concluded that RMMs to reduce Cr(VI) exposures to workers to an appropriate and effective level and thereby minimise the risk;

    b. The Agency assessed the socio-economic benefits of continued use and concluded that these are at least 300 times greater than the socioeconomic risks of a refusal to authorise;

    c. The Agency concluded in the Opinion that the Applicant's analysis of alternatives was detailed, that their justification behind rejected alternatives was reasonable, and that that their view on the possible commercial availability of the shortlisted alternative (chromium (III)) was optimistic. The Agency concluded that there were no technically or economically feasible alternatives for this use that would be applicable to

all components requiring plating, and that there were no uncertainties of such magnitude that they may affect its conclusions. This is unlikely to change within 12 years to the extent that an alternative could substitute Cr(VI) for all components which the Applicant plates;

d. UK REACH requires that the duration of review period must take into account time required for substitution. There is no evidence in the Application documents or in the Agency's Opinion that demonstrates substitution will happen in less than 12 years or to link substitution to 10 years;

e. The Agency noted that some of the components the Applicant chrome-plates may have lower technical requirements, and that substitution may be possible sooner for these than the components the Applicant plates for Customer X, which have very high technical requirements and make up a larger portion of the Applicant's business. However, the Agency noted that substitution of all components is intimately connected, that substitution for minor components with lower technical requirements would also be difficult, and that this is unlikely to be achieved within a 'short' timeframe. Furthermore, the Applicant has provided the same essential technical and aesthetic performance criteria for all components that require plating. Neither the Application documents nor the Agency Opinion provide sufficient evidence that the minor components of the Applicant's business have inferior performance requirements to its main component.

41. On this basis, and having evaluated the Agency's assessment, I consider a 12-year review period to be appropriate.

Conclusion

42. For the reasons set out above I conclude that the socio-economic benefits outweigh the risk to human health for the use of chromium trioxide referred to in paragraph 2 and that there are no suitable alternative substances or technologies.

43. The Scottish Ministers and the Welsh Ministers have given their consent to this decision in accordance with the requirements of UK REACH.

Marc Casale

Deputy Director, Chemicals, Pesticides and Hazardous Waste

On behalf of the Secretary of State for Environment, Food and Rural Affairs