# CHEMICAL SAFETY REPORT

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|---|---|
| **Legal name of applicant(s):** | Vertik-al ltd, Custom Wyteline powder ltd, Alucoat ltd, Architectural Powder Coating ltd, Senior architectural systems ltd, Superior Paint & Powder Coating ltd, Protective metal finishing ltd. |
| **Submitted by:** | *Vertik-al ltd* |
| **Substance:** | *[Chromium Trioxide CrO3, EC number 215-607-8 CAS number 1333-82-0]* |
| **Use title:** | *[Pre-treatment conversion coating of aluminium for the construction industry by spray and dip process]* |
| **Use number:** | *[1]* |

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# 9. EXPOSURE ASSESSMENT (and related risk characterisation)

## 9.1 Introduction

## 9.1. Overview of uses and Exposure Scenarios

The consortium operates powder coating facilities for aluminium mainly for the architectural industry, They operate pre-treatment lines based on Chromium trioxide (Chromic acid) by the chromium phosphate conversion method (green chromate)

The aluminium is oxidised with the loss of electrons

$Al \longrightarrow Al^{3+} + 3e^-$

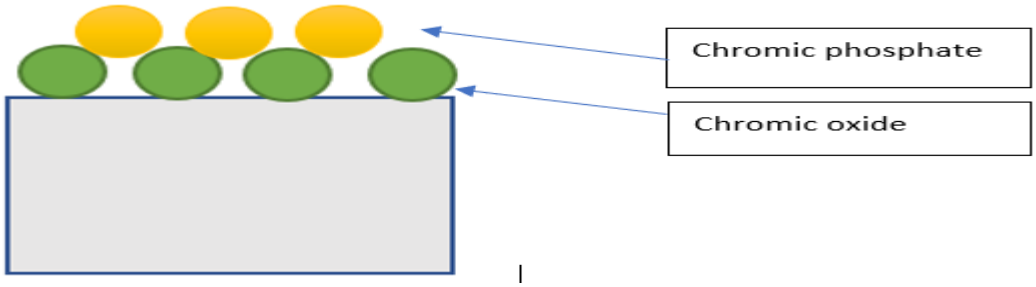
Chromic acid is reduced with the gain of electron

$HCrO_4^- + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$

With the addition of phosphoric acid a further conversion takes place

$Cr_2O_3.3H2O + 2H_3PO_4 \longrightarrow 2CrPO_4 + 6H_2O$

The conversion coating is characterised by chromic oxide at the aluminium surface and chromic phosphate forming a layer on top. These reactions are dependent on the concentrations, free Fluoride and the pH.




The chromium on the surface of the aluminium after conversion is in its trivalent transition state so that Chromium Trioxide does not appear in the downstream uses.

The chromium provides adhesion of the powder paint to the aluminium, corrosion resistance and is self-healing so that damage to the paint does not result in corrosion.

The consortium companies operate pre-treatment lines by spray or immersion plant for extrusions, fabrications and panel work.

The spray lines are closed systems with no emissions to air of Chromium Trioxide, the immersion lines have an open Chromium trioxide bath at ambient temperature and does not have any air emissions. Exposures by air are negligible from these processes.

There is an emission to the environment of Chromium in trivalent form following effluent treatment where the chromium is removed as a solid in a trivalent form in some of the sites. On other sites wastewater from rinsing is stored and removed by tanker, this must be further treated by the waste company. This discharge from site is then as chromium trioxide.

Exposures are possible by oral route from skin contact during maintenance activities, such as cleaning. These can be controlled with PPE and hygiene, there is an argument for biological testing for workers involved in maintenance activities.

**Tonnage information:**

Assessed tonnage: .10-100.. tonnes/year based on:

..10-100. tonnes/year used of proprietary Chromate pretreatment solution.

**Tonnage supplied per market sector: N/A**

The following table lists all the exposure scenarios (ES) assessed in this CSR.

**Table 1 a. Overview of exposure scenarios**

| Identifiers*) | Market Sector | Titles of exposure scenarios | Tonnage (tonnes per year) |
|---|---|---|---|
| ES 1: F# | architecture | Industrial end use, pre-treatment | 10-100 |
| | | | |
| ***) Manufacture: M-#, Formulation: F-#, Industrial end use at site: IW-#, Professional end use: PW-#, Consumer end use: C-#, Service life (by workers in industrial site): SL-IW-#, Service life (by professional workers): SL-PW-#, Service life (by consumers): SL-C-#.)** | | | |

**Table 1 b. Overview of Contributing Scenarios**

| Contributing scenario | ERC / PROC | Name of the contributing scenario | Size of the exposed population |
|---|---|---|---|
| **ES 1: ERC 7 industrial use of substances in closed systems** | | | |
| ECS1 | SU3 industrial uses | Industrial end use, pre-treatment | Regional: 0<br>Local:0 |
| WCS 1 | PROC2 use in closed process, with occasional controlled exposure | Loading IBCs and other containers | 5 |
| WCS 2 | PROC1 use in closed process, no likelihood of exposure | Addition of chemical by pump method | 6 |
| WCS 2b | PROC 8b transfer of substance or preparation from small | Addition of chemicals manually | 9 |

| | | | |
|---|---|---|---|
| | containers into tank at dedicated facilities | | |
| WCS 3 | PROC3 treatment of articles by dipping or pouring | Part processing Immersion | 15 |
| WCS 4 | PROC2 use in closed process with occasional controlled exposure | Part processing Spray | 0 |
| WCS 5 | PROC0 other process activity | Maintenance cleaning | 23 |
| WCS 6 | PROC0 other process activity | Maintenance breaks down | 10 |
| WCS 7 | PROC0 other process activity | Waste water via Effluent treatment | 4 |
| WCS 7b | PROC8a transfer of substance or preparation via tanker at non-dedicated facilities | Waste water via tanker to registered waste contractors | 12 |
| WCS 8 | PROC15 use as a laboratory reagent | Testing | 15 |
| WCS 9 | PROC0 other | Delivery and storage | 16 |

| | | | |
|---|---|---|---|
| | process activity | | |

## 9.2. Introduction to the assessment

### 9.2.1.1. Environment

**Scope and type of assessment:**

**Table 2. Type of risk characterisation required for the environment (if relevant)**

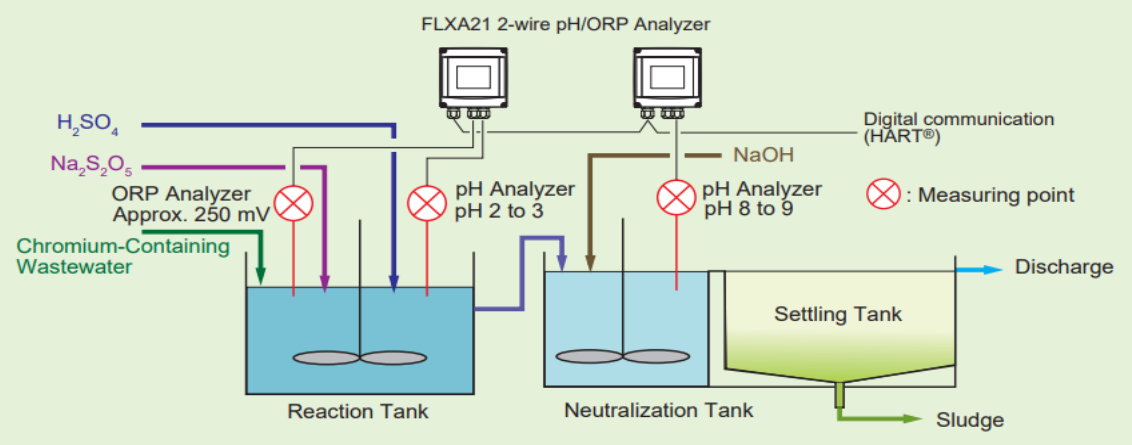
| Protection target | Type of risk characterisation | Hazard conclusion DNEL / dose – response relationship |
|---|---|---|
| Freshwater | Not required | Not relevant |
| Sediment (freshwater) | Not required | Not relevant |
| Marine water | Not required | Not relevant |
| Sediment (marine water) | Not required | Not relevant |
| Sewage treatment plant | Not required | Not relevant |
| Air | Not required | Not relevant |
| Agricultural soil | Not required | Not relevant |
| Predator | Not required | Not relevant |

**Comments on assessment approach:**

Releases to water are via an effluent treatment plant where the Chromium is removed to below the levels consented by Regulator.

The diagram below represents the effluent system. The principle of the operation is a reduction reaction (OILRIG, oxidation is loss of electrons, reduction is gain) of Chromium VI to Chromium III by the gain of electrons. $Cr^{6+} + 3e^{-}$ $Cr^{3+}$

1. Into the first stage acid is dosed to pH 2. Sodium Metabisulphite is dosed at a constant rate to hold the oxidation reduction potential to approx. 250mV. This leads to the reduction of Chromium VI into Chromium III.
2. In the second stage alkali is dosed to raise the effluent to pH 7-9, at this pH there is a conversion to Chromium (III) hydroxide that is insoluble, precipitation occurs and along with a coagulant allows the chromium to be separated from the water.
3. This is then allowed to settle, and the chromium free water is passed to the drain and the chromium has been made safe to Chromium III, in our system the effluent goes through a further stage of filter pressing to a solid waste.




Reaction
Sodium metabisulfite

$Na_2S_2O_5 + H_2O \rightarrow 2NaHSO_3$

$2H_2CrO_4 + 3NaHSO_3 + 3H_2SO_4 \rightarrow Cr_2(SO_4)_3 + 3NaHSO_4 + 5H_2O$

$Na_2Cr_2O_7 + 3NaHSO_3 + 5H_2SO_4 \rightarrow Cr_2(SO_4)_3 + 5NaHSO_4 + 4H_2O$

$Cr_2(SO_4)_3 + 6NaOH \rightarrow 2Cr(OH)_3 + 3Na_2SO_4$

Waste water by waste contractor

Some sites within the consortium do not treat wastewater and instead have it removed using waste contractors. This means that Chromium Trioxide from these sites undergoes processing by a similar method at waste processing plants. The Chromium Trioxide in this case is diluted.

The total Chromium Trioxide emission by this route from the consortium is estimated at 1250 kg per annum of $CrO_3$, This value is determined by a typical analysis on the waste multiplied by the annual volume of waste.

### 9.2.1.2. Human via environment

**Scope and type of assessment:**

There are no emissions from the process outside of the boundary so there is no risk for the local environment.

**Table 3. Type of risk characterisation required for human via the environment**

| Route of exposure and type of effects | Type of risk characterisation | Hazard conclusion DNEL / dose – response relationship |
|---|---|---|
| Inhalation: Systemic Long Term | N/A | |
| Oral: Systemic Long Term | N/A | |

**Comments on assessment approach:**

The exposure scenarios are closed processes.

### 9.2.1.3. Workers

**Scope and type of assessment:**

Exposures were measured at all but two of the companies in the consortium, those two companies have ordered testing for 2024 as a condition of inclusion in the consortium.

For the assessment 0.0014 mg/m3 will be used as this represents the average dose that from all tests conducted over four years. Of the 29 measurements made within the consortium only 3 measurements were above the level of detection for the test.

This represents personal exposures of workers performing multiple tasks in most cases.

Biomonitoring by 2 companies with an average of 1.77umol/mol also representative of workers performing multiple task.

Some biomonitoring was conducted by Vertik-al that due to the nature of Vertik-al having two plants and testing by a separate department is more task specific.

Dose response relationships were taken from RAC/27/2013 rev 1.

**Table 4. Type of risk characterisation required for workers**

| Route | Type of effect | Type of risk characterisation | Hazard conclusion DNEL / dose – response relationship |
|---|---|---|---|
| Inhalation | Systemic Long Term | Not required | |
| | Local Long Term | Average exposure over all tests 0.0014mg/m2 | ELR = $0.04X10^{-3}$ for 40 years<br>(based on 40 years, 8 hrs/day 5 days/week) |
| Oral | Systemic long term | Not required | |
| | Local long term | Measured dose 0.0014mg/$m^3$ | ELR = $0.2X10^{-4}$ for 40 years<br>(based on 40 years, 8 hrs/day 5 days/week) |

Comments on assessment approach related to toxicological hazard:

Excess risk levels in workers will only be assessed by the inhalation route,

There are good hygiene practices to avoid exposure by ingestion.

In the case of airborne Cr(VI), the oral route (swallowing of the non-respirable fraction) does not need to be explicitly considered since:

(i) the exposure calculations (airborne concentrations) do not provide different particle size fractions (inhalable/thoracic/respirable);

(ii) (ii) the excess lifetime risk (ELR) for intestinal cancer is lower than that for lung

cancer. The assessment of health impacts is therefore dominated by the potential risk of lung cancer due to inhalation of Cr(VI);

(iii) (iii) the document on a reference dose-response relationship for Cr(VI) compounds (RAC/27/2013/06 Rev.1) states that "in cases where the applicant only provides data for the exposure to the inhalable particulate fraction, as a default, it will be assumed that all particles were in the respirable size range."

## Comments on assessment approach related to physicochemical hazard:

The same controls are relevant to the physicochemical hazard, Chromium trioxide is not considered as a carcinogen via skin, however it is acidic pH 3-4 and therefore corrosive with prolonged contact.

## General information on risk management related to toxicological hazard:

The CoSHH hierarchy of control determines appropriate order to reduce risks.

### Elimination/Substitution

Elimination would be either not carrying out pre-treatment which is not possible as the paint would not adhere to the aluminium or using other materials.

The consortium members are job coaters so do not determine the materials used by our customers, however the benefits of powder coated Aluminium are parts that are they are fully recyclable and last for up to 40 years in situ. This means that our customers are unlikely to choose other materials.

The principle of authorisation is substitution, substitution activities have been conducted at most sites either trials with alternatives or investigations towards this aim. The reasons for substitution not taking place is set out in the AoA-SEA document.

Companies within the consortium will continue substitution activities.

### Engineering

Sites have employed engineering controls to separate workers from tanks containing Chromium Trioxide,

methods employed are screens, remote control on cranes, lids on spray tanks.

Authorised access is used to limit the numbers of worker with potential exposure.

Some sites have automated additions using pumps to eliminate some handling.

Bunding and/or caging is employed at sites for storage.

Spillage kits are available at most sites.

The process parameters reduce exposure as tanks are static (not agitated) and unheated. There are no expected emissions to air from immersion processes. Some small exposure might occur when baskets are lifted where an aerosol could form from splashing of liquid.

In spray plants the stage is sealed all round and the position in the sequence means that rogue emissions are not possible. A biological test was conducted on an operator working within 10m of the plant and had 0umol/mol indication that only those workers directly involved in the process are likely to be exposed.

In general it is not expected that indirect workers will be exposed to Chromium Trioxide.

### Administrative

Each company have produced CoSHH assessments and Risk assessments taking into account the CTAC recommendations from 2020 included in the CTAC authorisation that we

were working to between 2020-2024, a compliance pack of these CTAC advise sheets have been sent to all consortium members to use for review.

All companies have conducted some exposure testing, companies are encouraged to conduct bio-monitoring.

External companies were employed to carry out exposure measurements both personal and static. The results of which showed that exposures were very low and below measurable amounts on most sites (<0.0006mg/$m^3$) in 24 of 29 tests conducted across all sites. Average over all tests is 0.0014mgm$^3$ or 1.4ug/$m^3$

A permit to work system was implemented on some sites for maintenance activities

Operators were trained in the risks associated with Chromium Trioxide.

Due to the low exposures recorded and risk assessments indicating low exposure risk most companies in the group have not conducted biological testing, Superior Paint and Powder Coating has conducted biological tests and report low results and APC have also conducted biological testing with low results.

Vertik-al decided to also conduct biological testing for 2024 to add additional data to the risk profile of the consortium CSR. The Vertik-al tests were more task specific to improve the overall effectiveness of worker scenario risks.

The average from SPPC and APC doing biological testing is 1.77 umol/mol.

The limit is 10umol/mol although it must be noted that there is no derived no effect level so exposures cannot be regarded as safe even if they are controlled.

Vertik-al tests were more task specific so will be used for worker scenarios.

The average will be used across all worker scenarios except where task specific tests we conducted by Vertik-al

Vertik-al tested, Maintenance operator activities result 3.5umol/mol, Testing activities result 1.2umol/mol and 0umol/mol, Immersion tank crane operator result 1.2umol/mol and an operator working within 10m of Chromium Trioxide but not directly involved with Chromium Trioxide was 0umol/mol.

This testing indicates a higher exposure for maintenance tasks than other workers and special emphasis on awareness to maintenance workers will be enacted. Maintenance tasks do not occur every day or week so the likely exposures are infrequent, this can lead to complacency so it is advised to operate permit to work for maintenance as an opportunity to give regular reminders of the risks and control measures and provide supervision.

Legionella checks are a requirement for spray pre-treatment plants especially those where substitution activities are being undertaken as the alternative chemistry does not inhibit the growth of legionella bacteria as Chromium trioxide does.

**PPE/Hygiene**

Companies provide PPE to protect hands, eyes, face and inhalation depending on the task.

Where inhalation risk is identified the mask required is BS EN149-2001 giving protection against solids and liquids.

FFP3 is recommended from the guidance from CTAC for Chromium Trioxide best practice sheets. The biomonitoring suggests These should be mandatory for maintenance tasks, and when sampling from spray plants. A belt and braces approach.

This gives an APF 20 (applied protection factor) this is 20 X the workplace exposure limit.

Equivalent protection is available in half masks BS EN140 or full masks BS EN36 with BS EN 143 FFP3 filters.

HSE guidance on use Respiratory protective equipment (RPE)

Gloves should be Nitrile disposable or chemical resistance to BS EN374 type A or B for chemicals KLMS (Alkali and Acids)

Where overalls are required for cleaning works use BS EN14605 chemical T3 and T4 protects against splashes and spray.

Safety glasses or Face shields for manual addition of chemicals to BS EN166

Companies provide washing facilities.

Companies provide facilities for eating and drinking.

Some companies have emergency showers.

**Behavioural**

Provision of risk management measures is not enough on its own given the statement

Chromium Trioxide is classified as a Category 1 carcinogen (R45: 'May cause cancer') and, as such, does not have any Derived No Effect Limit (DNEL).

Workers can be encouraged to modify their behaviour to reduce exposure by sharing exposure measurement and biological measurement with a discussion of the results on a one to one basis.

These behaviours might include wearing of PPE, hygiene frequency, what workers do between tasks.

Training of workers is an important tool to promote good behaviours.

Permit to work systems offer a good reminder to reinforce the message for maintenance tasks. But also for companies that use external workers for maintenance or testing.

Supervision is also a key requirement that workers are following the measures put in place to control risks.

**Risk Measurement**

The data found within the consortium shows low to zero inhalation risk where exposures are measured form air.

The bio-monitoring showed that there are small exposures from certain task types and in these cases additional training and use of PPE is recommended to further reduce exposures. Bio-monitoring appears to give better risk measurement data than air exposures in the consortium data and better informed decision making.

## General information on risk management related to physicochemical hazard:

The physicochemical hazards associated with Chromium Trioxide are its corrosive properties. The same management practices for avoiding exposure to Chromium Trioxide for its toxic properties provide the mitigations for these properties.

Dusts of Chromium Trioxide can also be irritant to the lungs which is not normally an issue but could occur during maintenance task where residues are dried onto parts.

Washing down prior to maintenance and wearing of a dust mask will mitigate the irritation risk while also preventing exposure to Chromium Trioxide.

### 9.2.1.4. Consumers

**Scope and type of assessment:**

The conversion reaction as detailed at the start changes the Chromium into trivalent species so that the risk is not present following our process. It is also sealed within a powder coating.

**Table 5. Type of risk characterisation required for consumers**

| Route | Type of effect | Type of risk characterisation | Hazard conclusion DNEL / dose – response relationship |
|---|---|---|---|
| Inhalation | Systemic Long Term | Not applicable | |
| | Local Long Term | Not applicable | |
| | Local Long Term | Not applicable | |
| Oral | Systemic Long Term | Not applicable | |

**Comments on assessment approach:**

The approach for the management of Chromium Trioxide for consumers is not considered as it is not present in the end-product.

## 9.3. Exposure scenario 1 for workers

**Market sector:** powder coating architecture

**Sector of use:** architectural

**Article categories:** parts for architectural works

**Environment contributing scenario(s):** wastewater, waste filter cake

**Worker/Consumer contributing scenario(s):** use of Chromium Trioxide

**Subsequent service life exposure scenario(s):** not applicable

**Exposure scenario(s) of the uses leading to the inclusion of the substance into the article(s):** not applicable

**Description of the activities and technical processes covered in the exposure scenario:**

The receipt and use of Chromium Trioxide containing pre-treatment formulations for the conversion of aluminium prior to powder coating.

The formulation is stored in IBC or other size containers prior to use, the chemical is pumped at a small constant dose rate per hour automatically to avoid handling and dosing manually on most sites, some companies manually pour from smaller containers.

The process is by spray or immersion and contained within the process, the exposures show low to zero emissions into the work environments. It is expected that only direct workers will be exposed to Chromium Trioxide.

Parts are rinsed and the rinse water from each process is sent to the effluent plant for treatment of the Chromium Trioxide into trivalent Chromium hydroxide, removal of the Chromium by filter press to a solid waste, or by tanker by waste disposal companies.

There is handling of parts after rinsing before drying, on most sites parts are clear of Chromium Trioxide at this stage but sites that use tankers may have residues depending on the cleanliness of rinses. This extends perhaps the number of directly exposed workers.

The Chromium Trioxide process is tested 4 times per day at most sites for conformance to Qualicoat, during this samples are collected. Some sites that are not Qualicoat test less frequently, 2 sites leave the testing to their supplier on a weekly basis. There is an opportunity for exposure as when the lid is removed for sampling there can be an aerosol.

Sites using external workers have a duty to supervise these workers and it is recommended that a permit to work system would be a possible method to do this.

Maintenance is performed periodically by removing the spray pipes from the spray lines to clean them, this involves entry into the plant above the Chromium trioxide tank. This is infrequent. Once removed the pipes are washed internally and external and removal of debris from the spray nozzles. There is potential of exposure by touch during this task.

Immersion lines are cleaned after tanker removal at some sites this is the rinse processes that is cleaned not the main chemical tank.

Maintenance from breakdown is conducted on dosing pumps and spray pumps for the spray pipes. Pipe work and work generated from substitution activities.

Additional cleaning has been carried out on tanks for the preparation of Chromium Trioxide replacement. These activities are conducted using a permit to work to system. They are included in the worker contributing scenarios though they do not form part of the normal

scope of use. The biomonitoring test on maintenance at Vertik-al included some additional works to prepare tanks for alternative pre-treatment trials. This represents a higher-than-normal exposure and the test indicated that some exposure had occurred.

**Explanation on the approach taken for the ES:**

The approach for the ES is by observing the process and measurements taken for exposure over the period 2021 to 2024.

2021 is the base year as the previous authorisation by CTAC specified that exposures were measured within 6 months of the ruling. Exposure that was measured in 2021 is broadly representative of the period prior to regular measurements. Of 29 tests reported from the group only 3 were above the level of detection 1 in 2021 and 2 in 2022.

It is unclear whether ISO BS 16740:2005 was used for the testing as the tests were reported in $mg/m^3$ and compared to WELs, The statistical significance would not effect the average and the actual values would be lower so the average exposure used represents a worst case average.

Future testing to be specified to ISO BS 16740:2005

The average exposure is $0.0014mg/m^3$ or $1.4ug/m^3$ micrograms being the unit required to interrogate RAC/27/2013 rev 1 for dose relationship.

Chromium Trioxide is classified as a Category 1 carcinogen (R45: 'May cause cancer') and, as such, does not have any Derived No Effect Limit (DNEL). Therefore, (Worker exposure limits WEL) and (biological monitoring guidance values) BMGV values (where available) are used as benchmarks for controls.

The WEL for Chromium Trioxide is $0.1mg/m^3$

The BMGV for Chromium Trioxide is 10umol/mol

The exposures measured are for operators performing tasks closest to the process containing Chromium Trioxide or static adjacent to the process and represent the highest exposures.

For the purposes of the group CSR the average is used but there may be sites where the actual readings are higher or lower.

It is the responsibility of each site to interpret the results of any monitoring program and action recommendations from the occupational hygienists employed to conduct the work.

Each site should be able to provide HSE with a copy of the reports they have commissioned on request, and advise against any actions made by the companies conducting the tests.

For bio-monitoring results the average 1.77umol/mol will be used for most tasks, except where task specific tests were made by Vertik-al in 2024.

## 9.4. Environmental contributing scenario 1

### 9.4.1.1. Conditions of use

| **Product (article) characteristics** |
|---|
| ▪ Conversion coating on aluminium |
| **Amount used, frequency and duration of use (or from service life)** |
| ▪ 10000-20000 litres proprietary formulation per annum. |
| **Technical and organisational conditions and measures** |

| |
|---|
| ▪ Annual exposure survey, |
| **Conditions and measures related to sewage treatment plant** |
| ▪ total chromium, consented limits, |
| **Conditions and measures related to treatment of waste (including article waste)** |
| ▪ Duty of care |
| **Other conditions affecting environmental exposure** |
| ▪ On sites where waste water is by tanker treatment is by 3rd party actors |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** |
| ▪ CTAC good practice sheets |

**Table 6. Environmental RMMs**

| Compartment | RMM | Stated Effectiveness |
|---|---|---|
| Air | Not applicable | |
| Water | Effluent treatment | Consistently below consented limits |
| Water | Tanker | Treatment by waste process companies |
| Soil | Waste to land fill from effluent treatment | Removal of chromium prior to discharge to water below consented levels, waste does not contain Chromium Trioxide following treatment. |

### 9.4.1.2. Releases

**Table 7. Local releases to the environment**

| Release route | Release factor | Release Kg or T / per year | Release estimation justification, method and details |
|---|---|---|---|
| Water | Initial release factor: ...%<br>Final release factor: ...%<br>Local release rate: ... kg/day | 35kg per annum total chromium, based on the average measurements recorded by water regulators. | |
| Air | Initial release factor: ...%<br>Final release factor: ...%<br>Local release rate: ... kg/day | | |
| Soil<br><br><br><br>Waste | Final release factor: ...% | Filter cake containing trivalent Chromium hydroxide, Aluminium hydroxide 30-40 tonnes per year<br>Waste from tankers | |

| Release route | Release factor | Release Kg or T / per year | Release estimation justification, method and details |
|---|---|---|---|
| | | calculates to 1253 kg of CrO3 for processing by waste companies | |

**Releases to waste**

**Release factor to waste from the process:**

**Release factor to waste from onsite treatment:**

**9.4.1.3. Exposure and risks for the environment and human via the environment**

**Table 8. Exposure concentrations and risks for the environment – on local scale**

| Protection target | Exposure concentration | Risk characterisation |
|---|---|---|
| Freshwater | Not applicable | |
| Sediment (freshwater) | Not applicable | |
| Marine water | Not applicable | |
| Sediment (marine water) | Not applicable | |
| Sewage treatment plant | 35kg/year | Total Chromium |
| Predator (freshwater) | Not applicable | |
| Predator (marine water) | Not applicable | |
| Top predator (marine water) | Not applicable | |
| Air | Not applicable | |
| Agricultural soil | Not applicable | |
| Predator (terrestrial) | Not applicable | |
| Human via Environment - Inhalation | Not applicable | |
| Human via Environment - Oral | Not applicable | |
| Human via environment - combined routes | Not applicable | |

**Remarks on measured exposure:**

**Table 9. Contribution to oral intake for man humans via the environment from local contribution**

| Type of food | Estimated daily dose | Concentration in food |
|---|---|---|
| Drinking water | Not applicable | |

| Type of food | Estimated daily dose | Concentration in food |
|---|---|---|
| Fish | Not applicable | |
| Leaf crops | Not applicable | |
| Root crops | Not applicable | |
| Meat | Not applicable | |
| Milk | Not applicable | |

**Conclusion on risk characterisation:**

The risk from the process is low based on emissions that are contained with the factory, discharges to sewers are heavily treated. There are some releases via wastewater into waste process plants by tanker that will be treated in the same way.

### 9.5. Worker contributing scenario 1 Loading IBC or other containers

#### 9.5.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |
| ▪ Formulated product contained within IBC or small containers | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ Exposure during the opening of the IBC or container and insertion of pump tube. 2 minutes, weekly | Qualitative |
| **Technical and organisational conditions and measures** | |
| ▪ Trained operators, | Varies by size of organisation |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ Wearing of PPE to avoid exposure | PPE assessment |
| **Other conditions affecting workers exposure** | |
| ▪ | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC D4 Maintenance, repair and installation related to the existing process line when the equipment contains chromium trioxide | |

The task involves removing the lid from the IBC or smaller container and insertion of the pump feed pipe, there is potential for exposure to Chromium Trioxide from residues left on the feed pipe from the previous IBC.

Chemical resistant gloves are used for this task, Nitrile single use or to BS EN374 Type A or B KLMS, and eye protection either lab specs or face shield to BS EN 166.

Inhalation exposure is unlikely from this task.


### 9.5.1.2. Exposure and risks for workers

**Table 10. Exposure concentrations for worker–**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 1 | Inhalation | Not applicable | Not measured | | |
| | Dermal | Risk assessment | Not measured | Prevented with wearing of PPE | |
| | Biomonitoring | Urine test | 1.77umol/mol | | |

* The equation/s used to calculate the adjustment factors:

**Remarks on exposure data:**

Conclusion on risk characterisation: this is a low-risk task with a small potential for exposure by dermal route from residues on the feed pipe.

Biomonitoring is not broken down for this task and is for a direct worker performing multiple tasks.

## 9.6. Worker contributing scenario 2 pumping of chemicals into tanks

### 9.6.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |
| ▪ Pumps set to dose small quantities per hour | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ 1-3 litres per hour, Exposure potential when adjusting flow rates 1-2 minutes | Qualitative |

| | Method |
|---|---|
| **Technical and organisational conditions and measures** | |
| ▪ Pumps contained within an enclosure in case of spillage | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ Disposable gloves | |
| **Other conditions affecting workers exposure** | |
| ▪ Leaking around pump valves | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CoSHH hierarchy of control | |

Pump system used to avoid manual handling of Chromium Trioxide containing formulations. If a problem occurs can be switched of externally to the pump container by an isolation switch for each pump to avoid being splashed, Dosing replaces manual additions where possible and should always be use for IBCs.

PPE Gloves to BS EN374 Type A or B KLMS and Eye protection to BS EN 166 in case of splashes or leaks.

### 9.6.1.2. Exposure and risks for workers

**Table 11. Exposure concentrations for worker—**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 2 | Inhalation | Not | Not | | |

| | | | | | |
|---|---|---|---|---|---|
| | | applicable | measured | | |
| | Dermal | Potential if pump valve fails or line splits | Not measured | Prevented with the wearing of PPE | |
| | Biomonitoring | Urine test | 1.77umol/mol | | |

* The equation/s used to calculate the adjustment factors:….

**Remarks on exposure data:**

Conclusion on risk characterisation: Minimal risk during normal operation, potential for exposure if there is mechanical failure, which can be isolated by the pump containment and external switch. Biomonitoring is not broken down for this task, the value is for workers performing multiple tasks.

### 9.7. Worker contributing scenario 2b pouring of chemicals into tanks

#### 9.7.1.1. Conditions of use

| | **Method** |
|---|---|
| **Product (article) characteristics** | |
| ▪ Pouring small amounts directly into tanks | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ Up to 25 litres, Exposure potential from splashes | Qualitative |
| **Technical and organisational conditions and measures** | |
| ▪ Safe working procedures | Risk assessment |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ Gloves, prevention on splashes onto operator, Face shield | Risk assessment |
| **Other conditions affecting workers exposure** | |
| ▪ Contamination from splashes onto workwear | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ This practice should be replaced with pump systems where practical. | |

Pump system can be used to avoid manual handling of Chromium Trioxide containing formulations. There is a risk of splashing.

If working with small quantities pouring can be suitable but requires a high level of PPE and hygiene. It is advised where possible to eliminate this risk by changing to pump systems.

There is also a manual handling risk as the smallest container size is normally 25 litres

and lifting to shoulder height or above should be limited to 10kg in case of extension of the arms.

PPE for this task, Gloves to BS EN374 type A or B KLMS, Face shield to BS EN166, Overall to BS EN14605, Type 3 and 4, Mask to BS EN149:2001 FFP3.

#### 9.7.1.2. Exposure and risks for workers

**Table 12. Exposure concentrations for worker–**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 2b | Inhalation | Not applicable | Not measured | | |
| | Dermal | Potential for splashes | Not measured | Prevented with the wearing of PPE | |
| | Biomonitoring | Urine test | 1.77umol/mol | | |

* The equation/s used to calculate the adjustment factors:.

**Remarks on exposure data:**

Conclusion on risk characterisation: Avoidable risk as manual addition can be replaced with cheap and effective pump systems with limited engineering experience to install and operate. Some exposure by splashing is possible and is a risk for the corrosive nature of the Chromium Trioxide as well as the toxic risk.

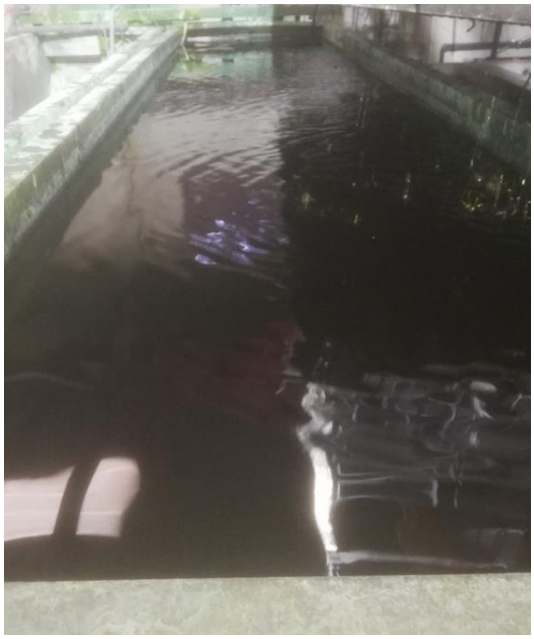
Biomonitoring is not broken down for this task the value is for workers doing multiple tasks.

### 9.8. Worker contributing scenario 3

#### 9.8.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |
| ▪ Part processing Immersion | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ Open tank up to 14000 litres of diluted formulated product, 4g per litre, operator working crane on platform and will be | |

| | Method |
|---|---|
| within 1m of the tank for 1 hour per shift | |
| **Technical and organisational conditions and measures** | |
| ▪ Remote controller for crane operation so that worker does not need to be close to each process tank during operation, or splash guard, or PPE | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ PPE, exposure measurement both personal and static. | measurement |
| **Other conditions affecting workers exposure** | |
| ▪ Build-up of dried on chemicals around the top of the tank that could be an exposure route for touch contact. Transfer to clothing could generate dust exposures. | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC C1 Surface treatment with chromates1 in open tanks or baths (e.g. passivation, conversion coating, anodize seal) without electric current | |



Open tank unheated and no electric current, parts are loaded into a basket and processed with a remotely operated crane. Measurements have been made on exposures both personal and static on most sites the measurement have been below the detectable level for the test <0.0006mg/m3

In a task specific test of biological monitoring a small exposure was noted 1.2umol/mol in one worker, this is probably due to hygiene.

PPE for this task, In principle exposure in controlled without PPE, depending on the work place some PPE can be considered for belt and braces determined by risk assessment.

Eye protection BS EN166 will prevent risks of splashing to eyes, if parts or loads fall.

Gloves to BS EN374 type A or B KLMS will avoid secondary exposures from contaminated surfaces.

A disposable overall will prevent secondary exposures.

### 9.8.1.2. Exposure and risks for workers

**Table 13. Exposure concentrations for worker—**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 3 | Inhalation | Personal and static measurement | In most sites the result has been below | | |

| | | | | | |
|---|---|---|---|---|---|
| | | s | the detectable level <0.0006mg/m3 up to 0.0014mg/m3 average | | |
| | Dermal | Risk assessment | Potential by contact with tank sides | Prevented with the wearing of PPE | |
| | Biomonitoring | Urine test | 1.77umol/mol<br><br>Task specific test 1.2umol/mol | | |

* The equation/s used to calculate the adjustment factors:….

**Remarks on exposure data:**

Conclusion on risk characterisation: The inhalation exposure data shows that the exposure from this process is below the level of detection for the test on most measurements. It is not expected that workers will have an exposure that would lead to poor health outcomes.

Biomonitoring conducted for this task by Vertik-al indicated that there was some low level exposure.

The task specific exposure is possibly related to hygiene and behaviour as it was not noticed in the inhalation exposures in any of the 4 years. Conversation with workers and some observed behaviours such as leaning on contaminated surfaces that could transfer Chromium Trioxide to clothing, or the position where the worker stands when operating the crane.

Training, awareness and supervision are key factors for reducing exposure to this task, Biomonitoring can be an effective tool to advise workers.

Screens alongside tanks as employed by some companies in the group would mitigate against these observations.

## 9.9. Worker contributing scenario 4 Processing of parts spraying

### 9.9.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |
| ▪ Spray operation | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ Tank containing 7000 litres formulated product diluted to 4g/litre | |
| **Technical and organisational conditions and measures** | |
| ▪ Keep tank lids in place<br>▪ The spray does not come out of the plant. | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ Measurements of exposure | measurement |
| **Other conditions affecting workers exposure** | |
| ▪ Workers are not close to plant. | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC C2 Surface treatment with chromates1 by spray application in a cabin (automated) | |

In 2021 there was a measured exposure of 0.001mg/m3 at Vertik-al in 2021 that is well below the workplace limits, however some of the tasks present at that time have been eliminated to reduce exposure. There was a change in method giving lower exposures in subsequent years

The other consortium member with a spray system Senior Architectural systems measured below detectable levels for the spray system. The plant as Senior Architectural systems is very similar to the plant at Vertik-al as both made by Transmetal in the 1990s.

There is a potential for exposure to aerosol from spray systems when the tank lid is removed for inspection or sampling.

Both companies with a spray system do not have any direct workers associated with the task.

PPE for inspection of the tanks containing chemical processes.

Mask to BS EN149 FFP3.

Gloves to BS EN374 Type A, KLMS

Eye protection to BS EN166

### 9.9.1.2. Exposure and risks for workers

**Table 14. Exposure concentrations for worker–**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 4 | Inhalation | Personal and static | 0.001mg/m3 (2021) 0mg/m3 (2022-2024) | Not applicable due to change in method | |
| | Dermal | Not applicable | | | |
| | Biomonitoring | Urine test | Not applicable | | |

* The equation/s used to calculate the adjustment factors:….

**Remarks on exposure data:**

Conclusion on risk characterisation: Exposures are possible during sampling and inspection when the spray is running. Exposure can be eliminated by sampling with spray off or reduced from use of PPE. This is covered by other worker exposure scenarios.

Biomonitoring is not completed for this task as APC and SPPC do not operate spray systems.

A worker 10m from the Vertik-al plant had zero Chromium Trioxide in biological testing.

## 9.10. Worker contributing scenario 6 Maintenance breakdown and repair

### 9.10.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |
| ▪ Pumps, pipework, Effluent | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ Quantities can vary, exposure can vary | |

| | Method |
|---|---|
| **Technical and organisational conditions and measures** | |
| ▪ Permit to work<br>▪ Trained maintenance technicians | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ PPE | |
| **Other conditions affecting workers exposure** | |
| ▪ Nature of work can be unknown requiring dynamic assessment at the time | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC D4 Maintenance, repair and installation related to the existing process line when the equipment contains chromium trioxide<br>▪ HSG53 | |

Typical jobs that might be performed

- Dosing pump repairs, containing up to 1 litre of Chromium Trioxide containing material
- Spray pump repairs, requires emptying the tank, pump transfer of liquid
- Blockages in effluent pipework
- Dust from dried residues

Exposures from this work is normally through contact, although there can be potential for dust generation.

Only one measurement within the consortium captured a maintenance task. In 2022 the exposure on a large maintenance task for cleaning an effluent tank. no exposure occurred by inhalation.

Biological testing performed on a maintenance worker gave 3.5umol/mol

PPE for maintenance tasks should be mandatory for most tasks as belt and braces.

Mask to BS EN149, FFP3

Gloves to BS EN374 type A or B, KLMS

Overall to BS EN14605 T3 and T4.

Eye protection to BS EN166

#### 9.10.1.2. Exposure and risks for workers

**Table 15. Exposure concentrations for worker–**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| | | | | | **frequency *** |
| WCS 6 | Inhalation | Personal exposure 2022 | <0.0006 mg/m3 | N/A | |
| | Dermal | Risk assessment, PPE risk assessment | | Prevented with the wearing of PPE | |
| | Biomonitoring | Urine test | 3.5umol/mol task specific | | |

* The equation/s used to calculate the adjustment factors:.

**Remarks on exposure data:**

Conclusion on risk characterisation: Maintenance constitutes the highest risk as the nature of the work is sometimes unknown. Having measured zero exposure on one substantial maintenance task suggests that exposure through contact and hygiene is more significant than inhalation.

Biomonitoring was measured task specific by Vertik-al for a maintenance worker, This indicated an exposure of 3.5umol/mol that was the highest recorded for all task specific tests. But below the guidance of 10ug/mol

At the time of testing the worker was making modifications to the immersion line in preparation for some substitution activities and had a repair to a pump associated with a Chromium Trioxide tank. The measurement represents a worse case in terms of activity type but also indicates that some control measures may not be fully effective for these tasks.

Discussion about the result with the worker indicated that the urgency of tasks can contribute to behavioural lapses. Opportunity taken to increase awareness of exposure reduction and belt and braces use of PPE.

Maintenance should be actively singled out for awareness training and biomonitoring to reduce exposures as far as possible. Where external maintenance is used this should be included by either induction or permit to work.

# 9.11. Worker contributing scenario 7 Effluent treatment

### 9.11.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |
| ▪ Treatment of Chromium Trioxide for sewer discharge | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ 2000 litres of very dilute formulated product from rinses, 10minutes per day checks on effluent by maintenance | |
| **Technical and organisational conditions and measures** | |
| ▪ Automatic equipment to control the process parameters | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ Generally visual check of the tanks and instruments, disposable gloves and eye protection worn. | |
| **Other conditions affecting workers exposure** | |
| ▪ Other chemicals used in the treatment can cause irritation | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC D7 On-site wastewater treatment | |

Improper treatment could release Chromium Trioxide into the trade effluent. Dosing pumps operate off pH probes in tanks. Visual checks made daily

PPE for this task depending on the risk assessment

Mask to BS EN149 FFP3.

Gloves to BS EN374 Type A, KLMS

Eye protection to BS EN166



#### 9.11.1.2. Exposure and risks for workers

**Table 16. Exposure concentrations for worker–**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 7 | Inhalation | Not measured | N/A | | |
| | Dermal | Not measured | N/A | | |
| | Biomonitoring | Urine test | 1.5umol/mol | | |

* The equation/s used to calculate the adjustment factors:….

**Remarks on exposure data:**

Conclusion on risk characterisation: Risk to workers is very low as no exposure is expected from visual checks. Risk to the environment is high so daily monitoring is required. Companies are consistently below the discharge limits for Total Chromium when tested by Local water authorities. No incidents have been reported.

Biomonitoring is not broken down for this task, as SPPC do not have effluent treatment the value from APC is used for a worker conducting multiple tasks.

## 9.12. Worker contributing scenario 7b Tanker removal of waste water

#### 9.12.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |
| ▪ Treatment of Chromium Trioxide as a waste process | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ Thousands of litres of very dilute formulated product from rinses, | |

| | Method |
|---|---|
| **Technical and organisational conditions and measures** | |
| ▪ Tanker | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ Generally visual check of the tanks and instruments, disposable gloves and eye protection worn. | |
| **Other conditions affecting workers exposure** | |
| ▪ 3rd party process | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC D7 On-site wastewater treatment | |

Use of registered waste contractors for removal of rinse water by tanker, this transfers Chromium Trioxide to 3rd Party processing. Pipes from tanker attached to valves or over tank top, some risk of spillage during this operation.

Exposure by contact with pipes.

PPE for this task

Mask to BS EN149 FFP3.

Gloves to BS EN374 Type A, KLMS

Eye protection to BS EN166

Overalls to BS EN14605 T3, T4

#### 9.12.1.2. Exposure and risks for workers

**Table 17. Exposure concentrations for worker—**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 7b | Inhalation | Not measured | N/A | | |
| | Dermal | Possible with contact with pipes | N/A | Can be mitigated with PPE | |
| | Biomonitoring | measurement | 1.77umol/mol | | |

## 9.13. Worker contributing scenario 8 Testing of tank parameters

#### 9.13.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |

| | Method |
|---|---|
| ▪ Removal of tank liquor for testing by titration and coating weight by immersion | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ 250mls 4 X per day, 5 mins per test, 1min to obtain sample 4min to test<br>▪ Coating weight 4 X per day 5 mins per test<br>▪ Total of 40 minutes per day | |
| **Technical and organisational conditions and measures** | |
| ▪ Lid replacement after testing<br>▪ Coating weight taken using a hook on a strap so that worker does not need to stand over the sample. | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ PPE | |
| **Other conditions affecting workers exposure** | |
| ▪ Exposure is possible with the lid removed from vertik-al line | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC C1 Surface treatment with chromates1 in open tanks or baths (e.g. passivation, conversion coating, anodize seal) without electric current<br>▪ HSG53 | |

There is a potential exposure from spray plant resulting from the opening of the tank lids when making routine checks on the tank levels.

This task has not been measured for exposure however it is similar in method but lower in duration to a task of tank inspection that gave the measured value of 0.001mg/m3in 2021 at Vertik-al that will be a good precautionary approximation to the exposure for this task.

Sites operating with immersion only are not expected to have an inhalation exposure from this task

Some sites within the consortium use suppliers for their testing, the risks for external contractors should be considered within each company's risk assessment.

PPE for this task

Mask to BS EN149 FFP3.

Gloves to BS EN374 Type A, KLMS

Eye protection to BS EN166

### 9.13.1.2. Exposure and risks for workers

**Table 18. Exposure concentrations for worker—**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 8 | Inhalation | Exposure Estimate from similar task | 0.001mg/m3 | P3 mask APF 20 0.00005mg/m3 | |
| | Dermal | Risk assessment | | Prevented with the wearing of PPE | |
| | Biomonitoring | Not measured | Task specific tests 1.2 and 0 umol/mol | | |

* The equation/s used to calculate the adjustment factors:….

**Remarks on exposure data:**

Conclusion on risk characterisation: The risk is small but not absent due to a possibility of aerosol exposure when the lid is lifted on spray lines.

Biomonitoring was measured for this task by monitoring two laboratory technicians on opposite shifts. One worker had an exposure of 1.2umol/mol and the other 0.0umol/mol

The difference in the result is probably behavioural or methodological and observation of both to determine best practice. Both operators advised to the wearing of a mask when taking samples from the tank, One worker advised to take samples at the same time as doing coating weight tests to reduce the number of times that they visit to tanks by half.

## 9.14. Worker contributing scenario 9 Delivery and storage

### 9.14.1.1. Conditions of use

| | Method |
|---|---|
| **Product (article) characteristics** | |

| | Method |
|---|---|
| ▪ Formulated product in IBCs or other containers | |
| **Amount used (or contained in articles), frequency and duration of use/exposure** | |
| ▪ Up to 1000 litres | |
| **Technical and organisational conditions and measures** | |
| ▪ Trained forklift operators<br>▪ Stored in indoor environment to prevent damage to IBC from freezing | |
| **Conditions and measures related to personal protection, hygiene and health evaluation** | |
| ▪ Not applicable | |
| **Other conditions affecting workers exposure** | |
| ▪ Delivery is a potential area for accidents by piercing with forks or dropping IBC | |
| **Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply** | |
| ▪ CTAC D6 Cleaning of spills or releases | |

There are no direct exposures, delivery and transport is a task where accidents could occur

**9.14.1.2. Exposure and risks for workers**

**Table 19. Exposure concentrations for worker—**

| Contributing scenario | Route of exposure | Method of assessment | Exposure value (8h TWA) | Exposure value corrected for PPE | Exposure value corrected for PPE and frequency * |
|---|---|---|---|---|---|
| WCS 9 | Inhalation | Not applicable | | | |
| | Dermal | Not applicable | | | |
| | Biomonitoring | Urine test | No exposure expected from this task | | |

* The equation/s used to calculate the adjustment factors:.

**Remarks on exposure data:**

Conclusion on risk characterisation: Only a risk if an accident occurs in which case evacuation from the accident is the first response and when it is safe to do so taking steps to avoid further release and protect the environment.

Biomonitoring is not relevant to this task

## 9.15. Exposure scenario 2 for consumers: …

**Market sector:** Architectural Aluminium

**Article categories:** Extrusions and pressing

**Environment contributing scenario(s):** No Chromium Trioxide present on the finished product

**Worker/Consumer contributing scenario(s):** not applicable

**Subsequent service life exposure scenario(s):** not applicable

**Exposure scenario(s) of the uses leading to the inclusion of the substance into the article(s):** not applicable

**Explanation on the activities and technical processes covered in the exposure scenario:**

There is no Chromium Trioxide present in the finished product

**Explanation on the approach taken for the ES:**

There is no exposure scenario for the finished product.

# 10. REFERENCES

Exposure testing since 2020 authorisation

| Site | 2021 avg 8hrs TWA mg/m3 | 2022 avg 8hrs TWA mg/m3 | 2023 avg 8hrs TWA mg/m3 | 2024 avg 8hrs TWA mg/m3 | notes |
|---|---|---|---|---|---|
| Vertik-al vertical line | 0.001 | <0.006 | <0.006 | <0.006 | changed to static due to change in operator function |
| Vertik-al immersion line | <0.006 | <0.006 | <0.006 | <0.006 | |
| Vertik-al maintenance activity | NT | <0.006 | NT | NT | |
| Vertik-al bio monitoring | NT | NT | NT | 0, 1.2, 1.2, 3.5, 0 | biological test conducted 3/10/24 |
| Custom Whyteline | <0.001 | NT | NT | <0.001 | |
| SPPC Ltd - Immersion Line | <0.005 | <0.005 | <0.001 | <0.001 | |
| SPPC Ltd - immersion Line | <0.005 | <0.005 | <0.001 | <0.001 | |
| SPPC Ltd - maintenance activity | NT | NT | NT | NT | |
| SPPC Ltd - Bio Monitoring imm Line | Non Detected | <7.7 | <1.0 | Non Detected | Current Bio Monitoring Guidance Value for Chromium is 10 µmol/mol |
| APC - Immersion Line | <0.001 | 0.0096 | <0.0007 | <0.0007 | |
| APC - Maintenance activity | NT | NT | NT | NT | |
| APC - Bio Monitoring | <0.9 | <3.5 & <0.4 | <2.2 & <0.7 | <1.3 | Current Bio Monitoring Guidance Value for Chromium is 10 µmol/mol |
| SAS vertical line | ND | <0.001 | ND | <0.001 | |
| SAS hand dipping accessories | ND | 0.03 | ND | <0.01 | |
| SAS Effluent treatment | ND | <0.001 | ND | <0.001 | |
| SAS maintenance activity | ND | NT | ND | NT | |
| Alucoat | | | | result pending | Testing 3/10/2024 |
| PMF | | | | result pending | Testing 4/10/2024 |

Environmental discharges

| | total mg day | kg/year | tankered waste l | CrO3 kg/l | CrO3 per annum (kg) |
|---|---|---|---|---|---|
| Vertik-al | 99816.75 | 25.95236 | 0 | | |
| SPPC | 24530 | 6.3778 | 40000 | 0.002655 | 106.2 |
| PFM | 0 | 0 | 216000 | 0.002655 | 573.48 |
| Alucoat | 0 | 0 | 216000 | 0.002655 | 573.48 |
| APC | 8281.65 | 1.060051 | 0 | | |
| Senior | 8899 | 1.655214 | 0 | | |
| | | 35.04542 | | Total | 1253.16 |

| | | Worker exposure numbers | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Vertik-al | SP&PC | Alucoat | PMF | Custom | APC | Senior | Total |
| WCS 1 | Loading IBCs and other containers | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 5 |
| WCS 2 | Addition of chemical by pump method | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 6 |
| WCS 2b | Addition of chemicals manually | 0 | 0 | 2 | 2 | 2 | 1 | 2 | 9 |
| WCS 3 | Part processing Imeersion | 2 | 2 | 4 | 2 | 2 | 1 | 2 | 15 |
| WCS 4 | Part processing Spray | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WCS 5 | Maintenance cleaning | 8 | 6 | 0 | 0 | 6 | 1 | 2 | 23 |
| WCS 6 | Maintenance break down | 2 | 2 | 0 | 0 | 2 | 2 | 2 | 10 |
| WCS 7 | Waste water via Effluent treatment | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 4 |
| WCS 7b | Waste water via tanker to registered waste contractors | 0 | 4 | 2 | 2 | 4 | 0 | 0 | 12 |
| WCS 8 | Testing | 4 | 4 | 0 | 0 | 4 | 1 | 2 | 15 |
| WCS 9 | Delivery and storage | 2 | 2 | 2 | 2 | 2 | 1 | 5 | 16 |
| | | 24 | 22 | 10 | 8 | 22 | 8 | 21 | |

The above table represents the number of workers per task some workers may be responsible for more than one task.


*Logo Informing the Chemical Properties of a Glove*

| Chemical | Code Letter |
|---|---|
| **Methanol** | A |
| **Acetone** | B |
| **Acetonitrile** | C |
| Dichloromethane | D |
| Carbon Disulphide | E |
| Toluene | F |
| **Diethylamine** | G |
| **Tetrahydrofuran** | H |
| **Ethyl Acetate** | I |
| **n-Heptane** | J |
| **Sodium Hydroxide 40%** | K |
| **Sulphuric Acid 96%** | L |
| **Nitric Acid 65%** | M |
| **Acetic Acid 99%** | N |
| **Ammonoim Hydroxide 25%** | O |
| **Hydrogen Peroxide 30%** | P |
| **Hydroflouric Acid 60%** | S |
| **Formaldehyde** | T |