7. ES 7: Use at industrial sites; Use of nickel oxide for the manufacture of nickel-containing glass

7.1. Title section

Sector of use: Manufacture of other non-metallic mineral products, e.g. plasters, cement (SU 13)

Environment	
1: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Discharge to fresh water via municipal sewage treatment plant	ERC 6a
2: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Direct discharge to fresh water	ERC 6a
3: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Direct discharge to marine water	ERC 6a
4: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - No water	ERC 6a
Worker	
5: Raw material handling	PROC 26
6: Formulation and mixing	PROC 3
7: Melting	PROC 22
8: Wet cleaning	PROC 28
9: Cleaning/removal of dust	PROC 28

7.2. Conditions of use affecting exposure

7.2.1. Control of environmental exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Discharge to fresh water via municipal sewage treatment plant (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.041 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 <= 15 tonnes/year
Emission days >= 365 days/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
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

No discharge to marine water assumed
Receiving water dilution (fresh or marine) >= 10
Receiving surface water flow >= 1.8E4 m3/day

7.2.2. Control of environmental exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Direct discharge to fresh water (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.041 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 <= 15 tonnes/year
Emission days >= 365 days/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
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 marine water assumed
Receiving water dilution (fresh or marine) >= 10
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

7.2.3. Control of environmental exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Direct discharge to marine water (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.041 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 <= 15 tonnes/year
Emission days >= 365 days/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitator or wet electrostatic precipitator or cyclones or fabric/bag filter or ceramic/metal mesh filter or wet scrubber
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

7.2.4. Control of environmental exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - No water (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.164 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 <= 60 tonnes/year
Emission days >= 365 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
The substance should not be released to water
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

7.2.5. Control of worker exposure: Raw material handling (PROC 26)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Amount used (or contained in articles), frequency and duration of use/exposure
Frequency of task: Once per shift.
Technical and organisational conditions and measures
Local exhaust ventilation

7.2.6. Control of worker exposure: Formulation and mixing (PROC 3)

Product (article) characteristics
Physical form of product: Solid, powder / dust.
Technical and organisational conditions and measures
Use in closed process

7.2.7. Control of worker exposure: Melting (PROC 22)

Product (article) characteristics
Physical form of product: Molten.
Maximum emission potential covered in this ES: Medium (temperature based).
Technical and organisational conditions and measures
Local exhaust ventilation
Automated task
Assumes process temperature up to 1.6E3 °C
Ensure enclosure of furnace operation

7.2.8. 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).

7.2.9. 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.

7.3. Exposure estimation and reference to its source

7.3.1. Environmental release and exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Discharge to fresh water via municipal sewage treatment plant (ERC 6a)

Release route	Release rate	Release estimation method
Water	0.041 kg/day	Estimated release factor
Air	0.058 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	3.78E-3 mg/L (EUSES 2.1.2)	0.533
Sediment (freshwater)	56.8 mg/kg dw (PEC sediment calculation method for metals)	0.521
Sewage Treatment Plant	0.012 mg/L (EUSES 2.1.2)	0.037
Agricultural soil	16.55 mg/kg dw (EUSES 2.1.2)	0.554

7.3.2. Environmental release and exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Direct discharge to fresh water (ERC 6a)

Release route	Release rate	Release estimation method
Water	0.041 kg/day	Estimated release factor

Release route	Release rate	Release estimation method
Air	0.058 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	4.37E-3 mg/L (EUSES 2.1.2)	0.616
Sediment (freshwater)	72.3 mg/kg dw (PEC sediment calculation method for metals)	0.663
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

7.3.3. Environmental release and exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - Direct discharge to marine water (ERC 6a)

Release route	Release rate	Release estimation method
Water	0.041 kg/day	Estimated release factor
Air	0.058 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	4.47E-4 mg/L (EUSES 2.1.2)	0.052
Sediment (marine water)	20 mg/kg dw (PEC sediment calculation method for metals)	0.183
Agricultural soil	16.20 mg/kg dw (EUSES 2.1.2)	0.542

7.3.4. Environmental release and exposure: Intermediate use of nickel oxide for the manufacture of nickel-containing glass - No water (ERC 6a)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	0.23 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Agricultural soil	16.22 mg/kg dw (EUSES 2.1.2)	0.543

7.3.5. Worker exposure: Raw material handling (PROC 26)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.028 mg/m³ (Measured data)	0.56
Inhalation, local, long term	0.028 mg/m³ (Measured data)	0.56
Inhalation, local, acute	0.111 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.063
Combined, systemic, long term		0.56

7.3.6. Worker exposure: Formulation and mixing (PROC 3)

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

7.3.7. Worker exposure: Melting (PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.021 mg/m³ (Measured data)	0.42
Inhalation, local, long term	0.021 mg/m³ (Measured data)	0.42
Inhalation, local, acute	0.085 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.063
Combined, systemic, long term		0.42

7.3.8. 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)	0.063
Combined, systemic, long term		0.12

7.3.9. 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)	0.01
Dermal, local, long term	0.76 µg/cm² (Measured data)	0.063
Combined, systemic, long term		0.64

7.4. 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”.