

11. ES 11: Use at industrial sites; Use of nickel powder or nickel alloy powder in powder metallurgy

11.1. Title section

Product category: Base metals and alloys (PC 7)

Sector of use: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: Use of nickel powder or nickel alloy powder in powder metallurgy - only air	ERC 5
Worker	
2: Raw material handling	PROC 26
3: Furnacing and atomisation	PROC 27a, PROC 22
4: Powder finishing - crushing, milling and sieving	PROC 24
5: Powder handling	PROC 26, PROC 5
6: Powder pressing	PROC 14
7: Sintering	PROC 22
8: Post-sintering operations	PROC 22
9: Wet cleaning	PROC 28
10: Cleaning/removal of dust	PROC 28

11.2. Conditions of use affecting exposure

11.2.1. Control of environmental exposure: Use of nickel powder or nickel alloy powder in powder metallurgy - only air (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 19.28 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 <= 4.78E3 tonnes/year
Emission days >= 248 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.

11.2.2. 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
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.

11.2.3. Control of worker exposure: Furnacing and atomisation (PROC 27a, PROC 22)

Technical and organisational conditions and measures
Use in closed process
Use of an integrated local exhaust ventilation is required.
Automated task

11.2.4. Control of worker exposure: Powder finishing - crushing, milling and sieving (PROC 24)

Product (article) characteristics
Physical form of product; Solid
Maximum emission potential covered in this ES: High. Low to high level of abrasion possible.
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
High temperature
Local exhaust ventilation
Automated task
Use in closed process

11.2.5. Control of worker exposure: Powder handling (PROC 26, PROC 5)

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
Ensure automation of the process as far as technically feasible
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.

11.2.6. Control of worker exposure: Powder pressing (PROC 14)

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
Ensure automation of the process as far as technically feasible
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.

11.2.7. Control of worker exposure: Sintering (PROC 22)

Product (article) characteristics
Physical form of product; Solid, high dustiness
Technical and organisational conditions and measures
Automated task
Use in closed process
Use of an integrated local exhaust ventilation is required.
High temperature processes slightly below melting point / degradation temperature.

11.2.8. Control of worker exposure: Post-sintering operations (PROC 22)

Product (article) characteristics
Physical form of product; Massive object
Maximum emission potential covered in this ES: Very low.
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
Automated task
Use in closed process

11.2.9. 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).

11.2.10. 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.

11.3. Exposure estimation and reference to its source

11.3.1. Environmental release and exposure: Use of nickel powder or nickel alloy powder in powder metallurgy - only air (ERC 5)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	2.22E-4 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Agricultural soil	16.2 mg/kg dw (EUSES 2.1.2)	0.542

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

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m ³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m ³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm ² (Measured data)	0.148
Combined, systemic, long term		0.28

11.3.3. Worker exposure: Furnacing and atomisation (PROC 27a, PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m ³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m ³ (Measured data)	0.12
Inhalation, local, acute	0.017 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	0.076 µg/cm ² (Measured data)	< 0.01
Combined, systemic, long term		0.12

11.3.4. Worker exposure: Powder finishing - crushing, milling and sieving (PROC 24)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.024 mg/m ³ (Measured data)	0.48
Inhalation, local, long term	0.024 mg/m ³ (Measured data)	0.48
Inhalation, local, acute	0.096 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm ² (Measured data)	0.022
Combined, systemic, long term		0.48

11.3.5. Worker exposure: Powder handling (PROC 26, PROC 5)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.014 mg/m ³ (Measured data)	0.28
Inhalation, local, long term	0.014 mg/m ³ (Measured data)	0.28
Inhalation, local, acute	0.071 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	5.18 µg/cm ² (Measured data)	0.148
Combined, systemic, long term		0.28

11.3.6. Worker exposure: Powder pressing (PROC 14)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	7E-3 mg/m ³ (Measured data)	0.14
Inhalation, local, long term	7E-3 mg/m ³ (Measured data)	0.14
Inhalation, local, acute	0.02 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	3.73 µg/cm ² (Measured data)	0.107
Combined, systemic, long term		0.14

11.3.7. Worker exposure: Sintering (PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.015 mg/m ³ (Measured data)	0.3
Inhalation, local, long term	0.015 mg/m ³ (Measured data)	0.3
Inhalation, local, acute	0.044 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm ² (Measured data)	0.022
Combined, systemic, long term		0.3

11.3.8. Worker exposure: Post-sintering operations (PROC 22)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	8E-3 mg/m ³ (Measured data)	0.16
Inhalation, local, long term	8E-3 mg/m ³ (Measured data)	0.16
Inhalation, local, acute	0.034 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm ² (Measured data)	0.022
Combined, systemic, long term		0.16

11.3.9. Worker exposure: Wet cleaning (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6E-3 mg/m ³ (Measured data)	0.12
Inhalation, local, long term	6E-3 mg/m ³ (Measured data)	0.12
Inhalation, local, acute	0.026 mg/m ³ (Measured data)	< 0.01
Dermal, local, long term	0.76 µg/cm ² (Measured data)	0.022
Combined, systemic, long term		0.12

11.3.10. 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/m ³ (Measured data)	0.64
Inhalation, local, long term	0.032 mg/m ³ (Measured data)	0.64
Inhalation, local, acute	0.189 mg/m ³ (Measured data)	0.016
Dermal, local, long term	0.76 µg/cm ² (Measured data)	0.022
Combined, systemic, long term		0.64

11.4. 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”.