

26. ES 26: Use at industrial sites; Use of nickel metal as intermediate for the manufacture of other substances in catalyst or catalyst precursor manufacture

26.1. 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 metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - Discharge to fresh water via municipal sewage treatment plant	ERC 6a
2: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - Direct discharge to fresh water	ERC 6a
3: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - Direct discharge to marine water	ERC 6a
Worker	
4: Industrial use of powdered catalysts	PROC 8b, PROC 4, PROC 8a, PROC 2, PROC 3, PROC 1
5: Industrial use of shaped catalysts (extrudates, pellets, tablets, spheres, encapsulated powders)	PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 1

26.2. Conditions of use affecting exposure

26.2.1. Control of environmental exposure: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - 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 $\geq 2E3$ m ³ /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

26.2.2. Control of environmental exposure: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - 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 $\geq 2E3$ m ³ /day
Local freshwater dilution factor 100

26.2.3. Control of environmental exposure: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - 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 $\geq 2E3$ m ³ /day
Local marine water dilution factor 100

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

Product (article) characteristics
Physical form of product: Solid, powder / dust (as dry powder or as suspension in an inert liquid (e.g. water, alcohols, hydrocarbons).
Limit the substance content in the product to 95 %
Amount used (or contained in articles), frequency and duration of use/exposure
Frequency and duration of use/exposure: 8–11 hours/shift (37.5 hours/week). Loading and unloading operations for plant operators shall be no more than 5% of shifts. Special loading companies have up to full shift exposures.
Amount used: 0.5-75 tonnes nickel/year (1-150 tonnes catalyst/year).
Technical and organisational conditions and measures
Use of water or vacuum cleaner fitted with a HEPA filter to remove dusts and powders during cleaning.
During use catalyst powder is required to be entirely contained within reaction vessels and associated pipework. The handling of powdered catalyst materials in open workspace is excluded.
Charging and discharging of catalyst powder take place in semi-automated methods whereby the catalyst is transferred into hoppers and lifted up to the top of the reactor and transferred from the hopper to the reactor by manual assistance/control or enclosed transfer from container to reactor.
Conditions and measures related to personal protection, hygiene and health evaluation
Use of RPE (Particle filter with high efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P3 or FFPE)) is required during loading and unloading of reactor and for cleaning and maintenance operations and where exposure to nickel containing dust or powder is possible. Use of air fed RPE is required if entry to the reactor is required.
Use of protective suit conforming to EN13982-1 Type 5 and suitable chemical resistant safety gloves (EN 374) capable of providing protection during prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374): E.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), butyl rubber (0.7 mm) or other gloves meeting the required performance specifications is required during loading and unloading of reactor, during cleaning and maintenance and during any other operations where dermal contact is possible. Other protective equipment should be chosen based on activities being undertaken, potential for exposure to airborne nickel and other relevant workplace hazards may include protective suit (with hood), safety shoes (e.g. according to EN 20346).

26.2.5. Control of worker exposure: Industrial use of shaped catalysts (extrudates, pellets, tablets, spheres, encapsulated powders) (PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 1)

Product (article) characteristics
Limit the substance content in the product to 65 %
Physical form of product: Shaped catalyst.
Amount used (or contained in articles), frequency and duration of use/exposure
Frequency and duration of use/exposure: Loading/unloading frequency: During 1 week once every 6 months or less frequently. Cleaning frequency: From twice a year to once in 8 years. 8 – 11 hours/shift (37.5 hours/week). Loading and unloading operations for plant operators shall be no more than 5% of shifts. Special loading companies have up to full shift exposures. For encapsulated powders loading/unloading may occur 10-20 times per day.
Amount used: 1.5 - 200 tonnes nickel/year (5 - 600 tonnes catalyst/year).
Technical and organisational conditions and measures
Use of water or vacuum cleaner fitted with a HEPA filter to remove dusts and powders during cleaning.
Use: A closed reactor is required. For encapsulated powders charging and discharging of catalyst droplets is entirely enclosed, including piped transfer of catalyst from supply tank and return of spent catalyst embedded in organic matrix to tank.
Loading: Enclosed transfer system are used to prevent the release of dust into workplace air or a semi-automated operation are used for outdoor transfer. Unloading: Enclosed transfer from reactor to container or operation may occur outdoors.
Conditions and measures related to personal protection, hygiene and health evaluation
Use of RPE (Particle filter with high efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P3 or FFPE)) is required during loading and unloading of reactor and for cleaning and maintenance operations where exposure to nickel containing dust or powder is possible; use of air fed RPE is required, if entry to the reactor is required.
Use of protective suit conforming to EN13982-1 Type 5 and suitable chemical resistant safety gloves (EN 374) capable of providing protection during prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374): E.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), butyl rubber (0.7 mm) or other gloves meeting the required performance specifications is required during loading and unloading of reactor, during cleaning and maintenance and during any other operations where dermal contact is possible. Other protective equipment should be chosen based on activities being undertaken, potential for exposure to airborne nickel and other relevant workplace hazards may include protective suit (with hood), safety shoes (e.g. according to EN 20346).

26.3. Exposure estimation and reference to its source

26.3.1. Environmental release and exposure: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - 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

Protection target	Exposure estimate	RCR
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

26.3.2. Environmental release and exposure: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - 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

26.3.3. Environmental release and exposure: Intermediate use of nickel metal for the manufacture of other substances in catalyst or catalyst precursor manufacture - 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

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

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.01 mg/m ³ (Measured data)	0.2
Inhalation, local, long term	0.01 mg/m ³ (Measured data)	0.2
Inhalation, local, acute	0.04 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	5E-4 mg/cm ² (MEASE, PROC 8b)	0.014
Combined, systemic, long term		0.2

26.3.5. Worker exposure: Industrial use of shaped catalysts (extrudates, pellets, tablets, spheres, encapsulated powders) (PROC 8b, PROC 4, PROC 28, PROC 8a, PROC 2, PROC 3, PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.02 mg/m ³ (Measured data)	0.4
Inhalation, local, long term	0.02 mg/m ³ (Measured data)	0.4
Inhalation, local, acute	0.06 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	5E-4 mg/cm ² (MEASE, PROC 8b)	0.014
Combined, systemic, long term		0.4

26.4. 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”.