25. ES 25: Use at industrial sites; Use of pre-reduced nickel-containing catalyst

25.1. Title section

Product category: Products such as ph-regulators, flocculants, precipitants, neutralization agents (PC 20)
Sector of use: Manufacture of bulk, large scale chemicals (including petroleum products) (SU 8), Manufacture of fine chemicals (SU 9)

Environment	
1: Use of pre-reduced nickel-containing catalysts - no releases	ERC 4
2: Use of pre-reduced nickel-containing catalysts - no releases	ERC 6b
Worker	
3: Industrial use of powdered catalysts	PROC 8b, PROC 4, PROC 8a, PROC 2, PROC 3, PROC 1
4: 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

25.2. Conditions of use affecting exposure

25.2.1. Control of environmental exposure: Use of pre-reduced nickel-containing catalysts - no releases (ERC 4)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 75 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 <= 75 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to air
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.

25.2.2. Control of environmental exposure: Use of pre-reduced nickel-containing catalysts - no releases (ERC 6b)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 75 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 <= 75 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to air
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.

25.2.3. 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).

25.2.4. 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).

25.3. Exposure estimation and reference to its source

25.3.1. Environmental release and exposure: Use of pre-reduced nickel-containing catalysts - no releases (ERC 4)

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

25.3.2. Environmental release and exposure: Use of pre-reduced nickel-containing catalysts - no releases (ERC 6b)

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

25.3.3. 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/m³ (Measured data)	0.2

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	0.01 mg/m³ (Measured data)	0.2
Inhalation, local, acute	0.04 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5E-4 mg/cm² (MEASE, PROC 8b)	0.014
Combined, systemic, long term		0.2

25.3.4. 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/m³ (Measured data)	0.4
Inhalation, local, long term	0.02 mg/m³ (Measured data)	0.4
Inhalation, local, acute	0.06 mg/m³ (Measured data)	< 0.01
Dermal, local, long term	5E-4 mg/cm² (MEASE, PROC 8b)	0.014
Combined, systemic, long term		0.4

25.4. 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”.