

6. Exposure scenario 6: Use at industrial sites - Passivation processes in surface treatment

Market sector: Use in surface treatment

Product category used: PC 14: Metal surface treatment products

Sector of use: SU 15: Manufacture of fabricated metal products, except machinery and equipment

Environment contributing scenario(s):		
CS 1	Passivation processes in surface treatment ES1 STP Discharge	ERC 5
CS 2	Passivation processes in surface treatment ES2 Direct Discharge	ERC 5
CS 3	Passivation processes in surface treatment ES3 Marine Discharge	ERC 5
Worker contributing scenario(s):		
CS 4	Raw material handling (solid input materials)	PROC 5, PROC 8b
CS 5	Dissolution of solid raw materials	PROC 2, PROC 1
CS 6	Raw material handling (exclusively aqueous solutions as input materials)	PROC 4, PROC 9
CS 7	Passivation	PROC 13
CS 8	Packaging and handling of passivated articles	PROC 21
CS 9	Cleaning & Maintenance	PROC 28

Subsequent service life exposure scenario(s):

ES9: Service life (worker at industrial site) - Industrial handling of surface treated articles (passivated/plated)

ES10: Service life (professional worker) - Professional handling of surface treated articles (passivated/plated)

Explanation on the approach taken for the ES

Please refer to IUCLID Section 13 for a detailed description of the specific methodology applied for the occupational exposure assessment.

It is noted that the substance is chemically transformed into another substance during this use. Consequently, exposure can no longer occur to the registered substance. Please refer to information on safe use for the handling of the individual manufactured substances for process steps commencing the chemical transformation step.

6.1. Env CS 1: Passivation processes in surface treatment ES1 STP Discharge (ERC 5)

6.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Daily use at site: ≤ 0.025 tonnes/day <i>The tonnage and further exposure is always expressed in cobalt.</i>
<ul style="list-style-type: none"> Annual use at a site: ≤ 4 tonnes/year <i>For the generic exposure scenario a tonnage covering 100% of the sector tonnages was selected.</i>
<ul style="list-style-type: none"> Number of release days per year: ≥ 160 days/year <i>The selected number of production days per year is the median value based on data from 8 companies.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> Risk management measures: One or more of the following measures should be present to reduce

emissions to water: Chemical precipitation, Sedimentation, Filtration, Electrolysis, Reverse osmosis or Ion exchange.
• Risk management measures: One or more of the following measures should be present to reduce emissions to air: Electrostatic precipitators, Wet electrostatic precipitators, Cyclones, but as primary collector, Fabric or bag filters, Ceramic/Metal mesh filters or Wet scrubbers.
Conditions and measures related to sewage treatment plant
• Municipal STP: Yes
• Discharge rate of STP: $\geq 2E3$ m ³ /d
• Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: No (low amount) (Particular risks from waste treatment unlikely due to small fraction of used substance entering into the waste stage. Waste disposal according to national/local legislation is sufficient.) <i>Wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately or/and with other cobalt compounds waste to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the cobalt content of the waste is elevated enough, internal or external recovery/recycling might be considered. Appropriate waste codes: 01 03 07*, 02 01 10*, 06 05 02*, 06 03 13*, 06 03 15*, 06 04 05*, 10 08 04, 10 10 03, 10 10 05*, 10 10 07*, 10 10 10, 10 10 11*, 11 02 07*, 12 01 03*, 12 01 04, 15 01 04*, 15 01 10*, 16 01 04*, 16 01 06*, 16 01 18*, 16 03 03*, 16 06 02*, 16 06 05, 16 08 02*, 16 08 03, 16 10 01*, 17 04 07*, 17 04 09*, 17 09 04*, 19 10 02*, 19 12 03*,... Suitable disposal: Keep separate and dispose of to either - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC. A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2011)</i>
Other conditions affecting environmental exposure
• Discharge rate of effluent: $\geq 2E3$ m ³ /d
• Receiving surface water flow rate: $\geq 3.98E5$ m ³ /d
• Final dilution factor: ≥ 200

6.1.2. Releases

The local releases to the environment are reported in the following table.

Table 9.62. Local releases to the environment

Release	Release factor estimation method	Explanation / Justification
Water	Release factor (SpERC Metallic coating)	Initial release factor: 0.5% Final release factor: 0.5% Local release rate: 0.125 kg/day Explanation / Justification: Eurométaux, 2012, version 2.1
Air	Release factor (SpERC Metallic coating)	Initial release factor: 0.2% Final release factor: 0.2% Local release rate: 0.05 kg/day Explanation / Justification: Eurométaux, 2012, version 2.1
Soil	Release factor	Final release factor: 0% Explanation / Justification: No direct release to soil.

Releases to waste

Release factor to external waste: 0.1 %

A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2011)

6.1.3. Exposure and risks for the environment and man via the

environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.63. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk characterisation
Freshwater	Local PEC: 0.22 µg/l	0.36
Sediment (freshwater)	Local PEC: 8.81 mg/kg dw	0.93
Sewage treatment plant	Local PEC: 0.04 mg/l	0.10
Air	Local PEC: 6.1 ng/m ³	No environmental hazard
Agricultural soil	Local PEC: 1.19 mg/kg dw	0.11
Man via Environment - Inhalation	Local PEC: 6.1 ng/m ³	< 0.01
Man via Environment - Oral	Exposure via food consumption: 0.324 µg/kg/d	< 0.01

Conclusion on risk characterisation

MAN VIA ENVIRONMENT:

The use of EUSES to predict the concentration in food is difficult to apply for metals and associated with much higher uncertainties than using measured data. Therefore, deviations from the TGD food basket approach for the exposure route "ingestion of food", have been applied as shortly described in section 9.0.3.6..

Furthermore, the exposure assessment is based on the cobalt ion, as this is the toxic species.

The oral exposure concentration in µg/kg bw/day has been derived by taking 2L of drinking water (PEC freshwater taken from the local environmental exposure assessment) + the worst case exposure of 19 µg Co/d from food (97.5th percentile from the 1994 UK total diet study (please refer to section 9.0.3.6) and a default body weight of 60kg into account.

For the risk characterisation the following DNELs based on cobalt were used:

DNEL inhalation, local, long-term of 6.3 µg Co/m³

DNEL oral, systemic, long-term of 8.6 mg Co/kg bw/day

As such a combined RCR cannot be provided (local and systemic effects).

6.2. Env CS 2: Passivation processes in surface treatment ES2 Direct Discharge (ERC 5)

6.2.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Daily use at site: <= 0.025 tonnes/day <i>The tonnage and further exposure is always expressed in cobalt.</i>
<ul style="list-style-type: none"> Annual use at a site: <= 4 tonnes/year <i>For the generic exposure scenario a tonnage covering 100% of the sector tonnages was selected.</i>
<ul style="list-style-type: none"> Number of release days per year: >= 160 days/year <i>The selected number of production days per year is the median value based on data from 8 companies.</i>
Technical and organisational conditions and measures

• Risk management measures: One or more of the following measures should be present to reduce emissions to water: Chemical precipitation, Sedimentation, Filtration, Electrolysis, Reverse osmosis or Ion exchange.
• Risk management measures: One or more of the following measures should be present to reduce emissions to air: Electrostatic precipitators, Wet electrostatic precipitators, Cyclones, but as primary collector, Fabric or bag filters, Ceramic/Metal mesh filters or Wet scrubbers.
Conditions and measures related to sewage treatment plant
• Municipal STP: No [Effectiveness Water: 0%]
Conditions and measures related to treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: No (low amount) (Particular risks from waste treatment unlikely due to small fraction of used substance entering into the waste stage. Waste disposal according to national/local legislation is sufficient.) <i>Wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately or/and with other cobalt compounds waste to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the cobalt content of the waste is elevated enough, internal or external recovery/recycling might be considered. Appropriate waste codes: 01 03 07*, 02 01 10*, 06 05 02*, 06 03 13*, 06 03 15*, 06 04 05*, 10 08 04, 10 10 03, 10 10 05*, 10 10 07*, 10 10 10, 10 10 11*, 11 02 07*, 12 01 03*, 12 01 04, 15 01 04*, 15 01 10*, 16 01 04*, 16 01 06*, 16 01 18*, 16 03 03*, 16 06 02*, 16 06 05, 16 08 02*, 16 08 03, 16 10 01*, 17 04 07*, 17 04 09*, 17 09 04*, 19 10 02*, 19 12 03*,... Suitable disposal: Keep separate and dispose of to either - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC. A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2011)</i>
Other conditions affecting environmental exposure
• Discharge rate of effluent: $\geq 2E3$ m ³ /d
• Receiving surface water flow rate: $\geq 5.98E5$ m ³ /d
• Final dilution factor: ≥ 300

6.2.2. Releases

The local releases to the environment are reported in the following table.

Table 9.64. Local releases to the environment

Release	Release factor estimation method	Explanation / Justification
Water	Release factor (SpERC Metallic coating)	Initial release factor: 0.5% Final release factor: 0.5% Local release rate: 0.125 kg/day Explanation / Justification: Eurométaux, 2012, version 2.1
Air	Release factor (SpERC Metallic coating)	Initial release factor: 0.2% Final release factor: 0.2% Local release rate: 0.05 kg/day Explanation / Justification: Eurométaux, 2012, version 2.1
Soil	Release factor	Final release factor: 0% Explanation / Justification: No direct release to soil.

Releases to waste

Release factor to external waste: 0.1 %

A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2011)

6.2.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following

table.

Table 9.65. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk characterisation
Freshwater	Local PEC: 0.23 µg/l	0.39
Sediment (freshwater)	Local PEC: 9.32 mg/kg dw	0.98
Air	Local PEC: 6.1 ng/m ³	No environmental hazard
Agricultural soil	Local PEC: 0.01 mg/kg dw	< 0.01
Man via Environment - Inhalation	Local PEC: 6.1 ng/m ³	< 0.01
Man via Environment - Oral	Exposure via food consumption: 0.324 µg/kg/d	< 0.01

Conclusion on risk characterisation

MAN VIA ENVIRONMENT:

The use of EUSES to predict the concentration in food is difficult to apply for metals and associated with much higher uncertainties than using measured data. Therefore, deviations from the TGD food basket approach for the exposure route “ingestion of food”, have been applied as shortly described in section 9.0.3.6..

Furthermore, the exposure assessment is based on the cobalt ion, as this is the toxic species.

The oral exposure concentration in µg/kg bw/day has been derived by taking 2L of drinking water (PEC freshwater taken from the local environmental exposure assessment) + the worst case exposure of 19 µg Co/d from food (97.5th percentile from the 1994 UK total diet study (please refer to section 9.0.3.6) and a default body weight of 60kg into account.

For the risk characterisation the following DNELs based on cobalt were used:

DNEL inhalation, local, long-term of 6.3 µg Co/m³

DNEL oral, systemic, long-term of 8.6 mg Co/kg bw/day

As such a combined RCR cannot be provided (local and systemic effects).

6.3. Env CS 3: Passivation processes in surface treatment ES3 Marine Discharge (ERC 5)

6.3.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Daily use at site: <= 0.025 tonnes/day <i>The tonnage and further exposure is always expressed in cobalt.</i>
<ul style="list-style-type: none"> Annual use at a site: <= 4 tonnes/year <i>For the generic exposure scenario a tonnage covering 100% of the sector tonnages was selected.</i>
<ul style="list-style-type: none"> Number of release days per year: >= 160 days/year <i>The selected number of production days per year is the median value based on data from 8 companies.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> Risk management measures: One or more of the following measures should be present to reduce emissions to water: Chemical precipitation, Sedimentation, Filtration, Electrolysis, Reverse osmosis or Ion exchange.
<ul style="list-style-type: none"> Risk management measures: One or more of the following measures should be present to reduce emissions to air: Electrostatic precipitators, Wet electrostatic precipitators, Cyclones, but as primary

collector, Fabric or bag filters, Ceramic/Metal mesh filters or Wet scrubbers.
Conditions and measures related to sewage treatment plant
• Municipal STP: No [Effectiveness Water: 0%]
Conditions and measures related to treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: No (low amount) (Particular risks from waste treatment unlikely due to small fraction of used substance entering into the waste stage. Waste disposal according to national/local legislation is sufficient.) <i>Wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately or/and with other cobalt compounds waste to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the cobalt content of the waste is elevated enough, internal or external recovery/recycling might be considered. Appropriate waste codes: 01 03 07*, 02 01 10*, 06 05 02*, 06 03 13*, 06 03 15*, 06 04 05*, 10 08 04, 10 10 03, 10 10 05*, 10 10 07*, 10 10 10, 10 10 11*, 11 02 07*, 12 01 03*, 12 01 04, 15 01 04*, 15 01 10*, 16 01 04*, 16 01 06*, 16 01 18*, 16 03 03*, 16 06 02*, 16 06 05, 16 08 02*, 16 08 03, 16 10 01*, 17 04 07*, 17 04 09*, 17 09 04*, 19 10 02*, 19 12 03*,... Suitable disposal: Keep separate and dispose of to either - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC. A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2011)</i>
Other conditions affecting environmental exposure
• Discharge rate of effluent: $\geq 2E3$ m ³ /d
• Receiving surface water flow rate: $\geq 5.98E5$ m ³ /d
• Final dilution factor: ≥ 300

6.3.2. Releases

The local releases to the environment are reported in the following table.

Table 9.66. Local releases to the environment

Release	Release factor estimation method	Explanation / Justification
Water	Release factor (SpERC Metallic coating)	Initial release factor: 0.5% Final release factor: 0.5% Local release rate: 0.125 kg/day Explanation / Justification: Eurométaux, 2012, version 2.1
Air	Release factor (SpERC Metallic coating)	Initial release factor: 0.2% Final release factor: 0.2% Local release rate: 0.05 kg/day Explanation / Justification: Eurométaux, 2012, version 2.1
Soil	Release factor	Final release factor: 0% Explanation / Justification: No direct release to soil.

Releases to waste

Release factor to external waste: 0.1 %

A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2011)

6.3.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.67. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk characterisation
Marine water	Local PEC: 0.11 µg/l	0.04
Sediment (marine water)	Local PEC: 8.42 mg/kg dw	0.89
Air	Local PEC: 6.1 ng/m ³	No environmental hazard
Agricultural soil	Local PEC: 0.01 mg/kg dw	< 0.01
Man via Environment - Inhalation	Local PEC: 6.1 ng/m ³	< 0.01
Man via Environment - Oral	Exposure via food consumption: 0.317 µg/kg/d	< 0.01

Conclusion on risk characterisation

MAN VIA ENVIRONMENT:

The use of EUSES to predict the concentration in food is difficult to apply for metals and associated with much higher uncertainties than using measured data. Therefore, deviations from the TGD food basket approach for the exposure route “ingestion of food”, have been applied as shortly described in section 9.0.3.6..

Furthermore, the exposure assessment is based on the cobalt ion, as this is the toxic species.

The oral exposure concentration in µg/kg bw/day has been derived by taking 2L of drinking water (PEC freshwater taken from the local environmental exposure assessment) + the worst case exposure of 19 µg Co/d from food (97.5th percentile from the 1994 UK total diet study (please refer to section 9.0.3.6) and a default body weight of 60kg into account.

For the risk characterisation the following DNELs based on cobalt were used:

DNEL inhalation, local, long-term of 6.3 µg Co/m³

DNEL oral, systemic, long-term of 8.6 mg Co/kg bw/day

As such a combined RCR cannot be provided (local and systemic effects).

6.4. Worker CS 4: Raw material handling (solid input materials) (PROC 5, PROC 8b)

Task(s) covered with this contributing scenario: Mixing, loading/unloading, weighing.

6.4.1. Conditions of use

	Method
Product (Article) characteristics	
<ul style="list-style-type: none"> Maximum emission potential of the substance: Medium <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> 	
<ul style="list-style-type: none"> Content in preparation: Not restricted [Effectiveness Inhalation: 0%, Dermal: 0%] 	
<ul style="list-style-type: none"> Physical form of substance: Solid, powder / dust 	
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration per shift: = 10.0 min 	
<ul style="list-style-type: none"> Shifts per year: = 4.0 Shifts/year <i>Typical number of shifts per year during which this task is conducted considering a single worker. This value has been taken into account in the calculation of excess cancer risk.</i> 	
Technical and organisational conditions and measures	

	Method
<ul style="list-style-type: none"> Integrated local exhaust ventilation: Upper confidence limit (industrial use) [Effectiveness Inhalation: 90%] <i>High efficiency</i> 	
<ul style="list-style-type: none"> Process temperature: Ambient 	
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> General good occupational hygiene practices <i>Required good occupational hygiene practices to ensure a safe handling of the substance involve measures (e.g. shower and change clothes at end of work shift) to avoid any contamination of private households via the work-home-interface and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking in the workplace. In general, inhalation and ingestion should be avoided. Unless otherwise stated below, certified working clothing and shoes should be worn during work. Any contaminated clothing should not be taken home. Good general ventilation in the workplace should be ensured. Dust should not be blown off (e.g. from dried splashes) with compressed air. Regular training in workplace hygiene practice and proper use of personal protective equipment (if relevant) is required.</i> 	
<ul style="list-style-type: none"> Gloves: Gloves protecting from sensitizing properties to skin, continuous supervision of workers required <i>Due to the skin sensitizing effect of the substance, protective gloves according to EN 374 have to be worn at all workplaces unless any exposure to the substance can be excluded when taking into account the nature of the conducted process, applied exposure prevention measures and physical appearance of the substance of concern in the specific type of application (e.g. protecting from splashes by containment of emission source). Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. Additionally, face protection is required to be worn as appropriate. This level of protection is to be achieved by continuous supervision and training of workers wearing gloves.</i> 	
<ul style="list-style-type: none"> Certified safety clothing and shoes <i>Certified safety clothing including coveralls and safety shoes are to be worn as appropriate. Face protection may be worn if the type of process is associated with the risk of face injuries due to thermal or mechanical stress.</i> 	
<ul style="list-style-type: none"> Chemical protective suit according to EN 13982 <i>In cases where direct contact with the substance cannot be avoided, a protective suit conforming to EN 13982 should be worn.</i> 	

6.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.68. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	8E-3 µg/m ³ (Measured data: Monitoring data)	RCR < 0.01

Remarks on measured exposure:

Monitoring data

Identity of the substance used: Exposure reported as substance

Inhalation exposure, long term concentration: Number of measured data points: 1

Risk characterisation

Qualitative risk characterisation:

The risk characterisation for local dermal effects is given in Section 9.0.4.2.

6.5. Worker CS 5: Dissolution of solid raw materials (PROC 2, PROC 1)

Task(s) covered with this contributing scenario: Dissolution, drying.

6.5.1. Conditions of use

	Method
Product (Article) characteristics	
<ul style="list-style-type: none"> Maximum emission potential of the substance: Very low <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> 	
<ul style="list-style-type: none"> Content in preparation: Not restricted [Effectiveness Inhalation: 0%, Dermal: 0%] 	
<ul style="list-style-type: none"> Physical form of substance: Aqueous solution 	
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration per shift: = 480.0 min 	
<ul style="list-style-type: none"> Shifts per year: = 240.0 Shifts/year <i>Typical number of shifts per year during which this task is conducted considering a single worker. This value has been taken into account in the calculation of excess cancer risk.</i> 	
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> Level of containment: Closed process <i>Closed pipe system, closed reaction vessels</i> 	
<ul style="list-style-type: none"> Level of automation: Semi-automated process 	
<ul style="list-style-type: none"> Process temperature: Ambient 	
<ul style="list-style-type: none"> Integrated local exhaust ventilation: Upper confidence limit (industrial use) [Effectiveness Inhalation: 90%] <i>High efficiency</i> <i>Vapour extraction units in the tank</i> 	
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> General good occupational hygiene practices <i>Required good occupational hygiene practices to ensure a safe handling of the substance involve measures (e.g. shower and change clothes at end of work shift) to avoid any contamination of private households via the work-home-interface and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking in the workplace. In general, inhalation and ingestion should be avoided. Unless otherwise stated below, certified working clothing and shoes should be worn during work. Any contaminated clothing should not be taken home. Good general ventilation in the workplace should be ensured. Dust should not be blown off (e.g. from dried splashes) with compressed air. Regular training in workplace hygiene practice and proper use of personal protective equipment (if relevant) is required.</i> 	
<ul style="list-style-type: none"> Gloves: Gloves protecting from sensitizing properties to skin, continuous supervision of workers required <i>Due to the skin sensitizing effect of the substance, protective gloves according to EN 374 have to be worn at all workplaces unless any exposure to the substance can be excluded when taking into account the nature of the conducted process, applied exposure prevention measures and physical appearance of the substance of concern in the specific type of application (e.g. protecting from splashes by containment of emission source). Gloves have to</i> 	

	Method
<i>be changed according to manufacturer's information or when damaged, whatever is the earlier. Additionally, face protection is required to be worn as appropriate. This level of protection is to be achieved by continuous supervision and training of workers wearing gloves.</i>	
<ul style="list-style-type: none"> • Certified safety clothing and shoes <i>Certified safety clothing including coveralls and safety shoes are to be worn as appropriate. Face protection may be worn if the type of process is associated with the risk of face injuries due to thermal or mechanical stress.</i> 	

6.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.69. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	8.6 µg/m ³ (Measured data: Monitoring data)	RCR = 0.107

Remarks on measured exposure:

Monitoring data

Identity of the substance used: Exposure reported as substance

Inhalation exposure, long term concentration: Number of measured data points: 9; GSD: 1.9

Risk characterisation

Qualitative risk characterisation:

The risk characterisation for local dermal effects is given in Section 9.0.4.2.

6.6. Worker CS 6: Raw material handling (exclusively aqueous solutions as input materials) (PROC 4, PROC 9)

Task(s) covered with this contributing scenario: Mixing, loading/unloading, weighing, immediate removal of wet splashes.

6.6.1. Conditions of use

	Method
Product (Article) characteristics	
<ul style="list-style-type: none"> • Maximum emission potential of the substance: Very low <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> 	
<ul style="list-style-type: none"> • Content in preparation: 5 - 25 % [Effectiveness Inhalation: 40%, Dermal: 40%] 	
<ul style="list-style-type: none"> • Physical form of substance: Aqueous solution 	
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> • Duration per shift: = 30.0 min 	
<ul style="list-style-type: none"> • Shifts per year: = 240.0 Shifts/year <i>Typical number of shifts per year during which this task is conducted considering a single worker. This value has been taken into account in the calculation of excess cancer risk.</i> 	
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> • General good occupational hygiene practices <i>Required good occupational hygiene practices to ensure a safe handling of the</i> 	

	Method
<p>substance involve measures (e.g. shower and change clothes at end of work shift) to avoid any contamination of private households via the work-home-interface and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking in the workplace. In general, inhalation and ingestion should be avoided. Unless otherwise stated below, certified working clothing and shoes should be worn during work. Any contaminated clothing should not be taken home. Good general ventilation in the workplace should be ensured. Dust should not be blown off (e.g. from dried splashes) with compressed air. Regular training in workplace hygiene practice and proper use of personal protective equipment (if relevant) is required.</p>	
<ul style="list-style-type: none"> Gloves: Gloves protecting from sensitizing properties to skin, continuous supervision of workers required <i>Due to the skin sensitizing effect of the substance, protective gloves according to EN 374 have to be worn at all workplaces unless any exposure to the substance can be excluded when taking into account the nature of the conducted process, applied exposure prevention measures and physical appearance of the substance of concern in the specific type of application (e.g. protecting from splashes by containment of emission source). Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. Additionally, face protection is required to be worn as appropriate. This level of protection is to be achieved by continuous supervision and training of workers wearing gloves.</i> 	
<ul style="list-style-type: none"> Certified safety clothing and shoes <i>Certified safety clothing including coveralls and safety shoes are to be worn as appropriate. Face protection may be worn if the type of process is associated with the risk of face injuries due to thermal or mechanical stress.</i> 	

6.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.70. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.6 µg/m ³ (Measured data: Analogous data)	RCR < 0.01

Remarks on measured exposure:

Analogous data

Identity of the substance used: Exposure reported as substance

Inhalation exposure, long term concentration: Number of measured data points: 9; GSD: 1.9

Risk characterisation

Qualitative risk characterisation:

The risk characterisation for local dermal effects is given in Section 9.0.4.2.

6.7. Worker CS 7: Passivation (PROC 13)

Task(s) covered with this contributing scenario: Passivation, immediate removal of wet splashes.

It is noted that the substance is used as raw material in the treatment of article surfaces. During treatment, the substance is completely transformed into cobalt and deposited as such on the respective article surface.

6.7.1. Conditions of use

	Method
Product (Article) characteristics	
<ul style="list-style-type: none"> Maximum emission potential of the substance: Very low <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> 	
<ul style="list-style-type: none"> Content in preparation: 1 - 5 % [Effectiveness Inhalation: 80%, Dermal: 80%] 	
<ul style="list-style-type: none"> Physical form of substance: Aqueous solution 	
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration per shift: = 35.0 min 	
<ul style="list-style-type: none"> Shifts per year: = 240.0 Shifts/year <i>Typical number of shifts per year during which this task is conducted considering a single worker. This value has been taken into account in the calculation of excess cancer risk.</i> 	
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> General good occupational hygiene practices <i>Required good occupational hygiene practices to ensure a safe handling of the substance involve measures (e.g. shower and change clothes at end of work shift) to avoid any contamination of private households via the work-home-interface and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking in the workplace. In general, inhalation and ingestion should be avoided. Unless otherwise stated below, certified working clothing and shoes should be worn during work. Any contaminated clothing should not be taken home. Good general ventilation in the workplace should be ensured. Dust should not be blown off (e.g. from dried splashes) with compressed air. Regular training in workplace hygiene practice and proper use of personal protective equipment (if relevant) is required.</i> 	
<ul style="list-style-type: none"> Gloves: Gloves protecting from sensitizing properties to skin, continuous supervision of workers required <i>Due to the skin sensitizing effect of the substance, protective gloves according to EN 374 have to be worn at all workplaces unless any exposure to the substance can be excluded when taking into account the nature of the conducted process, applied exposure prevention measures and physical appearance of the substance of concern in the specific type of application (e.g. protecting from splashes by containment of emission source). Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. Additionally, face protection is required to be worn as appropriate. This level of protection is to be achieved by continuous supervision and training of workers wearing gloves.</i> 	
<ul style="list-style-type: none"> Certified safety clothing and shoes <i>Certified safety clothing including coveralls and safety shoes are to be worn as appropriate. Face protection may be worn if the type of process is associated with the risk of face injuries due to thermal or mechanical stress.</i> 	

6.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.71. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.1 µg/m ³ (MEASE 1.02.01)	RCR < 0.01

Remarks on exposure data from external estimation tools:

MEASE 1.02.01

Explanation: Duration of exposure was not reflected in the exposure estimate by using the assessment tool but instead a linear interpolation was applied to the full-shift estimate as derived by the tool.

Risk characterisation

Qualitative risk characterisation:

The risk characterisation for local dermal effects is given in Section 9.0.4.2.

6.8. Worker CS 8: Packaging and handling of passivated articles (PROC 21)

Task(s) covered with this contributing scenario: Packaging and further handling of passivated articles.

It is noted that the substance is used as raw material in the treatment of article surfaces. During treatment, the substance is completely transformed into cobalt and deposited as such on the respective article surface.

6.8.1. Conditions of use

	Method
Product (Article) characteristics	
<ul style="list-style-type: none"> Maximum emission potential of the substance: Very low <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> 	
<ul style="list-style-type: none"> Content in preparation: Not restricted [Effectiveness Inhalation: 0%, Dermal: 0%] 	
<ul style="list-style-type: none"> Physical form of substance: Massive object 	
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> Duration per shift: = 150.0 min 	
<ul style="list-style-type: none"> Shifts per year: = 240.0 Shifts/year <i>Typical number of shifts per year during which this task is conducted considering a single worker. This value has been taken into account in the calculation of excess cancer risk.</i> 	
Technical and organisational conditions and measures	
<ul style="list-style-type: none"> Process temperature: Ambient 	
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> General good occupational hygiene practices <i>Required good occupational hygiene practices to ensure a safe handling of the substance involve measures (e.g. shower and change clothes at end of work shift) to avoid any contamination of private households via the work-home-interface and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking in the workplace. In general, inhalation and ingestion should be avoided. Unless otherwise stated below, certified working clothing and shoes should be worn during work. Any contaminated clothing should not be taken home. Good general ventilation in the workplace should be ensured. Dust should not be blown off (e.g. from dried splashes) with compressed air. Regular training in workplace hygiene practice and proper use of personal protective equipment (if relevant) is required.</i> 	
<ul style="list-style-type: none"> Gloves: Gloves protecting from sensitizing properties to skin, continuous supervision of workers required <i>Due to the skin sensitizing effect of the substance, protective gloves according</i> 	

	Method
<p>to EN 374 have to be worn at all workplaces unless any exposure to the substance can be excluded when taking into account the nature of the conducted process, applied exposure prevention measures and physical appearance of the substance of concern in the specific type of application (e.g. protecting from splashes by containment of emission source). Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. Additionally, face protection is required to be worn as appropriate. This level of protection is to be achieved by continuous supervision and training of workers wearing gloves.</p>	
<ul style="list-style-type: none"> • Certified safety clothing and shoes <i>Certified safety clothing including coveralls and safety shoes are to be worn as appropriate. Face protection may be worn if the type of process is associated with the risk of face injuries due to thermal or mechanical stress.</i> 	

6.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.72. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	2.7 µg/m ³ (Measured data: Analogous data)	RCR = 0.033

Remarks on measured exposure:

Analogous data

Identity of the substance used: Exposure reported as substance

Inhalation exposure, long term concentration: Number of measured data points: 10; GSD: 2.6

Risk characterisation

Qualitative risk characterisation:

The risk characterisation for local dermal effects is given in Section 9.0.4.2.

6.9. Worker CS 9: Cleaning & Maintenance (PROC 28)

Task(s) covered with this contributing scenario: Manual cleaning, repair and maintenance operations, removal of residuals from e.g. filters/overspill or as waste.

6.9.1. Conditions of use

	Method
Product (Article) characteristics	
<ul style="list-style-type: none"> • Maximum emission potential of the substance: High <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> 	
<ul style="list-style-type: none"> • Physical form of substance: Solid, powder / dust 	
Amount used (or contained in articles), frequency and duration of use/exposure	
<ul style="list-style-type: none"> • Duration per shift: = 240.0 min 	
<ul style="list-style-type: none"> • Shifts per year: = 2.0 Shifts/year <i>Typical number of shifts per year during which this task is conducted considering a single worker. This value has been taken into account in the calculation of excess cancer risk.</i> 	
Technical and organisational conditions and measures	

	Method
• Process temperature: Ambient	
• Process pressure: Ambient	
• Additional operational conditions for cleaning and maintenance: Maintenance and repair work only at machinery/systems which are not in operation. Minor cleaning tasks may be conducted under operation.	
Conditions and measures related to personal protection, hygiene and health evaluation	
• General good occupational hygiene practices <i>Required good occupational hygiene practices to ensure a safe handling of the substance involve measures (e.g. shower and change clothes at end of work shift) to avoid any contamination of private households via the work-home-interface and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking in the workplace. In general, inhalation and ingestion should be avoided. Unless otherwise stated below, certified working clothing and shoes should be worn during work. Any contaminated clothing should not be taken home. Good general ventilation in the workplace should be ensured. Dust should not be blown off (e.g. from dried splashes) with compressed air. Regular training in workplace hygiene practice and proper use of personal protective equipment (if relevant) is required.</i>	
• Gloves: Gloves protecting from sensitizing properties to skin, continuous supervision of workers required <i>Due to the skin sensitizing effect of the substance, protective gloves according to EN 374 have to be worn at all workplaces unless any exposure to the substance can be excluded when taking into account the nature of the conducted process, applied exposure prevention measures and physical appearance of the substance of concern in the specific type of application (e.g. protecting from splashes by containment of emission source). Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. Additionally, face protection is required to be worn as appropriate. This level of protection is to be achieved by continuous supervision and training of workers wearing gloves.</i>	
• Certified safety clothing and shoes <i>Certified safety clothing including coveralls and safety shoes are to be worn as appropriate. Face protection may be worn if the type of process is associated with the risk of face injuries due to thermal or mechanical stress.</i>	
• Chemical protective suit according to EN 13982 <i>In cases where direct contact with the substance cannot be avoided, a protective suit conforming to EN 13982 should be worn.</i>	

6.9.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.73. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	12.1 µg/m ³ (Measured data: Monitoring data)	RCR = 0.15

Remarks on measured exposure:

Monitoring data

Identity of the substance used: Exposure reported as substance

Inhalation exposure, long term concentration: Number of measured data points: 2; GSD: 3.4

Risk characterisation

Qualitative risk characterisation:

The risk characterisation for local dermal effects is given in Section 9.0.4.2.