

## 28. ES 28: Use at industrial sites; Production of batteries using nickel electrodes

### 28.1. Title section

Sector of use: Manufacture of computer, electronic and optical products, electrical equipment (SU 16)

<b>Environment</b>	
1: Production of batteries using nickel electrodes - Discharge to fresh water via municipal sewage treatment plant	ERC 5
2: Production of batteries using nickel electrodes - Direct discharge to fresh water	ERC 5
3: Production of batteries using nickel electrodes - Direct discharge to marine water	ERC 5
<b>Worker</b>	
4: Handling of massive raw materials	PROC 21
5: Handling of powders	PROC 26, PROC 5, PROC 14
6: Dissolution	PROC 4, PROC 8b
7: Coating, electroplating	PROC 4, PROC 13, PROC 8b
8: Sintering	PROC 1, PROC 22
9: Battery handling	PROC 21
10: Wet cleaning	PROC 28
11: Cleaning/removal of dust	PROC 28

### 28.2. Conditions of use affecting exposure

#### 28.2.1. Control of environmental exposure: Production of batteries using nickel electrodes - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

<b>Amount used, frequency and duration of use (or from service life)</b>
Daily amount per site <= 2.884 tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site <= 796 tonnes/year
Emission days >= 276 days/year
<b>Technical and organisational conditions and measures</b>
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
<b>Conditions and measures related to biological sewage treatment plant</b>
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
<b>Conditions and measures related to external treatment of waste (including article waste)</b>

Dispose of waste product or used containers according to local regulations.
<b>Other conditions affecting environmental exposure</b>
Receiving surface water flow $\geq 1.8E4$ m <sup>3</sup> /day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) $\geq 10$

### 28.2.2. Control of environmental exposure: Production of batteries using nickel electrodes - Direct discharge to fresh water (ERC 5)

<b>Amount used, frequency and duration of use (or from service life)</b>
Daily amount per site $\leq 2.884$ tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site $\leq 796$ tonnes/year
Emission days $\geq 276$ days/year
<b>Technical and organisational conditions and measures</b>
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
<b>Conditions and measures related to external treatment of waste (including article waste)</b>
Dispose of waste product or used containers according to local regulations.
<b>Other conditions affecting environmental exposure</b>
Receiving surface water flow $\geq 5.23E4$ m <sup>3</sup> /day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) $\geq 100$
Assumed effluent discharge flow from site $\geq 528$ m <sup>3</sup> /day

### 28.2.3. Control of environmental exposure: Production of batteries using nickel electrodes - Direct discharge to marine water (ERC 5)

<b>Amount used, frequency and duration of use (or from service life)</b>
Daily amount per site $\leq 2.884$ tonnes/day (All the amounts and concentrations are expressed as Ni as this is the driver for the environmental risk assessment.)
Annual amount per site $\leq 796$ tonnes/year
Emission days $\geq 276$ days/year
<b>Technical and organisational conditions and measures</b>
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
<b>Conditions and measures related to external treatment of waste (including article waste)</b>
Dispose of waste product or used containers according to local regulations.
<b>Other conditions affecting environmental exposure</b>
No discharge to freshwater assumed
Receiving water dilution (fresh or marine) $\geq 100$

Assumed effluent discharge flow from site $\geq$ 528 m <sup>3</sup> /day
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#### 28.2.4. Control of worker exposure: Handling of massive raw materials (PROC 21)

<b>Product (article) characteristics</b>
Maximum emission potential covered in this ES: Low (abrasion based).
Physical form of product; Massive object
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

#### 28.2.5. Control of worker exposure: Handling of powders (PROC 26, PROC 5, PROC 14)

<b>Product (article) characteristics</b>
Physical form of product; Solid, high dustiness
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>
Local exhaust ventilation
Semi-closed system
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
APF of RPE = 10 (90% respiratory protection). For further specification, refer to section 8 of the SDS.
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

#### 28.2.6. Control of worker exposure: Dissolution (PROC 4, PROC 8b)

<b>Product (article) characteristics</b>
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution.
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>
Covers use at ambient temperatures.

#### 28.2.7. Control of worker exposure: Coating, electroplating (PROC 4, PROC 13, PROC 8b)

<b>Product (article) characteristics</b>
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution.
<b>Technical and organisational conditions and measures</b>
Automated task
Use of a surfactant/wetting/foaming agent is required.
Use of a rim ventilation is required.

### 28.2.8. Control of worker exposure: Sintering (PROC 1, PROC 22)

<b>Product (article) characteristics</b>
Maximum emission potential covered in this ES: Low (temperature based).
Physical form of product: Solid.
<b>Technical and organisational conditions and measures</b>
Ensure automation of the process as far as technically feasible
Closed process with occasional opening
Use of an integrated local exhaust ventilation is required.
Manufacturing and processing of minerals and/or metals at substantially elevated temperature. High temperature processes slightly below melting point / degradation temperature.

### 28.2.9. Control of worker exposure: Battery handling (PROC 21)

<b>Product (article) characteristics</b>
Maximum emission potential covered in this ES: Low.
Physical form of product; Massive object
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Wear suitable gloves tested to EN374.; For further specification, refer to section 8 of the SDS.

### 28.2.10. Control of worker exposure: Wet cleaning (PROC 28)

<b>Product (article) characteristics</b>
Maximum emission potential covered in this ES: Very low.
Physical form of product: Solution and other liquid materials, e.g. suspensions are also covered.
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>
Cleaning machines such as power sweeper, no direct manual cleaning.
Covers use at ambient temperatures.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
APF of RPE = 10 (90% respiratory protection).

### 28.2.11. Control of worker exposure: Cleaning/removal of dust (PROC 28)

<b>Product (article) characteristics</b>
Physical form of product: Residual dust.
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>
Cleaning is conducted using cleaning machines, in particular hovering is applied and the use of compressed air is omitted.
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
APF of RPE = 20 (95% respiratory protection). For further specification, refer to section 8 of the SDS.

## 28.3. Exposure estimation and reference to its source

### 28.3.1. Environmental release and exposure: Production of batteries using nickel electrodes - Discharge to fresh water via municipal sewage treatment plant (ERC 5)

Release route	Release rate	Release estimation method
Water	0.123 kg/day	Estimated release factor
Air	0.073 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	5.55E-3 mg/L (EUSES 2.1.2)	0.782
Sediment (freshwater)	103.2 mg/kg dw (PEC sediment calculation method for metals)	0.947
Sewage Treatment Plant	0.037 mg/L (EUSES 2.1.2)	0.112
Agricultural soil	17.24 mg/kg dw (EUSES 2.1.2)	0.577

### 28.3.2. Environmental release and exposure: Production of batteries using nickel electrodes - Direct discharge to fresh water (ERC 5)

Release route	Release rate	Release estimation method
Water	0.123 kg/day	Estimated release factor
Air	0.073 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	4.57E-3 mg/L (EUSES 2.1.2)	0.644
Sediment (freshwater)	77.5 mg/kg dw (PEC sediment calculation method for metals)	0.711
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

### 28.3.3. Environmental release and exposure: Production of batteries using nickel electrodes - Direct discharge to marine water (ERC 5)

Release route	Release rate	Release estimation method
Water	0.123 kg/day	Estimated release factor
Air	0.073 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	1.97E-3 mg/L (EUSES 2.1.2)	0.229
Sediment (marine water)	60.1 mg/kg dw (PEC sediment calculation method for metals)	0.551
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

### 28.3.4. Worker exposure: Handling of massive raw materials (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	9E-3 mg/m <sup>3</sup> (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m <sup>3</sup> (Measured data)	0.18
Inhalation, local, acute	0.037 mg/m <sup>3</sup> (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm <sup>2</sup> (Measured data)	0.148
Combined, systemic, long term		0.18

### 28.3.5. Worker exposure: Handling of powders (PROC 26, PROC 5, PROC 14)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m <sup>3</sup> (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m <sup>3</sup> (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m <sup>3</sup> (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm <sup>2</sup> (Measured data)	0.148
Combined, systemic, long term		0.28

### 28.3.6. Worker exposure: Dissolution (PROC 4, PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.012 mg/m <sup>3</sup> (Measured data)	0.24
Inhalation, local, long term	0.012 mg/m <sup>3</sup> (Measured data)	0.24
Inhalation, local, acute	0.047 mg/m <sup>3</sup> (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm <sup>2</sup> (Measured data)	0.022
Combined, systemic, long term		0.24

### 28.3.7. Worker exposure: Coating, electroplating (PROC 4, PROC 13, PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	5E-3 mg/m <sup>3</sup> (Measured data)	0.1
Inhalation, local, long term	5E-3 mg/m <sup>3</sup> (Measured data)	0.1
Inhalation, local, acute	0.015 mg/m <sup>3</sup> (Measured data)	< 0.01
Dermal, local, long term	0.076 µg/cm <sup>2</sup> (Measured data)	< 0.01
Combined, systemic, long term		0.1

### 28.3.8. Worker exposure: Sintering (PROC 1, PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.015 mg/m <sup>3</sup> (Measured data)	0.3
Inhalation, local, long term	0.015 mg/m <sup>3</sup> (Measured data)	0.3
Inhalation, local, acute	0.044 mg/m <sup>3</sup> (Measured data)	< 0.01

Route of exposure and type of effects	Exposure estimate	RCR
Dermal, local, long term	0.76 µg/cm <sup>2</sup> (Measured data)	0.022
Combined, systemic, long term		0.3

### 28.3.9. Worker exposure: Battery handling (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	9E-3 mg/m <sup>3</sup> (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m <sup>3</sup> (Measured data)	0.18
Inhalation, local, acute	0.037 mg/m <sup>3</sup> (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm <sup>2</sup> (Measured data)	0.148
Combined, systemic, long term		0.18

### 28.3.10. Worker exposure: Wet cleaning (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m <sup>3</sup> (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m <sup>3</sup> (Measured data)	0.12
Inhalation, local, acute	0.026 mg/m <sup>3</sup> (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm <sup>2</sup> (Measured data)	0.022
Combined, systemic, long term		0.12

### 28.3.11. Worker exposure: Cleaning/removal of dust (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.032 mg/m <sup>3</sup> (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m <sup>3</sup> (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m <sup>3</sup> (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm <sup>2</sup> (Measured data)	0.022
Combined, systemic, long term		0.64

## 28.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: Please refer to Section 0.3 of this "ES for Communication".