6. ES 6: Formulation or re-packing; Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation

6.1. Title section

Product category: Base metals and alloys (PC 7)

Environment	
1: Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation - Discharge to fresh water via municipal sewage treatment plant	ERC 3
2: Use of nickel metal and nickel containing alloys for the production of steel and other alloys powder by atomisation - Direct discharge to fresh water	ERC 3
3: Use of nickel metal and nickel containing alloys for the production of steel and other alloys powder by atomisation - Direct discharge to marine water	ERC 3
Worker	
4: Handling of dusty raw materials	PROC 26
5: Handling of massive raw materials	PROC 21
6: Melting, casting and tapping	PROC 23, PROC 22, PROC 3
7: Atomisation	PROC 27a, PROC 1
8: Powder handling and packaging	PROC 26
9: Powder pressing	PROC 1
10: Wet cleaning	PROC 28
11: Cleaning/removal of dust	PROC 28

6.2. Conditions of use affecting exposure

6.2.1. Control of environmental exposure: Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation - Discharge to fresh water via municipal sewage treatment plant (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.909 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 <= 200 tonnes/year
Emission days >= 220 days/year
Technical and organisational conditions and measures
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
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 10

6.2.2. Control of environmental exposure: Use of nickel metal and nickel containing alloys for the production of steel and other alloys powder by atomisation - Direct discharge to fresh water (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 4.077 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 <= 897 tonnes/year
Emission days >= 220 days/year
Technical and organisational conditions and measures
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
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.98E5 m3/day
No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 100

6.2.3. Control of environmental exposure: Use of nickel metal and nickel containing alloys for the production of steel and other alloys powder by atomisation - Direct discharge to marine water (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 4.077 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 <= 897 tonnes/year
Emission days >= 220 days/year
Technical and organisational conditions and measures
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
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
No discharge to freshwater assumed
Receiving water dilution (fresh or marine) >= 100
Assumed effluent discharge flow from site >= 2E3 m3/day

6.2.4. Control of worker exposure: Handling of dusty raw materials (PROC 26)

Product (article) characteristics
Maximum emission potential covered in this ES: High.
Physical form of product: Solid, powder / dust, massive forms.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system
Conditions and measures related to personal protection, hygiene and health evaluation
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.

6.2.5. Control of worker exposure: Handling of massive raw materials (PROC 21)

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

6.2.6. Control of worker exposure: Melting, casting and tapping (PROC 23, PROC 22, PROC 3)

Product (article) characteristics
Maximum emission potential covered in this ES: High (temperature based).
Physical form of product: Molten.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Assumes process temperature up to 1.6E3 °C
Local exhaust ventilation
Semi-closed system

6.2.7. Control of worker exposure: Atomisation (PROC 27a, PROC 1)

Product (article) characteristics
Physical form of product: Molten.
Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation is required.

6.2.8. Control of worker exposure: Powder handling and packaging (PROC 26)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Technical and organisational conditions and measures
Local exhaust ventilation
Semi-closed system
Conditions and measures related to personal protection, hygiene and health evaluation
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.

6.2.9. Control of worker exposure: Powder pressing (PROC 1)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation is required.

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

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

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

Product (article) characteristics

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

6.3. Exposure estimation and reference to its source

6.3.1. Environmental release and exposure: Use of nickel metal and nickel containing alloys for the production of steel and other alloy powders by atomisation - Discharge to fresh water via municipal sewage treatment plant (ERC 3)

Release route	Release rate	Release estimation method
Water	0.045 kg/day	Estimated release factor
Air	0.019 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	3.88E-3 mg/L (EUSES 2.1.2)	0.546
Sediment (freshwater)	59.1 mg/kg dw (PEC sediment calculation method for metals)	0.542
Sewage Treatment Plant	0.014 mg/L (EUSES 2.1.2)	0.041
Agricultural soil	16.58 mg/kg dw (EUSES 2.1.2)	0.555

6.3.2. Environmental release and exposure: Use of nickel metal and nickel containing alloys for the production of steel and other alloys powder by atomisation - Direct discharge to fresh water (ERC 3)

Release route	Release rate	Release estimation method
Water	0.204 kg/day	Estimated release factor
Air	0.084 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	3.34E-3 mg/L (EUSES 2.1.2)	0.47
Sediment (freshwater)	52.6 mg/kg dw (PEC sediment calculation method for metals)	0.483
Agricultural soil	17.91 mg/kg dw (EUSES 2.1.2)	0.599

6.3.3. Environmental release and exposure: Use of nickel metal and nickel containing alloys for the production of steel and

other alloys powder by atomisation - Direct discharge to marine water (ERC 3)

Release route	Release rate	Release estimation method
Water	0.204 kg/day	Estimated release factor
Air	0.084 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	1.03E-3 mg/L (EUSES 2.1.2)	0.12
Sediment (marine water)	35.2 mg/kg dw (PEC sediment calculation method for metals)	0.323
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

6.3.4. Worker exposure: Handling of dusty raw materials (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.28

6.3.5. 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/m³ (Measured data)	0.18
Inhalation, local, long term	9E-3 mg/m³ (Measured data)	0.18
Inhalation, local, acute	0.037 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.18

6.3.6. Worker exposure: Melting, casting and tapping (PROC 23, PROC 22, PROC 3)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.016 mg/m³ (Measured data)	0.32
Inhalation, local, long term	0.016 mg/m³ (Measured data)	0.32
Inhalation, local, acute	0.065 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.32

6.3.7. Worker exposure: Atomisation (PROC 27a, PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.017 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.076 µg/cm² (Measured data)	< 0.01
Combined, systemic, long term		0.12

6.3.8. Worker exposure: Powder handling and packaging (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm² (Measured data)	0.148
Combined, systemic, long term		0.28

6.3.9. Worker exposure: Powder pressing (PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.017 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.076 µg/cm² (Measured data)	< 0.01
Combined, systemic, long term		0.12

6.3.10. Worker exposure: Wet cleaning (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m³ (Measured data)	0.12
Inhalation, local, acute	0.026 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.12

6.3.11. 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/m³ (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m³ (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.022
Combined, systemic, long term		0.64

6.4. 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”.