3. ES 3: Use at industrial sites; Use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts

3.1. Title section

Sector of use: Manufacture of bulk, large scale chemicals (including petroleum products) (SU 8), Manufacture of fine chemicals (SU 9)

Environment	
1: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - Discharge to fresh water via municipal sewage treatment plant	ERC 6a
2: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - Direct discharge to fresh water	ERC 6a
3: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - Direct discharge to marine water	ERC 6a
Worker	
4: Industrial use of powdered catalysts	PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 9, PROC 1, PROC 14
5: Industrial use of shaped catalysts	PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 9, PROC 1

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - 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 <= 1.4 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 <= 476 tonnes/year
Emission days >= 340 days/year
Technical and organisational conditions and measures
Direct emissions to air should be mitigated by application of one or more of the following RMMs: • HEPA filtration (ESCOM 9267234005), Fabric filters (ESCOM 9267234003) and Bag or Ceramic Filters (ESCOM 12355002122) • Wet Scrubbers (ESCOM 9267234016) • Dry or semi-dry Scrubbers (No available ESCOM phrase) • Metallic Grids (ESCOM 12355002122)
Direct emissions to water should be mitigated by application of one or more of the following RMMs: •

Precipitation (ESCOM 12355002126) • Sedimentation (ESCOM 12355002126) • Filtration (ESCOM 12355002126) • Distillation (ESCOM 9267234037) • Ion Exchange (ESCOM 12355002126)
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
Local freshwater dilution factor 50

3.2.2. Control of environmental exposure: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - Direct discharge to fresh water (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 1.4 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 <= 476 tonnes/year
Emission days >= 340 days/year
Technical and organisational conditions and measures
Direct emissions to air should be mitigated by application of one or more of the following RMMs: • HEPA filtration (ESCOM 9267234005), Fabric filters (ESCOM 9267234003) and Bag or Ceramic Filters (ESCOM 12355002122) • Wet Scrubbers (ESCOM 9267234016) • Dry or semi-dry Scrubbers (No available ESCOM phrase) • Metallic Grids (ESCOM 12355002122)
Direct emissions to water should be mitigated by application of one or more of the following RMMs: • Precipitation (ESCOM 12355002126) • Sedimentation (ESCOM 12355002126) • Filtration (ESCOM 12355002126) • Distillation (ESCOM 9267234037) • Ion Exchange (ESCOM 12355002126)
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
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 100

3.2.3. Control of environmental exposure: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - Direct discharge to marine water (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 1.4 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 <= 476 tonnes/year
Emission days >= 340 days/year
Technical and organisational conditions and measures

Direct emissions to air should be mitigated by application of one or more of the following RMMs: • HEPA filtration (ESCOM 9267234005), Fabric filters (ESCOM 9267234003) and Bag or Ceramic Filters (ESCOM 12355002122) • Wet Scrubbers (ESCOM 9267234016) • Dry or semi-dry Scrubbers (No available ESCOM phrase) • Metallic Grids (ESCOM 12355002122)
Direct emissions to water should be mitigated by application of one or more of the following RMMs: • Precipitation (ESCOM 12355002126) • Sedimentation (ESCOM 12355002126) • Filtration (ESCOM 12355002126) • Distillation (ESCOM 9267234037) • Ion Exchange (ESCOM 12355002126)
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
Assumed effluent discharge flow from site >= 2E3 m3/day
Local marine water dilution factor 100

3.2.4. Control of worker exposure: Industrial use of powdered catalysts (PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 9, PROC 1, PROC 14)

Product (article) characteristics
Physical form of product: Powder or shaped solid.
Limit the substance content in the product to 90 %
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours
Amounts used: 220-1700 kg nickel oxide/shift.
Technical and organisational conditions and measures
Ensure semi-closed transfers, reduction, stabilisation and sulphiding are closed processes.
Local exhaust ventilation
Use vacuum cleaner fitted with a HEPA filter to remove dusts and powders during cleaning.
Reduce dermal contact to a single event per day.
Containment of raw materials and product is required to prevent dermal contact.
Automated task
Conditions and measures related to personal protection, hygiene and health evaluation
Use of protective suit conforming to EN13982-1 Type 5 is required during operations where dermal contact is possible. Other protective equipment should be chosen based on activities being undertaken, potential for exposure to airborne substance-containing dust and other relevant workplace hazards may include protective suit (with hood) and safety shoes (e.g. according to EN 20346).
Use of RPE (Particle filter with high efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P3 or FFPE)) for cleaning and maintenance operations and where exposure to the substance dust or powder is possible. Air fed RPE may be used, if entry to the equipment used for production is required.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

3.2.5. Control of worker exposure: Industrial use of shaped catalysts (PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 9, PROC 1)

Product (article) characteristics

Limit the substance content in the product to 90 %
Physical form of product: Solid, shaped catalysts.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers daily exposures up to 8 hours (loading and unloading: carried out by specialist catalyst loading companies).
Amounts used: 220-1700 kg nickel oxide/shift.
Technical and organisational conditions and measures
Local exhaust ventilation
Use vacuum cleaner fitted with a HEPA filter to remove dusts and powders during cleaning.
Closed or semi-closed, semi-automated loading (closed use in reactors, closed or semi-closed, semi-automated discharge).
Reduce dermal contact to a single event per day.
Semi-automated task
Conditions and measures related to personal protection, hygiene and health evaluation
Use of protective suit conforming to EN13982-1 Type 5 is required during operations where dermal contact is possible. Other protective equipment should be chosen based on activities being undertaken, potential for exposure to airborne substance-containing dust and other relevant workplace hazards may include protective suit (with hood) and safety shoes (e.g. according to EN 20346).
Use of RPE (Particle filter with high efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P3 or FFPE)) for cleaning and maintenance operations and where exposure to the substance dust or powder is possible. Air fed RPE may be used, if entry to the equipment used for production is required.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

3.3. Exposure estimation and reference to its source

3.3.1. Environmental release and exposure: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - Discharge to fresh water via municipal sewage treatment plant (ERC 6a)

Release route	Release rate	Release estimation method
Water	0.56 kg/day	Estimated release factor
Air	0.252 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	5.31E-3 mg/L (EUSES 2.1.2)	0.748
Sediment (freshwater)	96.88 mg/kg dw (PEC sediment calculation method for metals)	0.889
Sewage Treatment Plant	0.168 mg/L (EUSES 2.1.2)	0.509
Agricultural soil	20.93 mg/kg dw (EUSES 2.1.2)	0.7

3.3.2. Environmental release and exposure: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture

of other nickel substances in catalysts - Direct discharge to fresh water (ERC 6a)

Release route	Release rate	Release estimation method
Water	0.56 kg/day	Estimated release factor
Air	0.252 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Fresh water	4.91E-3 mg/L (EUSES 2.1.2)	0.691
Sediment (freshwater)	86.32 mg/kg dw (PEC sediment calculation method for metals)	0.792
Agricultural soil	16.22 mg/kg dw (EUSES 2.1.2)	0.543

3.3.3. Environmental release and exposure: Intermediate use of nickel oxide-containing catalyst precursors for the manufacture of other nickel substances in catalysts - Direct discharge to marine water (ERC 6a)

Release route	Release rate	Release estimation method
Water	0.56 kg/day	Estimated release factor
Air	0.252 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Marine water	2.31E-3 mg/L (EUSES 2.1.2)	0.268
Sediment (marine water)	68.92 mg/kg dw (PEC sediment calculation method for metals)	0.632
Agricultural soil	16.22 mg/kg dw (EUSES 2.1.2)	0.543

3.3.4. Worker exposure: Industrial use of powdered catalysts (PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 9, PROC 1, PROC 14)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.045 mg/m³ (Measured data)	0.9
Inhalation, local, long term	0.045 mg/m³ (Measured data)	0.9
Inhalation, local, acute	0.18 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5E-4 mg/cm² (MEASE, PROC 8b)	0.042
Combined, systemic, long term		0.9

3.3.5. Worker exposure: Industrial use of shaped catalysts (PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 9, PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.026 mg/m³ (Measured data)	0.52

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	0.026 mg/m³ (Measured data)	0.52
Inhalation, local, acute	0.078 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5E-4 mg/cm² (MEASE, PROC 8b)	0.042
Combined, systemic, long term		0.52

3.4. 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”.