

1. Title		Version 2, 2015
GES 38 Use of Ni powder in the manufacturing of micronutrient additives for biogas production		
Life cycle	Use of nickel metal (Ni) powder in the manufacturing of micronutrient additives for biogas production	
Free short title	Use of Ni powder in the manufacturing of micronutrient additives for biogas production	
Systematic title based on use descriptor	SU: SU 1: Agriculture PC: PC 12: Fertilizer ERC: ERC 2: Formulation of preparations PROC: PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of chemicals into small containers (dedicated filling line) PROC 0 – Cleaning and maintenance	
Processes, tasks, activities covered (environment)	Use of Ni powder in the manufacturing of micronutrient additives for biogas production	
Processes, tasks, activities covered (workers)	Contributing exposure scenario ES 38.1: PROC 3, 4 and PROC 8b: Ni powder reception Contributing exposure scenario ES 38.2: PROC 3 Preparing the additive powder Contributing exposure scenario ES 38.3: PROC 9: Packaging Contributing exposure scenario ES 38.4: PROC 3 Palletising Contributing exposure scenario ES 38.5: PROC 0: Cleaning and Maintenance	
2. Operational conditions and risk management measures		
2.1 Control of environmental exposure		
Environmental related free short title	Use of Ni powder in the manufacturing of micronutrient additives for biogas production	
Systematic title based on use descriptor (environment)	ERC2 – Formulation of preparations	
Processes, tasks, activities covered (environment)	Manufacture of Ni metal-containing micronutrient additives for biogas production	
Environmental Assessment Method	Not Relevant (no release to water or air)	
Product characteristics		
Powder		
Amounts used		
Maximum daily use at a site	25 kg	
Maximum annual use at a site	1-10 tonnes	
Frequency and duration of use		
Pattern of release to the environment	No appreciable release to the environment	
Environment factors not influenced by risk management		
Receiving surface water flow rate	Not relevant	
Dilution capacity, freshwater	Not relevant	
Dilution capacity, marine	Not relevant	
Other given operational conditions affecting environmental exposure		
None		

Technical conditions and measures at process level (source) to prevent release	
There is no discharge to sewer or river. A dust aspiration system used to collect particles that are directed back to the mixing system (thus no release to air).	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Waste water: There are no discharges to a sewer or river.	
Air: Technical aspiration is present to avoid dust emissions to the environment. A filtration system is present that re-circulates particles back to the mixing system. When the filter elements are reaching their end of life they are replaced.	
Organizational measures to prevent/limit release from site	
None	
Conditions and measures related to municipal sewage treatment plant	
Municipal Sewage Treatment Plant (STP)	Not relevant
Discharge rate of the Municipal STP	Not relevant
Incineration of the sludge of the Municipal STP	Not relevant
Conditions and measures related to external treatment of waste for disposal	
Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the nickel content of the waste is elevated enough, internal or external recovery/recycling might be considered.	
Fraction of daily/annual use expected in waste:	
<ul style="list-style-type: none"> - Nickel producers = 0.05 % - DU: stainless steel and alloy steels = 0.6 % - DU: nickel alloys, copper alloys, foundry, batteries, catalysts, chemicals, dyes and others = 0.5 % - DU: Plating = 3% 	
Appropriate waste codes:	
01 03 07*, 02 01 10*, 06 03 13*, 06 03 15*, 06 04 05*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 09, 10 08 15*, 10 08 16, 10 10 03, 10 10 05*, 10 10 07*, 10 10 09*, 10 10 10, 10 10 11*, 11 02 07*, 12 01 03*, 12 01 04, 15 01 04*, 15 01 10*, 16 01 04*, 16 01 06*, 16 01 08*, 16 06 02*, 16 06 05, 16 08 02*, 16 08 03*, 17 04 07*, 17 04 09*, 19 09 04*, 19 10 02*, 19 12 03*	
Suitable disposal: Keep separate and dispose of to either	
<ul style="list-style-type: none"> - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC. 	
Conditions and measures related to external recovery of waste	
Shredders pre-treating metal wastes should have a maximum release factors to air of 0.0015 after RMM and no releases to water and soil.	
Q _{max, local(shredding)} =26kg Ni/day	
(Note: This Q _{max, local} for shredders is based on the existing information at the moment of the update. It will be reviewed when new information is available from the BREF for shredding)	
2.2 Control of workers exposure for contributing exposure scenario 38.1	
Ni powder reception	
Workers related free short title	Use of Ni powder in the manufacturing of micronutrient additives for biogas production

Use descriptor covered	PROC 3: Use in closed batch process (synthesis or formulation) PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities	
Processes, tasks, activities covered	Ni powder is obtained ready for processing and placed in a dispensing bin.	
Assessment Method	Estimation of dermal & inhalation exposure using a Tier 1 model (MEASE)	
Product characteristic		
Ni powder		
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
Duration of exposure is considered to be less than 4 hours per day for nutrient manufacture especially when this production process is not continuous and where this product line is one of a range of products manufactured on site for the agricultural or energy etc. sectors.		
Human factors not influenced by risk management		
Respiration volume under conditions of use	Light to medium level work is routinely undertaken ~10 m ³ /d	
Room size and ventilation rate	Not relevant	
Area of skin contact with the substance under conditions of use	480 cm ²	
Body weight	70 kg	
Other given operational conditions affecting workers exposure		
The reception of raw materials for the manufacturing of micronutrient additives is a non-continuous operation and/or takes place for no more than 4 hours per day and all activities are carried out manually by the worker e.g. the reactor is charged by tipping NiSO ₄ .6H ₂ O powder or pouring NiSO ₄ solution into the dispensing bin. Oral: Good workplace hygiene practice.		
Technical conditions and measures at process level (source) to prevent release		
Transfer of Ni powder to the dispensing bin, should be automated and enclosed where exposure to Ni powder is likely.		
Technical conditions and measures to control dispersion from source towards the worker		
LEV is required to extract mists and aerosols from processes that are not fully enclosed and are likely to give rise to Ni-containing aerosols.		
Organisational measures to prevent /limit releases, dispersion and exposure		
Training to reinforce good workplace hygiene practice and hygiene issues are performed.		
Conditions and measures related to personal protection, hygiene and health evaluation		
<u>Inhalation</u> : Air-assisted filtering visor, masks or hood with P3 filter element (Assigned Protection Factor = 40 based on use of powered respirator meeting EN12492 requirement or equivalent suitable P3 level protection) is required for charging the dispensing bin where exposure to Ni-containing mist or dust is possible. It is important to note that the disposable mask FFP1 (with APF = 4) is not recommended for use with Ni-containing aerosols.		
<u>Dermal</u> : Suitable gloves (EN 374, protection level 6, PVC or equivalent), and goggles. Other protective equipment e.g. special safety clothing should be chosen based on activities being undertaken, potential for exposure to airborne nickel-containing aerosols and other relevant workplace hazards may include protective suit with hood (conforming to EN13982-1 Type 5) and safety shoes (e.g. according to EN 20346).		
2.3 Control of workers exposure for contributing exposure scenario 38.2		
Preparing the additive (for biogas production) powder or solutions		
Workers related free short title	Use of Ni powder in the manufacturing of micronutrient additives for biogas production	
Use descriptor covered	PROC 3: Use in closed batch process (synthesis or formulation)	
Processes, tasks, activities covered	Preparing the additive (for biogas production) powder or solutions	
Assessment Method	Estimation of dermal & inhalation exposure using a Tier 1 model (MEASE)	
Product characteristic		

Ni powder	
Amounts used	
Not relevant	
Frequency and duration of use/exposure	
Duration of exposure is considered to be less than 4 hours per day for nutrient manufacture especially when this production process is not continuous and where this product line is one of a range of products manufactured on site for the agricultural or energy etc. sectors.	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Light to medium level work is routinely undertaken ~10 m ³ /d
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	240 cm ²
Body weight	70 kg
Other given operational conditions affecting workers exposure	
All activities are largely run from a control room or from a control booth (in sight of the process when they are required to observe the process directly) except when operators are required to inspect or intervene in the process and make any adjustments on the factory floor. The Ni-powder is piped from the dispensing bin to the blender which is automated and enclosed. Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
Transfer and mixing systems shall be enclosed with high level of containment.	
Technical conditions and measures to control dispersion from source towards the worker	
LEV shall be used to extract the particulate during the mixing and transferring operations.	
Organisational measures to prevent /limit releases, dispersion and exposure	
Training to reinforce good workplace hygiene practice and hygiene issues.	
Conditions and measures related to personal protection, hygiene and health evaluation	
<u>Inhalation:</u> Air-assisted filtering visor, masks or hood with P3 filter element (Assigned Protection Factor ~20 based on use of powered respirator meeting EN12492 requirement or equivalent suitable P3 level protection) is required for entry into the production area for inspections/emergency situations where exposure to Ni-containing mist or dust is possible. It is important to note that the disposable mask FFP1 (with APF = 4) is not recommended for use with Ni-containing aerosols. <u>Dermal:</u> Suitable gloves (EN 374, protection level 6, PVC or equivalent), and goggles. Other protective equipment e.g. special safety clothing should be chosen based on activities being undertaken, potential for exposure to airborne nickel-containing aerosols and other relevant workplace hazards may include protective suit with hood (conforming to EN13982-1 Type 5) and safety shoes (e.g. according to EN 20346).	
2.4 Control of workers exposure for contributing exposure scenario 38.3	
Packaging	
Workers related free short title	Use of Ni powder in the manufacturing of micronutrient additives for biogas production
Use descriptor covered	PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Processes, tasks, activities covered	Packaging
Assessment Method	Estimation of dermal exposure using a Tier 1 model (MEASE) and inhalation exposure from read across of an analogous process
Product characteristic	
Ni/NiSO ₄ -containing powder	
Amounts used	
Not relevant	
Frequency and duration of use/exposure	
Duration of exposure is considered to be less than 1 hour per day for nutrient manufacture where some manual intervention is required during the packaging operation but may be longer when operating a fully automated packaging line or if wearing	

RPE.	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	480 cm ²
Body weight	Not relevant
Other given operational conditions affecting workers exposure	
All activities except filled bag removal from the packaging (valve bag filling) station are automated with a high level of containment. Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
Filled bag self-seals through an internal valve system and this prevents dust escaping from the bag.	
Technical conditions and measures to control dispersion from source towards the worker	
LEV is required to control inhalation exposure to particulates during product release into the packaging and sealing of the filled packaging.	
Organisational measures to prevent /limit releases, dispersion and exposure	
Training to reinforce good workplace hygiene practice and hygiene issues	
Conditions and measures related to personal protection, hygiene and health evaluation	
<p><u>Inhalation:</u> Air-assisted filtering visor, masks or hood with P3 filter element (Assigned Protection Factor ~20 based on use of powered respirator meeting EN12492 requirement or FFP3 (EN149) or equivalent suitable respirator) is required for emergencies and non-routine tasks where exposure to Ni-containing mist or aerosol is possible or for operations that are not fully enclosed and are likely to give rise to Ni-containing mist or aerosol and where there is contamination with Ni-containing solutions and dusts. It is important to note that the disposable mask FFP1 (with APF = 4) is not recommended for use with Ni-containing aerosols.</p> <p><u>Dermal:</u> Suitable gloves (EN 374, protection level 6, PVC or equivalent), and goggles. Other protective equipment e.g. special safety clothing should be chosen based on activities being undertaken, potential for exposure to airborne nickel-containing aerosols and other relevant workplace hazards may include protective suit with hood (conforming to EN13982-1 Type 5) and safety shoes (e.g. according to EN 20346).</p>	
2.5 Control of workers exposure for contributing exposure scenario 38.4	
Palletising	
Workers related free short title	Use of Ni powder in the manufacturing of micronutrient additives for biogas production
Use descriptor covered	PROC 3: Use in closed batch process (synthesis or formulation)
Processes, tasks, activities covered	Palletising and wrapping of filled bags of biogas nutrient
Assessment Method	Estimation of dermal & inhalation exposure using a Tier 1 model (MEASE)
Product characteristic	
Ni-containing powder or solution	
Amounts used	
Not relevant	
Frequency and duration of use/exposure	
Duration of exposure is considered to be less than 1 hour per day for nutrient manufacture especially when this production process is not continuous and where this product line is one of a range of products manufactured on site for the agricultural or energy etc. sectors	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Light to medium level work is routinely undertaken ~10 m ³ /d
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	240 cm ²
Body weight	70 kg
Other given operational conditions affecting workers exposure	

The structure of bag used for packaging the micronutrients limits dust released from filled bags and hence exposure. Activities involve handling the filled bags of biogas nutrient powder which are considered a leak-proof packaging system. Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
None reported	
Technical conditions and measures to control dispersion from source towards the worker	
None reported	
Organisational measures to prevent /limit releases, dispersion and exposure	
Training to reinforce good workplace hygiene practice and hygiene issues related to exposure	
Conditions and measures related to personal protection, hygiene and health evaluation	
<u>Inhalation</u> : Air-assisted filtering visor, masks or hood with P3 filter element (Assigned Protection Factor ~20 based on use of powered respirator meeting EN12492 requirement or FFP3 (EN149) or equivalent suitable respirator) is required for emergencies and non-routine tasks where exposure to Ni-containing mist or aerosol is possible or for operations that are not fully enclosed and are likely to give rise to Ni-containing mist or aerosol and where there is contamination with Ni-containing solutions and dusts. It is important to note that the disposable mask FFP1 (with APF = 4) is not recommended for use with Ni-containing aerosols.	
<u>Dermal</u> : Suitable gloves (EN 374, protection level 6, PVC or equivalent), and goggles. Other protective equipment e.g. special safety clothing should be chosen based on activities being undertaken, potential for exposure to airborne nickel-containing aerosols and other relevant workplace hazards may include protective suit with hood (conforming to EN13982-1 Type 5) and safety shoes (e.g. according to EN 20346).	
2.5 Control of workers exposure for contributing exposure scenario 38.5	
Cleaning and Maintenance	
Workers related free short title	Use of Ni powder in the manufacturing of micronutrient additives for biogas production
Use descriptor covered	PROC 0 – Cleaning and maintenance
Processes, tasks, activities covered	Cleaning and Maintenance
Assessment Method	Estimation of dermal & inhalation exposure using a Tier 1 model (MEASE)
Product characteristic	
Ni-containing powder, solution and dust	
Amounts used	
Not relevant	
Frequency and duration of use/exposure	
Duration of exposure is considered to be less than 1 hour per day for nutrient manufacture especially when this production process is not continuous and where this product line is one of a range of products manufactured on site for the agricultural or energy etc. sectors	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Light to medium level work is routinely undertaken ~10 m ³ /d
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	960 cm ²
Body weight	70 kg
Other given operational conditions affecting workers exposure	
Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
None	
Technical conditions and measures to control dispersion from source towards the worker	
None	
Organisational measures to prevent /limit releases, dispersion and exposure	
Training to reinforce good workplace hygiene practice and hygiene issues	
Conditions and measures related to personal protection, hygiene and health evaluation	
Inhalation to mists and particulates and skin exposure to mists, liquids splashes and particulates shall be controlled by RPE	

and gloves when undertaking maintenance and cleaning work.

Inhalation: Use of air-assisted filtering visor, masks or hood with P3 filter element for plant or premises heavily contaminated with nickel-containing dust or spills {APF 20 or 40 based on use of powered respirator meeting EN12492 or EN12941 requirement or FFP3 (EN136) or equivalent suitable respirator}. RPE with a lower APF of 10 {air-assisted filtering visor, masks or hood with P2 filter element including powered respirators meeting the EN12492 TM1 or EN 12941 TH1 requirement or the FFP2 (EN149) or equivalent suitable respirator} may be used for cleaning and maintenance work where the plant or premises is less heavily contaminated with nickel-containing dust or spills. It is important to note that the disposable mask FFP1 (with APF = 4) is not recommended for use with Ni-containing dust.

Dermal: Suitable gloves (EN 374, protection level 6, PVC or equivalent), and goggles. Other protective equipment e.g. special safety clothing should be chosen based on activities being undertaken, potential for exposure to airborne nickel-containing aerosols and other relevant workplace hazards may include protective suit with hood (conforming to EN13982-1 Type 5) and safety shoes (e.g. according to EN 20346).

3. Exposure and risk estimation

Environment

ERC 2							
compartment	Unit	PNEC	PEC _{Regional}	C _{local}	PEC	RCR	Methods for calculation of environmental concentration
Freshwater	µg/L	3.6	-	-	-	-	Not relevant
Marine	µg/L	8.6	-	-	-	-	
Sediment	mg/kg	136	33.5	-	-	-	
Terrestrial	mg/kg	29.9	-	-	-	-	
STP	Mg/kg	0.33	-	-	-	-	

Workers

ES 38.1					
PROC 4 and PROC 8b: Nickel reception					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR		
Acute local	mg Ni/cm ² /day	-	NR		
Long-term systemic	mg Ni/kg/day	-	NR		
Long-term local	mg Ni/cm ² /day	0.035	0.00003	0.00086	90 th percentile exposure estimate using MEASE for PROC 8b {ind, NDU, NDH, inc, GV, duration 60-240 mins, RPE (APF=40), gloves}
Inhalation					
Acute local	mg Ni/m ³	4	5.13	1.3	3 x long-term modeled estimate
Long-term systemic and local	mg Ni/m ³	0.05	1.71 0.043	34 (excluding RPE) By use of RPE (APF 40) 0.86	90 th percentile exposure estimate using MEASE for PROC 8b {ind, NDU, NDH, inc, GV, duration 60-240 mins, RPE (APF=40), gloves}

ES 38.2					
PROC 3: Preparing the additive (for biogas production) powder or solutions					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR		
Acute local	mg Ni/cm ² /day	-	NR		
Long-term systemic	mg Ni/kg/day	-	NR		
Long-term local	mg Ni/cm ² /day	0.035	0.000018	0.00051	90 th percentile exposure estimate using MEASE for PROC 3 {ind, NDU, NDH, incidental exposure, enc, LEV, duration 60-240 mins, gloves}
Inhalation					
Acute local	mg Ni/m ³	4	0.141	0.0352	3 x long-term inhalable modeled estimate
Long-term systemic and local	mg Ni/m ³	0.05	0.047	0.94	90 th percentile exposure estimate using MEASE for PROC 3 {ind, NDU, NDH, incidental exposure, enc, LEV, duration 60-240 mins, gloves}
ES 38.3					
PROC 9: Packaging					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR		
Acute local	mg Ni/cm ² /day	-	NR		
Long-term systemic	mg Ni/kg/day	-	NR		
Long-term local	mg Ni/cm ² /day	0.035	0.00029 with gloves	8.3 x 10 ⁻³	Read across 75 th percentile for personal exposure measurement (hands and arms for insoluble nickel) reported for an analogous operation for packaging of NiSO ₄ ·6H ₂ O and nickel hydroxycarbonate
Inhalation					
Acute local	mg Ni/m ³	4	0.23	0.0575	10 x long-term inhalable read-across estimate. A factor of 10 was used because of the substantial short term variability of exposure concentrations during powder handling operations
Long-term systemic and local	mg Ni/m ³	0.05	0.023	0.46	Read across 75 th percentile for personal exposure measurements reported for an analogous operation for packaging of NiSO ₄ ·6H ₂ O and nickel hydroxycarbonate
ES 38.4					
PROC 3: Palletising					
	Unit	DNEL	Exposure	RCR	Methods for calculation of exposure

			concentration		
Dermal					
Acute systemic	mg Ni/kg/day	-	NR		
Acute local	mg Ni/cm ² /day	-	NR		
Long-term systemic	mg Ni/kg/day	-	NR		
Long-term local	mg Ni/cm ² /day	0.035	0.000002	5.7 x 10 ⁻⁵	90 th percentile exposure estimate using MEASE for PROC 3 {ind, NDU, NDH, incidental exposure, GV, duration 15-60 mins, gloves}
Inhalation					
Acute local	mg Ni/m ³	4	0.069	0.0172	3 x long-term modeled estimate
Long-term systemic and local	mg Ni/m ³	0.05	0.023	0.46	90 th percentile exposure estimate using MEASE for PROC 3 {ind, NDU, NDH, incidental exposure, GV, duration 15-60 mins, gloves}
ES 38.5					
PROC 0: Cleaning and Maintenance					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR		
Acute local	mg Ni/cm ² /day	-	NR		
Long-term systemic	mg Ni/kg/day	-	NR		
Long-term local	mg Ni/cm ² /day	0.035	0.00001	2.9 x 10 ⁻⁴	90 th percentile exposure estimate using MEASE for PROC 10 {ind, incidental exposure, NDU, NDH,,duration 15-60 mins, general ventilation, RPE, gloves}
Inhalation					
Acute local	mg Ni/m ³	0.7	1.71	0.428	3 x long-term inhalable modeled estimate
Long-term systemic and local	mg Ni/m ³	0.05	0.57 0.029	11.4 (excluding RPE) By use of RPE (APF 20) 0.58	90 th percentile exposure estimate using MEASE for PROC 10 {ind, incidental exposure, NDU, NDH,,duration 15-60 mins, general ventilation, RPE, gloves}
NR: Not Relevant					
<u>Acute local inhalation</u> DNEL based on respirable size aerosols. Equivalent inhalable fraction levels expected to be at least 3-fold higher					
4. Guidance to evaluate whether a site works inside the boundaries set by the ES					
Environment					
Scaling tool: Metals EUSES IT tool (free download: http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool)					

Scaling of the release to air and water environment includes:

Refining of the release factor to air and waste water and/or and the efficiency of the air filter and wastewater treatment facility.

Scaling of the PNEC for aquatic environment by using a tiered approach for correction for bioavailability and background concentration (C_{local} approach).

Scaling of the PNEC for soil compartment by using a tiered approach for correction for bioavailability and background concentration (C_{local} approach).

Workers

Scaling considering duration and frequency of use

Collect process monitoring data with an inhalable sampler. The simultaneous use of a respirable sampler is encouraged.

Use aerosol particle size information, when available, to confirm the appropriate use of the inhalable DNEL of 0.05 mg Ni/m³. Respirable fraction exposure levels should be kept below 0.01 mg Ni/m³.

For further information and guidance on exposure scenarios, available tools, and scaling options, please visit the Nickel Consortia exposure scenario library at the following link: <http://www.nickelconsortia.eu/exposure-scenario-library.html>

Man via Environment exposure and risk characterisation assessments for the use of Ni powder in the manufacturing of micronutrient additives for biogas production

Environmental exposure is not relevant for this exposure scenario