ANALYSIS OF ALTERNATIVES
and
SOCIO-ECONOMIC ANALYSIS

Legal name of applicant:	ACF Howell
Submitted by:	ACF Howell
Date:	29th December 2024
Substance:	Chromium trioxide EC : 215-607-8 CAS : 1333-82-0
Use title:	Use of chromium trioxide for the electroplating of legacy components such as for classic/vintage cars & motorcycles with the purpose of creating a coating to match the original specification and provide specific performance characteristics.
Use number:	3 - Functional chrome plating with decorative character

CONTENTS

DECLARATION

We, the Applicant, are aware of the fact that further evidence might be requested by HSE / DEFRA to support the information provided in this document.

Also, we request that the information blanked out in the “public version” of the Analysis of Alternatives and Socio-economic Analysis is not disclosed. We hereby declare that, to the best of our knowledge as of today (29th December 2024), the information is not publicly available, and, in accordance with the due measures of protection that we have implemented, a member of the public should not be able to obtain access to this information without our consent or that of the third party whose commercial interests are at stake.

Signed on behalf of the applicant by
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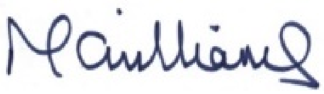
Signature. 

Date. 29th December 2024
Place. Willenhall, UK

1. SUMMARY

This Analysis of Alternatives and Socio-Economic Analysis relates to the application for authorisation for the continued use of chromium trioxide in electroplating processes for legacy components. Legacy components are generally components that are no longer in production and are required to conform to original specifications. The applicant is a micro business and specialises primarily in the refurbishment and restoration of legacy components for vintage and classic cars and motorcycles, together with small batch work of new parts. Typical components include bumpers, overriders, bonnet and boot catches, light surrounds, door and window trims, exhaust systems and handlebars.

The applicant has reviewed previous applications for authorisation from similar trades and consulted with its supplier regarding alternatives to chromium trioxide-based plating. In this regard, it has also discussed with, and followed the significant research and development invested by, other chrome platers from a similar trade. Customers have also been consulted and all are of the opinion that any alternative would not meet their requirements.

The function of the chromium trioxide is to provide a thin metallic chromium electroplated coating, which is essentially inert, usually termed decorative chromium plating. The overall plated coating will consist of multiple layers of copper, nickel and chromium and must adhere to the requirements of BS EN ISO 1456:2009 as a minimum. The chromium electroplated coating provides specific characteristics that include corrosion resistance, chemical resistance, hardness and resistance to wear and abrasion, colour and shine stability, surface consistency and smoothness. In addition, the coating is fully recyclable.

The applicant is fundamentally a subcontractor and does not own any of the components which customers provide for refurbishment and restoration. The customer defines its requirements and ultimately the process and finish specifications. This means that the use of chromium trioxide is led by the consumer and any alternative must mirror the customers' requirements, which primarily is to meet the original specification and match the other chrome plated components on their vehicle.

The applicant relies totally on the propriety chemistry suppliers, other larger platers in the sector and trade associations to conduct research and development as the costs are so prohibitive. There are currently three technologies that could be considered as potential alternatives to the use being applied for. Trivalent chromium electroplating, Physical Vapour Deposition (PVD) and metallic powder coating. The only alternative which has received serious consideration by the functional decorative plating sector is the one based on trivalent chromium.

With respect to the specific performance requirements of the required coating, none of the potential alternatives were considered to be viable alternatives at the present time nor in the foreseeable future. A review period of 12 years is therefore requested.

With the passage of time, further research and development will be undertaken by the market sector to improve the performance of trivalent chromium technology and newly developed coatings may become available. The applicant will monitor the situation closely.

As stated in the application for authorisation by the Chromium Trioxide Authorisation Consortium (CTAC) submitted to the European Chemicals Agency (ECHA) and other similar application for authorisations - "*As of today, no complete chromium trioxide free process,* *providing all the required properties to the surfaces of all articles in the scope of this application, is industrially available*." The CTAC consortium was made up of several of the largest chemical suppliers in Europe for electroplating chemistry and technology has not moved on significantly over the years, thus justifying the applicant's statements made above.

If authorisation is granted, the applicant will continue to use chromium trioxide for its high quality plating, in line with best practice principles, together with continuing to ensure that the control of exposure to chromium trioxide is maintained as low as practicable. The applicant is too small to be able to undertake any research and development into alternatives but will consult with their suppliers and the market sector generally, to monitor developments in new technologies.

If authorisation is not granted, the applicant expects that without the chrome-plating facility, it would lose its refurbishment and restoration business, and the company would be closed down. This would result in lost turnover and profits and necessitate redundancies.

Over the 12 years (requested review period), the societal costs resulting from non-use is £81,000 per year, of which £62,000 per year is resulting from unemployment and lost wages.

Over the same period, the residual risks to human health of continued use are extremely low, where the excess lung cancer risk is estimated at 0.004 and the monetised excess risk is estimated over the full 12 years (review period) at £12,400.

The societal costs of not granting this authorisation far outweigh the residual risks from the continued use of chromium trioxide for the use applied for.

The Chemical Safety Report demonstrates that risks to workers are well managed and controlled, and there is no risk to the environment or 'man via environment'.

With the continued use of airborne mist monitoring, personal air monitoring and biological monitoring, all routes of exposure can be regularly assessed and the principles of "as low as reasonably practicable" will be maintained.

2. AIMS AND SCOPE

A.C.F. Howell is a micro business and specialises primarily in the refurbishment and restoration of chromed parts for vintage and classic cars and motorcycles, together with small batch work of new parts.

The company is located in Walsall and employs a small team of versatile metal workers and long serving staff, experienced in the metal finishing business. The chromium plating process is carried out in a single dedicated unit on the site and is the final stage of what can be a complex process of specialist component restoration.

The company has a loyal customer base, made up of enthusiasts, prestigious restoration businesses, spares dealers and general engineering companies. Typical components include bumpers, overriders, bonnet and boot catches, light surrounds, door and window trims, exhaust systems and handlebars.

The company is fundamentally a subcontractor and does not own any of the components which customers bring for refurbishment and restoration. Customers define their requirements and ultimately the process and finish specifications. This means that the use of chromium trioxide is led by the consumer and any alternative must mirror the customers' requirements, which primarily is to meet the original specification and match the other chrome plated components on their vehicle.

This application for authorisation covers the use of chromium trioxide to produce an electroplated coating of metallic chromium on top of multiple layers of copper, nickel and chromium and must adhere to the requirements of BS EN ISO 1456:2009 as a minimum.

BS EN ISO 1456:2009 specifies coating designations appropriate for the service conditions (SC) to which the coated product will be exposed. Each service condition requirement will determine the deposit thickness of the copper and nickel layers. The thickness of the chromium layer remains the same across all service conditions.

Table 2.1 BS EN ISO 1456:2009 Extract (5.3 Service-condition number)

SC No	SC Description	Severity of the Conditions
1	Mild	Service indoors in warm dry atmospheres, e.g. offices
2	Moderate	Service indoors where condensation may occur, e.g. bathroom, kitchens
3	Severe	Service outdoors where occasional or frequent wetting by rain or dew may occur, e.g. outdoor furniture, bicycles, hospital goods.
4	Very severe	Service outdoors in very severe conditions, e.g. components of automobiles, boat fittings.
5	Exceptionally severe	Service outdoors in exceptionally severe conditions, where long-time protection (such as longer than about 10 years) of the substrate is required, e.g. vehicle components: bumpers, wheels.

Interior motor vehicle fixtures such a door handles and console badges will have to meet the requirements of SC3 as a minimum. Exterior motor vehicle fixtures such a badges, light surrounds and trim will have to meet the requirements of SC4 as a minimum. Bumpers and wheels will have to meet the requirements of SC5.

The chromium electroplated coating provides specific characteristics that include corrosion resistance, chemical resistance, hardness and resistance to wear and abrasion, colour and shine stability, surface consistency and smoothness.

The aim of this Analysis of Alternatives is to demonstrate that no suitable alternative to the use of chromium trioxide is currently available for the use being applied for.

The aim of the Socio-Economic Analysis is to demonstrate that the benefits of the continued use of chromium trioxide, for the use applied for, far outweigh any potential risks to human health and/or the environment.

The scope covers the implications of a refusal to grant an authorisation for the continued use of chromium trioxide for the use applied for.

The applicant is a proud UK business, and the Socio-Economic Analysis discusses how it provides local employment, generates tax revenues and preserves specialist engineering skills.

3. ANALYSIS OF ALTERNATIVES

3.1 SVHC use applied for

Use of chromium trioxide for the electroplating of legacy components such as for classic/vintage cars & motorcycles with the purpose of creating a coating to match the original specification and provide specific performance characteristics.

3.1.1 Description of the function(s) of the Annex XIV substance and performance requirements of associated products

Hexavalent Chromium (Chromium trioxide Cr(VI)) is used to produce an electroplated metallic chromium coating. The base material of components include steel, castings, zinc die-castings such as mazak and brass.

For the specific use being applied for, the chrome plating process is performed on a manually operated in-line rack plating line containing a total of 27 process stations and chrome plating is the final stage of a predetermined sequence of operations as detailed below:

Stripping to base material : Removal of existing coatings

Refurbishment : May include surface repairs, welding on missing brackets, brazing etc.

Polishing : Manual polishing to provide smooth surface (both in base material and copper)

Pre-treatment processes : Cleaning and pickling the surface of the component

Electroplating processes : Plating in copper (which is taken off plant for repolishing) and then plating in nickel and chrome

Post-treatment processes : Immersion in neutralising solution removing any chromium trioxide residue

Components are rinsed by immersion in clean water between processes to prevent contamination from previous stages.

Components are inspected for defects at the first polishing stage, at the intermediate copper polishing stage and after the final chrome plating process prior to packing and despatch.

The final coated component does not contain any hexavalent chromium and is essentially inert and the only potential exposure to chromium trioxide occurs when operating the plating line.

The chromium plated components, for the use being applied for, requires the following performance requirements:

- **Corrosion resistance**
  Surface must be resistant to corrosion from the environment, which can reduce product service life and consumer satisfaction. Table 2.1 above provides the conditions which components could be subjected while in service.
- **Chemical resistance**
  Surface must be resistant to chemicals to which a component is likely to be exposed to throughout its service life. This can affect the integrity of the coating and visual quality. Cleaning chemicals and road salt are examples.
- **Hardness and resistance to wear and abrasion**

Surface must resist damage in normal use, which can reduce service life and visual quality. Breakthrough, due to scratching and chipping can bring on corrosion of the substrates.

- **Colour and shine stability**
  Surface must be resistant to discolouration and loss of shine while in service. Colour and shine should be consistent across different components and different batches together with matching the original specification and other components.
- **Surface consistency and smoothness**
  Surface must be consistent and smooth to a mirror finish, without blemishes or other faults. Failure to achieve this leads to rejection and consumer dissatisfaction.

The plated surface must comply with technical specifications and international standards.
An example is BS EN ISO 1456:2009 which specifies requirement conditions for appearance, impact resistance, coating performance and salt spray resistance.

Salt spray testing is used to evaluate the corrosion resistance of coatings. The test involves exposing coated samples to a controlled corrosive environment, typically a salt fog, to simulate long-term exposure to harsh conditions. This helps in assessing how well the coatings can protect the underlying material from corrosion.

3.1.2 Market analysis of products manufactured with the Annex XIV substance

The applicant has a loyal customer base, made up of enthusiasts, prestigious restoration businesses, spares dealers and general engineering companies. The refurbishment market and aftermarket sector serves owners of wide range of heritage and legacy vehicles which typically refers to older models of cars and motorcycles that are no longer in production but are still in use on the road.

Typical components that require decorative chromium plating for the use being applied for are:

- **Motor Vehicles (e.g. Vintage/Classic Cars)**
  Bonnet and boot catches
  Indicator and light housings
  Headlight bezels, rims and reflectors
  Bumpers, quarter bumpers, and overriders
  Door frames, window frames and windscreen surrounds
  Gear levers, ashtrays, handbrakes and window winders
  Grilles and bonnet trims
  Badges, scripts and motifs
  Hub caps and wheels
- **Motorcycles**
  Exhaust systems
  Clutch covers
  Handlebars
  Pannier rails
  Wheels

These are generally refurbished from the original components or in one-off situations, fabricated to order when replacement components are no longer available.

The sector is made up of private individuals, enthusiasts, specialist restorers and large companies with classic and heritage car collections or museum collections. As you would expect, the range and models of motor cars involved in this sector is extensive. Just a few examples are Rolls Royce Camargue and Bentley, Jaguar E-Type and XK, Mercedes-Benz S-Class and Morgan to name just a few. Motorcycles include Triumph, Suzuki and more.

As already indicated, the applicant has to operate to the very highest quality standards in this extremely demanding heritage market and has to preserve the authenticity of the vehicles including matching the original coatings that were applied to the original vehicles.

3.1.3 Annual volume of the SVHC used

The applicant is a micro enterprise for the purpose of REACH authorisation applications and only uses a total weight of 50-75 kg per annum.

3.2 Efforts made to identify alternatives

The application for authorisation by the Chromium Trioxide Authorisation Consortium (CTAC) submitted to the European Chemicals Agency (ECHA) and other similar applications stated that "*As of today, no complete chromium trioxide free process, providing all the required properties to the surfaces of all articles in the scope of this application, is industrially available*." The CTAC consortium was made up of several of the largest chemical suppliers in Europe for electroplating chemistry and technology has not moved on significantly over the years.

The applicant is a subcontractor and does not own any of the components which customers provide for refurbishment and restoration. The customers define their requirements and ultimately the process and finish specifications. This means that the use of chromium trioxide is led by the consumer and any alternative must mirror the customers' requirements, which primarily is to meet the original specification and match the other chrome plated components on their vehicle.

The applicant has reviewed previous applications for authorisation from electroplaters in the same sector and consulted its supplier regarding alternatives to hexavalent chromium based plating. In this regard, it has also discussed with, and closely followed the significant research and development invested by a local electroplater, known to the applicant.

3.2.1 Research and development

Chromium electroplating using trivalent chromium was first marketed in the 1970s. There has been considerable research and development since then, by the major chemistry suppliers and research continues in an attempt to obtain a true alternative to chromium electroplating using hexavalent chromium.

The applicant relies entirely on the chemistry suppliers to conduct the research and development as the costs are so prohibitive for small subcontract businesses. Subcontract platers in this sector will have to wait until such time that a true alternative becomes available. It is for the platers and their customers to assess whether proposed alternatives are suitable for their application. From information currently available the cost of transition to trivalent chrome is likely to be significant, and perhaps prohibitive for some small electroplating companies.

3.2.2 Consultations with customers and suppliers of alternatives

The applicant has been in regular contact with its customers and suppliers of electroplating chemistry, as already discussed above. In this respect, one of the applicant's customers, who supplies chromed components to the [redacted], *insisted that the finish had to be to the traditional hexavalent bright chrome and not the trivalent finish that was offered to them by electroplaters in China.*

3.2.3 Data searches

Dating back to the applicant's involvement with CTAC, [redacted], a considerable amount of information has been available on the ECHA and HSE websites. Regular reviews and examinations of published applications for authorisation regularly take place, both those submitted to ECHA and those to HSE under UK REACH. Although not regularly updated, "*the list of UK REACH authorisations – granted and applications in progress*" shows there have been 30 applications for the continued use of chromium trioxide since 2001 and 13 grandfathered authorisations dating back to 2013. Not all applications are related to this electroplating sector, but there are several recent applications of particular interest, namely the applications from the Surface Engineering Association's three consortiums and several from major chemistry suppliers.

Research into the potential alternatives being offered by [redacted] has also taken place.

The applicant's own chemistry technician also keeps updated, via chemical suppliers, as to the latest developments in trivalent technology.

3.2.4 Identification of alternatives

To date, many potential alternatives have been considered and outlined in the various applications for authorisation for functional chrome-plating with decorative character. These were shortlisted by the Surface Engineering Association Legacy Consortium (Ref. AFA024-01) as below:

- Trivalent chromium chemistry
- Physical vapour deposition (PVD)
- Metallic powder coating

These are all publicised by chemical suppliers as suitable alternatives, but none are suitable for the applicant's specific requirements and specification.

Powder-coating provides finishes which are noticeably different visually from the traditional hexavalent bright chrome finish and would not be acceptable to customers. This has been discounted as an option. PVD has been discounted as an option on the grounds that it is extremely expensive and results in a finish which is not sufficiently resistant to corrosion or wear.

The applicant has some practical experience of the trivalent chromium alternative. Recently, a customer arrived at the company with a component that was plated using trivalent chrome. *The customer had paid to have the job plated elsewhere and had brought it to the applicant so he* *could have it stripped and replated in the traditional hexavalent chrome.* The customer was totally dissatisfied and unhappy with the colour of the trivalent finish*, as it was not the bright reflective finish he was expecting and was fundamentally different to the chrome finish on the other parts of his car.*

Nevertheless, this option is the only alternative which is seriously being considered by the jobbing shop electroplating sector and is the only option meriting consideration in this application for authorisation.

3.2.5 Shortlist of alternatives

The most relevant coating technology with potential, in the future, to replace the current use of hexavalent chrome is shown in Table 3.1.

Table 3.1 Shortlisted alternatives

Name	**CAS or EC Number**	**Description of alternative**
Trivalent chrome	N/A	Chromium electroplating using a trivalent chromium-based processing solution

3.3 Assessment of shortlisted alternatives

3.3.1. Alternative 1: Trivalent chromium electroplating

3.3.1.1 General description of Alternative 1

Trivalent chromium and hexavalent chromium based electroplating processes are similar in principle, where the hexavalent chromium is replaced by a mixture of substances which ultimately produces trivalent plating technology, using similar plant and equipment.

Chromium electroplating with the trivalent chromium chemistry still enables the deposition of the thin metallic chromium onto components.

The component to be coated is immersed in the trivalent chromium plating solution, which contains dissolved trivalent chromium salts and additives, that act as complexing agents, and boric acid which acts as a buffering agent to control the pH.

The actual composition of the chromium trioxide plating solution depends on the performance requirement of the coating. The most commonly used types of chemistry is either sulphate based or chloride based chromium trioxide.

There are several major differences in the technology to be considered, such as:

- the complex chemical composition of the plating solution and its control
- the strict operating parameters necessary
- the need for additional ancillary equipment such as ion exchangers.

It must be noted that the transition to trivalent chrome plating will involve significant capital investment.

3.3.1.2 Availability of Alternative 1

Trivalent chromium electroplating technology is available worldwide and is being used in a variety of indoor decorative applications. However, the issue arises where trivalent chromium does not meet all the performance requirements for the particular use being applied for, functional chrome-plating with decorative character.

3.3.1.3 Safety considerations related to using Alternative 1

The following is an extract from the application for authorisation submitted by the Chromium Trioxide Authorisation Consortium (CTAC). The CTAC consortium was made up of several of the largest chemical suppliers in Europe for electroplating chemistry.

"As the alternative is not technically feasible, only classification and labelling information of substances and products reported during the consultation were reviewed for comparison of the hazard profile. Based on the available information on the substances used within this alternative, chromium (III) chloride would be the worst case with a classification as Skin Irrit. 2, Eye Irrit. 2, Acute Tox.

In general, the trivalent electroplating processes are less toxic than chromium trioxide plating due to the oxidation state of the chromium. Cr(III) solutions do not pose serious air emission issues, but still pose the problems of disposal of stripping solutions (depending on the type of stripping solution) and exposure of staff to chrome dust during grinding. In addition, there is a certain risk of Cr(VI) being generated during the plating process (anodic oxidation of Cr(III) ions). This is why appropriate security precaution and process management has to be adopted to prevent the formation of Cr(VI).

The Cr(III) bath electrolyte solution typically also contains a high concentration of boric acid, which is a SVHC (Repr. 2; H361) included on the candidate list and currently on the 6th recommendation for inclusion in Annex XIV. Overall, the transition from Cr(VI) to Cr(III) technology constitutes a shift to less hazardous substances, despite one of the used alternative substances is itself classified for mutagenicity and carcinogenicity. Hence, any replacements will need to be carefully evaluated on a case-by-case basis."

The trivalent chromium process involves the use of many more substances than just the one substance required by hexavalent chrome. The following are typically required in trivalent chromium electroplating solutions:

- Chromium Sulphate EC: 233-253-2 CAS: 10101-53-8
- Chromium Chloride EC: 233-038-3 CAS: 10025-73-7
- Chromium Trichloride Hexahydrate EC: 629-714-6 CAS: 10060-12-5
- Boric Acid EC: 233-139-2 CAS: 10043-35-3
- Ammonium Chloride EC: 235-186-4 CAS:1215-02-9

Chromium Sulphate shown above has several hazards according to CLP:

Acute toxicity, Oral (H302): Harmful if swallowed
Acute toxicity, Dermal (H312): Harmful in contact with skin
Acute toxicity, Inhalation (H332): Harmful if inhaled
Skin corrosion (H314): Causes severe skin burns and eye damage
Serious eye damage (H318): Causes serious eye damage

Chromium Chloride shown above has several hazards according to CLP:

Acute toxicity, Oral (H302): Harmful if swallowed
Skin sensitization (H317): May cause an allergic skin reaction
Serious eye damage (H318): Causes serious eye damage
Skin corrosion (H314): Causes severe skin burns and eye damage
Respiratory sensitization (H334): May cause allergy or asthma symptoms or breathing difficulties if inhaled
Long-term (chronic) aquatic hazard (H411): Toxic to aquatic life with long-lasting effects

Chromium Trichloride Hexahydrate shown above has several hazards according to CLP:
Corrosive to metals (H290): It may corrode metals
Acute toxicity, Oral (H302): Harmful if swallowed
Skin sensitization (H317): May cause an allergic skin reaction
Short-term (acute) aquatic hazard (H401): Toxic to aquatic life
Long-term (chronic) aquatic hazard (H411): Toxic to aquatic life with long-lasting effects

Boric Acid shown above has a severe hazard according to CLP:
Reproductive toxicity (H360FD): May damage fertility or the unborn child

Ammonium Chloride has several hazards according to CLP:
Acute toxicity, Oral (H302): Harmful if swallowed
Serious eye irritation (H319): Causes serious eye irritation

It is the applicants view that the hazards listed above are no greater than those already being controlled on the current non-chrome processes on the plating line. Nevertheless, the trivalent chrome process would increase the use of boric acid, a Substance of Very High Concern, on the plating line,

3.3.1.4 Technical feasibility of Alternative 1

As previously stated, customers specifically request the traditional hexavalent chrome for their components because it matches the original specification and specific performance characteristics. Performance characteristics relate to corrosion resistance, chemical resistance and resistance to wear and abrasion. Other specific requirements relate to colour and shine stability together with surface consistency and smoothness.

A technically feasible alternative must be able to provide these characteristics in full. Moreover, it should be able to plate on the base materials currently being processed, which includes steel, castings, zinc die-castings and brass. Experience suggests that this should not be an issue.

Preferably, any technically feasible alternative should be using much of the existing process plant and equipment, and ideally be a straight transfer of chrome plating solutions.

The research and information gathered from a range of other applications for authorisation indicates that the trivalent chrome process differs from the existing process in a number of important ways. Additional plant and equipment will be required along with significantly tighter process control parameters. Trivalent chrome solutions are very sensitive to impurities and process temperature; therefore, ion exchange units are required to remove contaminants on a continual basis and cooling of the process solution is often required.

The research highlights that the components being processed need to be totally free of contamination from previous processing stages and therefore extra rising stages may be required before the trivalent chromium plating process.

Trivalent chromium chemistry is much more sensitive to metallic impurities and to changes in the pH of the plating solution. Even small deviations in the process conditions can strongly influence the deposition success, the layer quality, performance, and the final appearance.

It is reported that trivalent chrome surfaces are more porous and susceptible to corrosion, because the plated deposit is not a consistently pure chromium layer but rather a micro-cracked alloy of chromium and iron. Paradoxically, the presence of micro-cracks should, in fact, be improving the wear resistance and corrosion resistance.

Other research indicates that it may be necessary to add an additional post-treatment process (known as passivation) which could improve the durability and corrosion resistance of the plated deposit. However, even with this additional process, testing reported by other authorisation applicants has indicated that the plated surface remains markedly inferior at withstanding abrasion, salt-spray corrosion and chemical attack.

The applicant's working pattern is very unpredictable and does not operate the plating plant on a continual basis. The trivalent chromium plating process solution needs to be able to cope with being left idle for lengthy periods. Research indicates that trivalent chromium solutions are unsuitable for this type of working arrangement.

As mentioned previously, any technically feasible alternative must be able to meet the specific technical requirements in full. This is examined in detail below:

Corrosion resistance

Extensive research has been undertaken and references have been made to other applications for authorisation for the continued use of chromium trioxide. The corrosion resistance of electroplated chromium using trivalent chromium chemistry is dependent on many differing parameters. These include the type of process chemistry being used, the electroplated under-layers and any potential post-treatments used to enhance the corrosion resistance. It is concluded that the corrosion resistance of trivalent chromium electroplating does not currently meet the requirements of the applicant's customers and the legacy market generally.

Chemical resistance

Information provided previously and in other applications for authorisation shows that the chemical resistance of electroplated chromium using trivalent chromium chemistry is lower than when using hexavalent chromium trioxide. It is concluded that the chemical resistance of trivalent chromium electroplating does not currently meet the requirements of the applicant's customers and the legacy market generally.

Hardness and resistance to wear and abrasion

Although these terms are often seen as interchangeable, wear is the loss of material from the surface of a material and abrasion is one of the actions which can cause wear. The chromium plating produced from trivalent chemistry tends to have a lower hardness and therefore lower wear resistance. It is reported that research and development continues with regards to modifying the process parameters in order to improve this condition. It is concluded that the hardness and resistance to wear and abrasion of trivalent chromium electroplating does not currently meet the requirements of the applicant's customers and the legacy market generally.

Colour and shine stability

The colour of the deposit produced by trivalent chromium electroplating differs according to the make-up of the process solution and any impurities present. From the applicant's experience, components plated for the heritage and legacy market must match those produced when the vehicle was built. The visual appearance of components that are plated using trivalent chromium chemistry does not meet this specific requirement.

Surface consistency and smoothness

Also, the surface consistency of the deposit produced by trivalent chromium electroplating varies according to the make-up of the process solution and any impurities present. The surface quality can be so variable that it does not currently meet the requirements of the applicant's customers and the legacy market generally.

On the basis of this review, the conclusion is that trivalent chromium electroplating technology is not a technically feasible alternative to the traditional hexavalent chrome system at this time.

3.3.1.5 Economic feasibility of Alternative 1

The research and information gathered from a range of sources indicates that the trivalent chrome process would be more costly to run on a daily basis compared to the existing process. The capital expenditure required, and startup cost is significant.

Additional information has been obtained from a company known to the applicant (Referred to as Company A in this section).

A review of the implementation process for transition to trivalent chrome and the significant factors involved has taken place and is outlined below:

Plant, Equipment and Infrastructure

The process line will have to be re-engineered to account for the ion exchange process and the extra rinsing requirements to avoid impurities. It would not be possible to run both chrome plating systems in tandem during transition. Temporary alternate arrangements would have to be made.

Ion exchange units will have to be purchased (capital investment & increased energy consumption) to ensure that any impurities in the trivalent chromium process are removed. This removal needs to be a continuous process.

In 2013, Company A embarked on the transition to trivalent chromium. Out of a total project cost of £40,000, Company A spent £12,000 (30%) on new plant and equipment.

Start up

New platinised titanium anodes will have to be purchased for the new trivalent chromium process. The existing process uses lead anodes.

Solution make-up chemicals will have to be purchased. This is an initial one-off cost to make-up the new trivalent chromium process. There will be disposal costs involved in the removal of the existing hexavalent chromium solution from the site

Out of a total project cost of £40,000, Company A spent £17,000 (27%) on chemicals and anode materials.

Other setup costs

Implementing a new process will involve the engagement of contract labour, to assist with the infrastructure changes and commissioning. Management and staff training will also be necessary.

Out of a total project cost of £40,000, Company A spent £11,000 (27%) on contract labour, training and other miscellaneous items.

Running costs

Regular solution maintenance, probably on an hour by hour basis, will be essential since the trivalent chromium process chemistry requires more substances and additives. Compared to the existing process, the costs will be significantly higher.

Chemical analysis of the existing process is required no more once per month. Chemical analysis for a typical trivalent chromium plating solution will be needed every day (at least), therefore probably necessitating onsite laboratory facilities.

Energy consumption is likely to be higher. Although the trivalent chromium plating process uses less energy, there is likely to be a requirement for the solution to be cooled whilst in operation.

Cooling equipment and supporting pipework was not included in the review of new plant and equipment.

Other considerations include stripping and reprocessing costs, due to the potential colour variation between components and surface defects associated with trivalent chromium plating.

For Company A, over a 3 year period, the running costs for a trivalent chrome plating system was twice that of their hexavalent chrome system. The extra cost in materials during that period was approximately £10,000. It will not be surprising to learn that Company A, after 3 years, abandoned its use of the trivalent chromium system in favour of a return to the traditional hexavalent chrome. Citing the lack of control over nickel contamination, excessive downtime and disproportionate costs associated with regular purification, the finish was not visually comparable and interchangeable with hexavalent finishes and customer discontent.

Several local plating companies, in Wolverhampton, promote their use of trivalent chrome and must be operating it successfully on less demanding applications. On the companies' websites, it stipulates that their hexavalent option *"is much easier to control than trivalent because the solution comprises less chemicals"* and *"in reality, the hexavalent chrome finish does give a more corrosion resistant coating."*

On the basis of this review, for a micro business with limited turnover, the conclusion is that the trivalent chromium electroplating technology would not currently be an economically feasible alternative to the traditional hexavalent chrome system.

3.3.1.6 Suitability of Alternative 1 for the applicant and in general

With respect to the specific performance requirements of the coatings for the use being applied for and the excess cost involved, the use of trivalent chromium electroplating technology is not considered to be a viable alternative at the present time and may be in the foreseeable future.

3.4 Conclusion on shortlisted alternatives

Whilst this only potential alternative coating has successfully replaced hexavalent chromium trioxide in decorative chromium environments, for the specific products with the specific technical and performance requirements, it is not currently considered to be a viable alternative for the use being applied for.

4. SOCIO-ECONOMIC ANALYSIS

4.1 Continued use scenario

4.1.1 Summary of substitution activities

The applicant has researched the potential alternatives to chromium trioxide and has practical experience of the components produced from the trivalent chromium plating technology.

The trivalent chromium plating technology is the only viable alternative. This alternative does not satisfy any of the performance and visual characteristics that is required by the end users of the components being coated.

The most significant performance characteristics being corrosion resistance, chemical resistance, hardness and resistance to wear and abrasion, with no alternative able to satisfy these criteria.

To the end user, the most important visual characteristics are colour and shine stability, surface consistency and smoothness. The component parts should have the same appearance and match all other chromium plated parts on the vehicle – regardless of when or where they are sourced. None of the potential alternatives can satisfy these requirements.

4.1.2 Conclusion on suitability of available alternatives in general

Since currently available alternatives are unacceptable to the end users, the conclusion is that the applicant has no available or potential alternative, likely to be introduced for the foreseeable future. Therefore, it is not possible to produce a substitution plan.

4.1.3 R&D plan

The applicant is a micro enterprise, as defined in the EU recommendation 2003/361, and does not have the resources and access to funds to perform individual R&D activities.

The applicant is fundamentally a subcontractor and relies entirely on the R&D carried out by the major process chemistry suppliers. The costs are prohibitive to micro businesses and who would simply review samples from by the major suppliers as and when new plating systems become available.

Following a programme of rigorous testing with regard to its performance characteristics, any decisions to proceed with an alternative would be made in partnership with customers who would be the ultimate judge of quality.

Trade associations such as the Surface Engineering Association, have access to research and development activities on a global scale and they are a valuable source of information.

4.2 Risks associated with continued use

4.2.1 Impacts on humans

Since the results of the plating workers biological monitoring programme for 2024 are below the background level of hexavalent chromium (Cr(VI)) for the general population (which is typically around 10 µmol/mol creatinine) and that there are no discharges of chromium trioxide to the environment, it can be concluded there is no excess lifetime risk to individuals (workers or general population) or to the environment.

Nevertheless, as chromium trioxide is classified as a non-threshold carcinogen, the dose response relationship for exposure to chromium trioxide developed by the Risk Assessment Committee of the European Chemicals Agency should be employed to calculate the excess risk.

The worst-case assessment of worker health risks within this socio-economic analysis utilises the results of a study endorsed by ECHA identifying the reference dose response relationship for carcinogenicity of hexavalent chromium. These results are acknowledged to be the preferred approach of the RAC and SEAC and therefore have been used as a methodology for the calculation of work cancer risks in this socio-economic analysis.

Following the applicant's worst case scenario methodology, the highest total excess risk value from the CSR, table 10.2 (section 10.1.1), is used to make the assessment of health impacts.

Table 4.1 Highest excess lung cancer mortality risk to a worker covered by this application

Support Plater	Total excess risk (40 years)	0.00521 [A]

Table 4.2 Excess risk estimates for 40 years exposure for workers

No of exposed people	Excess lifetime mortality risk per employee	Number of excess fatal cancer cases predicted over 40 years *
2	0.00521[A]	0.01042 [B]

*per employee x2

The overall cumulative number of excess fatal cancer cases over a 40-year period, for the exposed worker population in this application is calculated to be 0.01042.

The individual development of cancer may be fatal or non-fatal but the dose response excess risk unit coefficient considers only fatal cancer. It must therefore follow that the excess risk of contracting cancer is higher than the excess risk of fatal cancer.

Referencing the Opinion by the Agency for UK REACH on an Application for Authorisation for Chromium Trioxide by SEA CTAC - Legacy Parts dated 23/10/2023, table 4.3 shows the monetary values for fatal and non-fatal cancer that were used when revising the estimates provided by the consortium applicants.

Table 4.3 Monetary values for fatal and non-fatal cancer

Value per statistical fatal cancer case	£3.9m - £5.5m [C]
Value per statistical non-fatal cancer case	£0.5m [D]

According to Cancer Research UK, the 5-year survival rate for lung cancer in England is approximately 20%, meaning that 80% of cases are fatal within five years of diagnosis.

Table 4.4 Statistics for lung cancer in England

5-year survival rate	20% [E]
Non-fatal – fatal ratio	1:4
Present Value Factor (PDF): Discounting at 3.5%. and a latency period of 10 years	0.7089 [F]

Note: $PDV=1/(1+r)^n$ where r= discount rate (3.5%) and n= latency period (10 years)

This enables the determination of present value (PV) of the total monetised excess risk (fatal and non-fatal cancer) over 12 years (review period).

Table 4.5 provides an analysis of the additional lifetime risk of contracting lung cancer due to exposure to Cr(VI) incurred over the working lifetime of directly exposed workers performing tasks described in the worker contributing scenarios.

Table 4.5 Summary of additional statistical lung cancer cases

	Number of exposed people	Estimated statistical fatal cancer cases (over 12 years) [1]	Value per statistical fatal cancer case	(PV) Monetised excess risk, fatal (over 12 years) [2]	Estimated statistical non-fatal cancer cases (over 12 years) [3]	Value per statistical non-fatal cancer case	(PV) Monetised excess risk, non-fatal (over 12 years) [4]
Directly exposed workers	2	0.003126 [G]	£3.9m-£5.5m [C]	£8.6k-£12.2k	0.0006252 [H]	£0.5m [D]	£0.2k
General population	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes: 1. Excess risk is estimated over a typical lifetime working exposure (40 years). G = B x 12/40

2. Calculation C * G * F

3. Calculation H = G * E

4. Calculation D * H * F

The present value (PV) of total monetised excess risk (fatal and non-fatal cancer) over 12 years (review period) = £8,800-£12,400. [2]+[4]

The exposure of the local and regional populations to Cr(VI) via the environment is negligible and therefore results in a negligible monetised excess cancer risk.

The implications of a non-use scenario will only affect the applicant and its customers.

4.3 Non-use scenario

If the application is not granted, the applicant expects that without the chrome-plating facility, it would lose its refurbishment and restoration business, and the company would be unable to continue trading.

This will place the workers at immediate risk of unemployment and the applicant will be confronted with significant costs associated with chemical disposal, redundancy, asset disposal and sale of premises.

4.3.1 Summary of the consequences of non-use

In the non-use scenario, the applicant will cease trading, and customers will have to research providers of traditional hexavalent chrome plating who have the skills and dedication for the refurbishment and restoration of heritage motor vehicle components. Taking into account the potential for a non-use scenario for the Surface Engineering Association Legacy Consortium then providers of traditional hexavalent chrome plating would have to be from outside the UK and the EU. If the consortium were successful and were authorised for continued use, then there would be no benefit to society because the applicant's customers would potentially move to other current competitors, and they would still be using hexavalent chromium.

The applicant will have job losses, and this would be a total of 15 part time and full time persons, together with other external support workers. Since the applicant is fundamentally a subcontractor it is impossible to quantify any additional risk of job losses at the applicant's customers.

There will be an economic effect on the applicant's suppliers of the proprietary plating chemistry currently purchased but this has not been determined for this application. Regarding the potential for a complete non-use scenario for the legacy sector in the UK then the economic effect on suppliers of the proprietary plating chemistry would not be insignificant.

The applicant is in regular contact with many local owners of electroplating businesses. Their reaction to the quality of product, produced by the currently available trivalent chromium plating technology, is that it doesn't meet the strict requirements for their customers by way of corrosion performance and "*doesn't come close to matching hexavalent chrome*".

4.3.2 Identification of plausible non-use scenarios

For the purpose of exploring plausible non-use scenarios, below identifies any possible non-use scenarios, many of which will not be seem reasonable or probable:

- Change to a worse performing alternative
- Shut-down the chrome plating process
- Shut-down all plating processes
- Relocate the business outside of the UK and the EU
- Shut-down the business

Change to a worse performing alternative

Trivalent chromium electroplating is the only alternative which is seriously being considered by the jobbing shop electroplating sector and is the only option meriting consideration in this application for authorisation.

Section 3.3.1 details the trivalent chrome process, its operation, and its technical characteristics.

The conclusion outlined in Section 3.4 is that, for the specific products with the specific technical and performance requirements, it is not currently considered to be a viable alternative for the use being applied for.

In light of this conclusion, the applicant would not consider this option, taking into account customer's rejection of the process. Total loss of business and business closure would result.

Shut-down the chrome plating process

Whilst retaining the restoration and refurbishment skills, the applicant could outsource the chrome plating process to other electroplaters who are authorised to use hexavalent chromium trioxide.

There are significant commercial issues to be considered. It is inconceivable that the outsource could be in the legacy electroplating sector. Many outsource platers are restricted by component size and would need to be capable of plating large and varied of components.

The benefits of having chrome plating onsite is that there is total control of quality and components only have to travel a few metres between operations. Transporting components to and from an outsource is fraught with danger. Significant cost will already have been invested in the product and specialist packaging would be essential to maintain quality and avoid damage. In addition to the difference in plating cost, there will be extra costs due to rejects from poor plating and potential transit damage. This does not make this scenario a plausible option.

Reflecting on this option, it would be highly likely that there would be no requirement for the onsite nickel plating process either, because the product could be outsourced in the copper state. It is probable that the outsourcing electroplating company would choose to process the products through their own nickel chrome plating system.

Shut-down all plating processes

This option is being considered because there could be a chance for someone continuing with the restoration and refurbishment business alone and use the building as a repair shop, attempting to retain the acquired metal working skills. This is unlikely to be a plausible option because the building would be too large, and the overheads would be unsustainable. The restoration and refurbishment would probably be taken on board by a competitor following the shutting down of the current business.

Relocate the business outside of the UK and the EU

This option is being considered because there is likely to be locations in the world where authorisations will not be required. As stated before, the applicant is fundamentally a subcontractor and depends on UK enthusiasts and the UK heritage/classic car market. It is concluded that this scenario as not a plausible option.

Shut-down the business

Trivalent chromium electroplating is the only alternative which is seriously being considered by the jobbing shop electroplating sector and is the only option meriting consideration in this application for authorisation.

Section 3.3.1 details the trivalent chrome process, its operation, and its technical characteristics. The conclusion outlined in Section 3.4 is that, for the specific products with the specific technical and performance requirements, it is not currently considered to be a viable alternative for the use being applied for.

As there is no alternative process which meets customer’s requirements, it is inevitable that the business will close, and the staff, who are highly skilled, and long serving will be made redundant.

It is concluded that this scenario is the only plausible option.

The applicant will have to dispose of all materials, using specialist contractors to handle the hazardous waste, thereby incurring unrecoverable costs. The plating facility will then be dismantled and disposed of for scrap recovery, incurring further specialist contractor cost because of the contaminated equipment.

Significantly, removal and clean-up costs will reduce company balance sheet value affecting the applicant’s ability to pay both statutory and commercial creditors and, possibly staff redundancy payments.

4.4 Societal costs associated with non-use

In the continued use scenario, it is expected that there will be some additional costs resulting from any conditions that may be applied to the authorisation approval but not significant enough to affect future trading. There would be no effect on business activity and employment would continue at the current levels. Support for the UK enthusiasts and the UK heritage/classic car market would continue, together with its contributions to the local economy.

There would be no increased health effects to either the workers or the general population and there would be no financial burden on the health or social services.

The restoration market in the UK makes a significant economic contribution to the UK economy and supports around 113,000 jobs. It is forecast that there is likely to be growth in the market of around 8% year on year and therefore will provide market opportunities for the applicant in the continued use scenario.

The most likely non-use scenario is that the business will close and since this market is demand driven with real-time needs and customer preferences, it is likely that the financial impact on the customer supply chain will be minor as the demand for refurbishment and restoration is taken up by competitors in this sector.

It is assumed that all those workers who are made redundant, as a result of the non-use scenario, would experience a period of temporary unemployment. This assumption is based on the understanding that the workers are generally highly skilled and likely to regain employment within a relatively short period.

Conversely, this statement might be affected by a non-use scenario for the SEA Legacy Consortiums, since there will be a significant number of redundancies with far fewer plating jobs available in the UK electroplating sector.

To address the societal impact of unemployment, the applicant considers the SEAC's approach in SEAC/32/2016/04 (Dubourg, 2016) which concludes that, for the UK, the social cost of one job lost is about 2.09 times the annual pre-displacement wages (excluding taxes paid by the employer) of this job.

Table 4.6 Expected job losses and annual salaries

	No. of workers *	Total gross wage paid per annum **
Skilled	6	£154,000
Semi-Skilled	3	£71,000
Totals	9	£225,000

Nore : * Average based on Annual Work Unit calculations

** Calculated on the basis of average hours worked per week and average rate per hour

Using the above total gross wage paid per annum and applying the SEAC(2016) approach for unemployment in the UK, the following figures can be deduced.

Table 4.7 Unemployment cost component estimates

Component	NPV	Distribution of cost
Lost output	£285,348	Nominal years 1-2
Leisure time	-£126,436	Nominal years 1-2
Search costs	£7,904	Nominal years 1-2

Recruitment and training costs	£53,147	Nominal year 3 only
Scarring costs	£249,195	Nominal years 2-8
Total cost of job losses	**£469,157**	

Nore: Net present value (NPV), discounting as per methodology

This value of total unemployment cost is over an 8 year period, since the distribution of cost using the SEAC(2016) approach is for nominal years 1-8 overall.

4.4.1 Economic impacts on applicants

Welfare Implications

As result of redundancy, there will be costs incurred on payments to workers, subject to statutory regulations.

Site Closure Plan

An estimation of the disposal costs of the process chemistry is shown below:

Table 4.8 Disposal Costs of Process Chemistry

Commodity	Est. Volume Litres / Kg	Disposal Cost	Disposal Method *	Comments
Swills & Rinses	7000	£1,000	Tanker	Dump to contained storage then tanker
Cleaners & Acids	11200	£1,900	Tanker	Dilute then dump to contained storage then tanker
Plating Solutions	12600	£4,000	Contractor	1000L IBCs
Stores	300	£50	Inventory for re-sale ?	If these did not attract a buyer, then waste contractor
Solid Waste	2500	£500	Contractor	Sludge etc in 205L drums
Contained Storage	15000	£2,500	Tanker	
Stripping Solutions	2500	£500	Contractor	205L drums / IBCs
Total disposal cost of process chemicals		**£10,450**		

Note: * Authorised & Registered Contractors

Plating Equipment for scrap:
Steel Tanks 27 X 700 Kg : Est. scrap value £3,500
Pipe Work, Plastic Liners Etc

Ancillaries for scrap:
Ventilation Ducting, Jigs, Transporters, Switch Gear, Rectifiers, Bus Bars, Cables

Other site equipment (Probably for resale)
Polishing Equipment, Lathes etc, Boilers etc

Other Considerations:
Specialist Site Contractors, Asbestos Consultants, Bore Hole Sampling, Site Clearance Costs

As the applicant will need to finance the disposals and clean-up costs, the probability is that the applicant would enter administration/liquidation putting, as a minimum, the burden of redundancy on the employee having to make a claim from the government, by way of the National Insurance Fund (NIF) through the Redundancy Payments Service.

Direct business loss due to closure

Following the SEAC's approach in guidance SEAC/52/2021/03 on producer surplus, the default value of 4-years of profit losses has been used to estimate direct business loss due to closure.

This value has been selected because there is no suitable alternative generally available (Non-SAGA) for the use of functional chrome plating with decorative character being applied for.

As discussed in SEAC(2021), a production asset can be considered to have scrap value if it cannot be sold in its current form, and instead can only be sold for parts. Furthermore, a production asset has resale (or salvage) value if it can be sold to a new user in its existing form.

As shown above, in the site closure plan, it is likely that certain on-site equipment will be offered for resale and would eventually attract buyers. Other plant is unlikely to attract such buyers and would be considered as scrap. This residual asset value has been conservatively estimated at £15,000 and is deducted from the eventual estimate of profit losses.

Following the applicant's worst case scenario approach, the disposal cost of process chemicals, shown in table 4.8, has not been included any of the following calculations.

4.4.2 Economic impacts on the supply chain

In the non-use scenario, the applicant will cease trading, and customers will have to research providers of traditional hexavalent chrome plating who have the applicant's skills and dedication for the refurbishment and restoration of heritage motor vehicle components.

Enthusiasts in this market sector will remain and the short term uncertainty or reduction in demand will return as the alternative supply routes adapt.

4.4.3 Economic impacts on competitors

Again, in the non-use scenario, there would be no benefit to society, since the applicant's customers would potentially move to other current UK competitors, and they would still be using hexavalent chromium.

Assuming that the Surface Engineering Association Legacy Consortium was successful and were authorised for continued use, in the non-use scenario, there will be a short term effect on the customer base while alternative sources within the UK are established.

The approach to valuing producer surplus losses is based on SEAC(2021), and already accounts for gains to competitors in the non-use scenario.

4.4.4 Wider socio-economic impacts

Socio-economic impacts described in the previous sections, include the societal impact of unemployment resulting from a refused authorisation (Section 4.4) and support for UK enthusiasts and the UK heritage/classic car market would be diminished, together with the applicant's contribution to the local economy.

The applicant's business will probably need to enter administration/liquidation, and the burden of redundancy will fall on the government, by way of the National Insurance Fund and the Redundancy Payments Service.

4.4.5 Compilation of socio-economic impacts

Table 4.9 Societal Costs Associated with Non-Use

Description of major impacts	**Monetised/quantitatively assessed/qualitatively assessed impacts**	**Monetised/quantitatively assessed/qualitatively assessed impacts**
1. Monetised impacts		**£ [per year] [Over 12 years]**
Direct business loss due to closure	£237,854* over 4 year period	£19,821
Potential supply chain impact	Not evaluated	
Social cost of unemployment	£469,157 ** over 8 year period	£39,096
Cost of lost wages	£270,000*** over 1.2 years	£22,500
Sum of monetised impacts		£81,417
2. Additional quantitatively assessed impacts		**[Per year] [Over x years]**
	Not applicable	
3. Additional qualitatively assessed impacts		
	Not applicable	

Note: * Reduced by residual asset value SEAC(2021)
** Net present value (NPV) SEAC(2016)
*** Table 4.6 figure x Mean duration (years) of unemployment UK (1.2 years) SEAC(2016)

4.5 Combined impact assessment

Table 4.10 Societal costs of non-use and risks of continued use

Societal costs of non-use		**Risks of continued use**	
Economic impacts Direct business loss due to closure Social impacts Social cost of unemployment + Cost of lost wages	£19,821 per year over 12 years + £61,596 per year over 12 years	Monetised excess risks to directly and indirectly exposed workers	£8,800 - £12,400 over 12 years Equates to £1,033 (upper bound value) per year over 12 years
Potential supply chain impact	Not evaluated		
		Monetised excess risks to the general population	No risk to general population
Qualitatively assessed impacts	Not applicable	Qualitatively assessed risks	No direct emissions to the environment

To summarise:
As shown in table 4.10 the monetised excess human health risk (fatal and non-fatal cancer) as a result of exposure to Cr(VI) in this application is estimated as £1,033 (upper bound value) per year over 12 years (review period).

As shown in table 4.10 the total costs of the non-use scenario are estimated at £81,417 per year over 12 years (review period).

Conclusion:
The costs of non-use clearly outweigh the monetised excess health risk as a result of workers exposure to Cr(VI).

Costs of non-use per unit of release.
Not applicable.

4.6 Sensitivity analysis

With reference to the ECHA (2011) Guidance on the preparation of a socio-economic analysis, a simple qualitative assessment of uncertainties should be sufficient because there would need to be extremely significant changes to the calculations for the overall conclusion to change.

Exposure calculations made in the CSR rely entirely on using the Advanced REACH Tool 1.5 (ART) exposure model. Input values are as accurate as possible and include both near-field and far-field parameters as necessary.

The most important worker contributing scenario, WCS 3 - Working in the Plating Shop, which was likely to reveal the most significant exposure value, was modelled over a full working shift. The model included three activity stages, to ensure the most precise result.

- Activity 1 : Working outside Chrome Zone
- Activity 2 : Working inside Chrome Zone
- Activity 3 : Working with contaminated components after plating

The task based personal exposure measurements recently performed reveals a maximum value for this scenario, of 0.927 µg/m³ Cr(VI) Exposure (8hr TWA) compared with an ART modelled value 1.2 µg/m³ Cr(VI) Exposure (8hr TWA).

Although more measurements are required for a true statistical analysis, for the purpose of the CSR, the modelled result is sufficiently representative and is in keeping with the worst case approach taken throughout this application.

The health risks of continued use need to increase significantly and a major reduction in economic and social impacts, would be the only way that the conclusion could affected.

4.7 Information to support for the review period

The applicant considers a review period of 12 years to be appropriate, on the basis that the only viable alternative that might be acceptable to the applicant’s customers is unlikely to be commercially available for the foreseeable future and that the risk management measures, and operational controls employed are robust and the human impact risks are extremely low.

Research into alternatives to hexavalent chromium electroplating has been conducted for decades, by the plating industry, without discovering any process that provides a surface finish that matches the unique performance and decorative benefits of hexavalent chrome. Major innovations and developments will be necessary to overcome the performance weaknesses of trivalent chrome. The industry has initiated joint research projects with academic groups to address these weaknesses, but no significant success is expected within the foreseeable future.

The legacy market is dominated by components plated using hexavalent chrome because of its superior performance, prolonged lifespan and visual quality. The only viable alternative, at the moment, "*doesn't come close to matching hexavalent chrome".*

Even if the research groups did develop a viable alternative to hexavalent chrome within the requested review period, it would take several years to develop into a marketable product, industrialise the production process, and for users to introduce the necessary process changes for industrial-scale production.

In conclusion, with the research and development efforts that have been made in the past and the future ongoing efforts that will required by the industry, it does not provide confidence that it will lead to any major development of a suitable alternative, that could be available within the normal review period. While the continuing human impact risks remain low and the socio-economic benefits continue to be high, there is clear evidence that this balance is not likely to change in the next 12 years and justifies the requested review period as appropriate.

5. CONCLUSION

The applicant is a well-respected micro business and specialises primarily in the refurbishment and restoration of chromed parts for vintage and classic cars and motorcycles. It employs a small team of versatile metal workers and long serving staff, experienced in the metal finishing business. The applicant has a loyal customer base, made up of enthusiasts, prestigious restoration businesses, spares dealers and general engineering companies. Typical components include bumpers, overriders, bonnet and boot catches, light surrounds, door and window trims, exhaust systems and handlebars.

The applicant uses hexavalent chrome because it meets its customer's requirements for the high quality finish, its hard-wearing properties and matches the other chromed parts on their classic and/or heritage vehicle. Customers confirm that there is currently no suitable alternative for hexavalent chrome plating.

The applicant is too small to be able to undertake significant R&D into alternatives but will continue to liaise with their supplier and clients and monitor the development of new technologies. However, as subcontractors, the applicant is dependent on the preferences of its customers and exists to provide the services and products which those customers' demand.

If authorisation is not granted, the applicant expects that the business would be closed down, with the consequences of redundancies and plant disposal.

The Chemical Safety Report has justified that risks to workers are well controlled, and there is no risk to 'man via environment'.

The costs of a non-use scenario are shown to outweigh the risks of continued use by a significant factor.

6. REFERENCES

BS EN ISO 1456:2009 published by British Standards Institute

Application for authorisation for the continued use of chromium trioxide, submitted by the Chromium Trioxide Authorisation Consortium (CTAC), to the European Chemicals Agency (ECHA)

Application for authorisation submitted by Surface Engineering Association Legacy Consortium, to Agency for UK REACH. (Ref. AFA024-01)

Opinion by the Agency for UK REACH on an Application for Authorisation for Chromium Trioxide by SEA CTAC - Legacy Parts dated 23/10/2023 (Ref. AFA024-01)

Justification for confidentiality claim

This report does not contain any redacted information.