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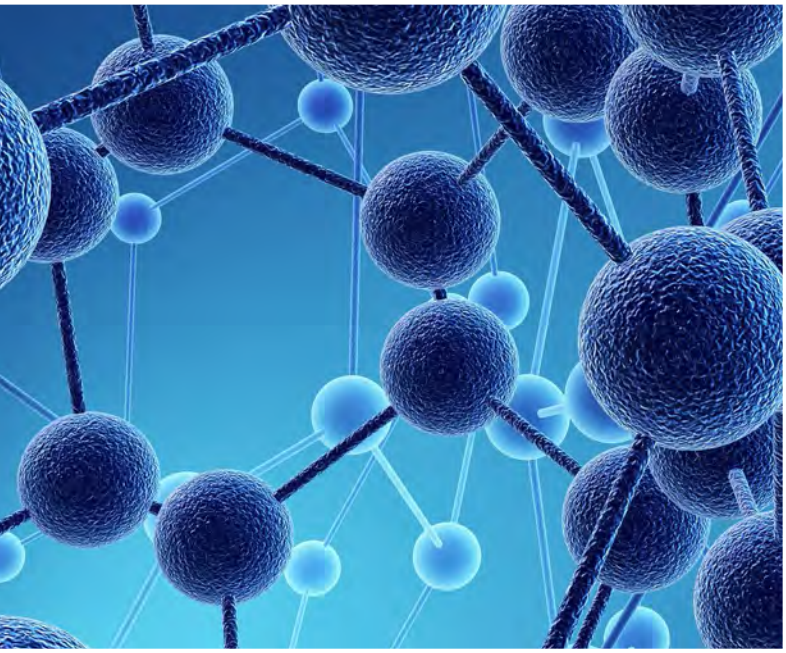
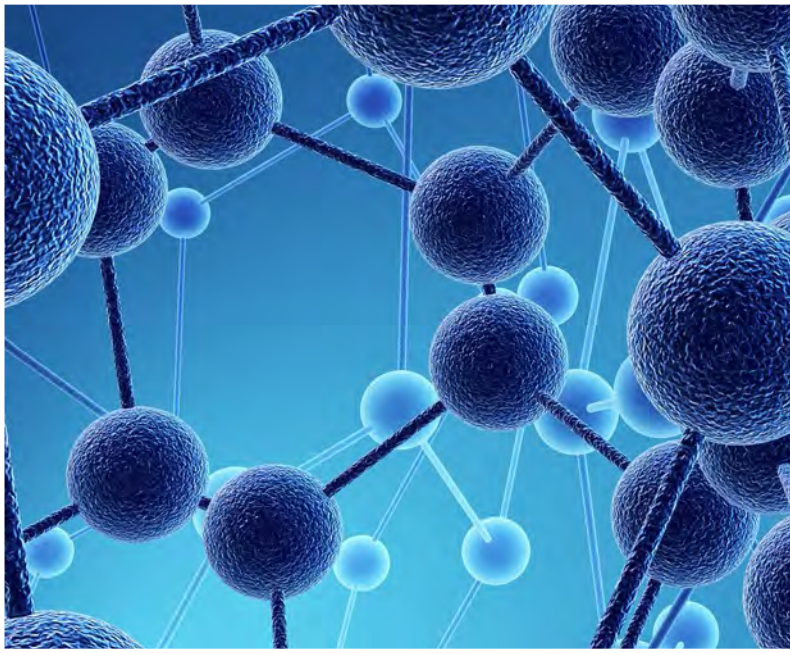
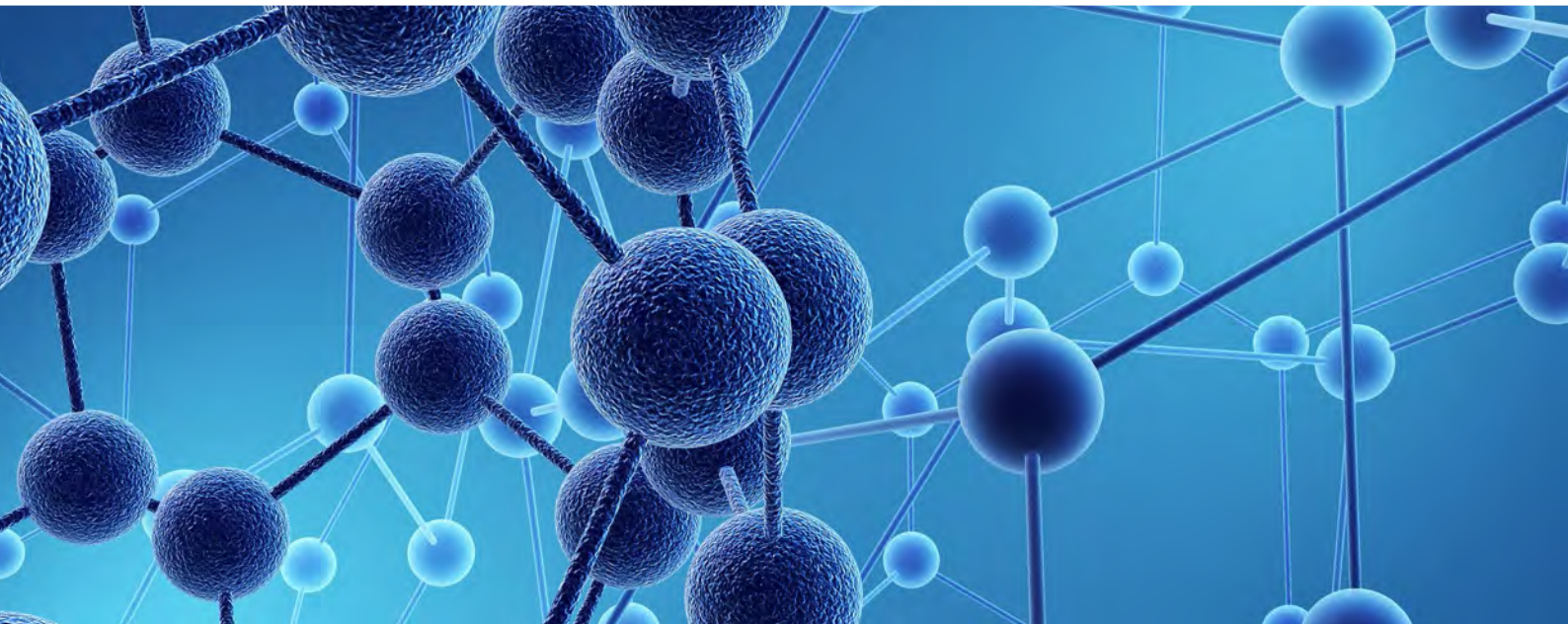
The use of information generated by REACH/CLP to ensure safe use of chemicals

Nickel electroplating: a case study

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Explanatory note

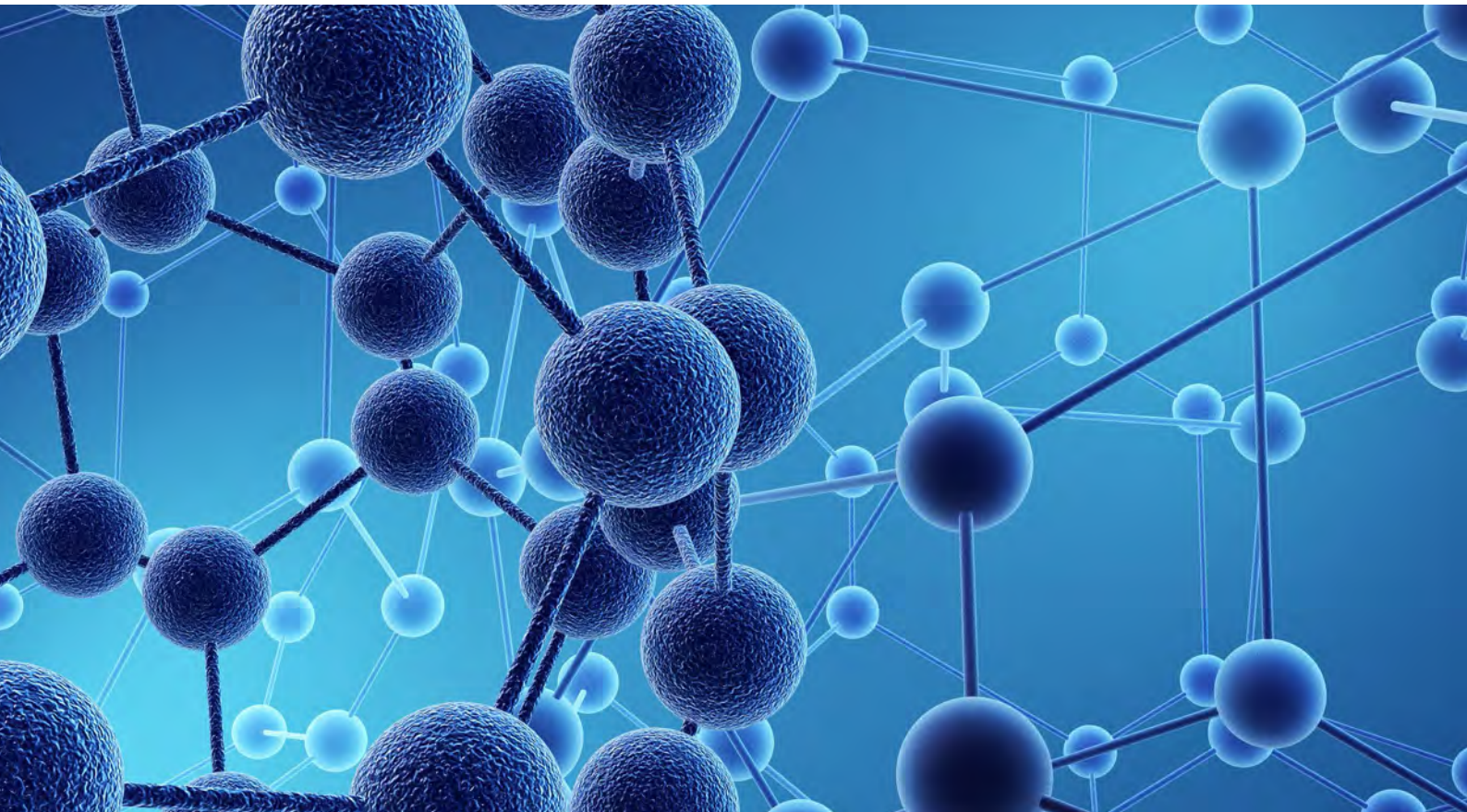
This is a working document shared with the stakeholders of the European Chemicals Agency (ECHA). It is solely intended for consultation purposes and is subject to modification. The information and views set out in this document are those of the authors and do not necessarily represent the official position of ECHA. The Agency is not responsible for the use that may be made of the information contained in this document.

Introduction

This case study has been developed by ECHA with the support of industry and authority representatives. It illustrates where the supply chain information from REACH/CLP can be used to support downstream users meet their obligations under certain occupational safety, health and environmental legislations.

This work aims to support discussion with relevant stakeholders on how industrial downstream users can integrate information from REACH and CLP at company level to help them to meet their obligations to ensure the safe use of chemicals. The "case study" formed part of the content of a Workshop with stakeholders in April 2015[1] to gather ideas on stakeholders' needs and areas for further work/cooperation.

1 http://echa.europa.eu/news-and-events/events/event-details/-/journal_content/56_INSTANCE_DR2i/title/workshop-on-the-use-of-reach-clp-information-at-industrial-sites



Foreword

Operators of industrial installations using chemicals in their activities are key actors in ensuring that chemicals are used safely, and their risks controlled for both human health and the environment. In doing so, they need to comply with a number of environmental and occupational safety and health legislations as well as REACH.

This is a case study of a downstream user company operating in the plating/surface treatment industry. It aims to illustrate, in a practical and realistic way, where the supply chain information from REACH/CLP applies and can be used to support the company meeting their obligations under the main occupational safety, health and environmental legislations.

The examples shown in this document serve to illustrate a number of ways in which the supply chain information can be used. However the examples are not meant to be exhaustive in identifying and illustrating all the obligations or possibilities in which the information might be used under these legislations.

The company described in this case study is hypothetical and nickel electroplating is only one amongst the many processes used in the plating/surface treatment industry. Similarly, the chemicals featured in this document only represent part of the wide range of substances and mixtures used in this industrial sector.

This case study was chosen to exemplify a typical process that utilises chemicals and where the learnings can be applied to other industry sectors.

The case study draws on information publically available for the surface treatment process described including generic exposure scenarios and safety data sheets. As part of the CSR/ES Roadmap[2] , work is underway to improve supply chain communication between suppliers and downstream users on the information for the safe use of chemicals; this includes projects to identify good practices for the harmonisation of the format and content of exposure scenarios. It should be noted that the generic exposure scenarios used in this case study do not follow the current developments and good practices identified in the Roadmap regarding format and content in all aspects. However, excerpts are shown to illustrate the nature of the information available and where it might be found in different documents.

Source of safety data sheets and exposure scenarios presented in the case study

- Sigma Aldrich: Hydrofluoric acid (2013), Nickel chloride (2012)
- Nordkalk: Slaked lime (2012)
- Norilsk Nickel Harjavalta Oyl: Nickel sulphate (2012), Nickel briquettes (2013)
- Nickel Consortia: Generic Exposure Scenarios (GES, 2014)

2 http://www.echa.europa.eu/csr-es-roadmap

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A. Description of the hypothetical nickel plating shop and its activities

1. General considerations

The company is a small sized enterprise (according to the EU SME definition3) located in one of the Member States of the European Union. It is a subcontractor for manufacturers of machinery and equipment. The company carries out the nickel plating of parts or components which are then used in the assembly of the machinery.

The parts to be plated are of various geometry and size with a maximum weight of 2 metric tonnes. The base material is steel or stainless steel.

The company purchases chemicals for use from EU-based suppliers and is therefore a downstream user according to REACH. It does not supply substances or mixtures onwards and so is referred to as an end user. The company prepares the plating solution by mixing various chemicals substances together. This is done on-site and for the company's own use. The plating solution is typically composed of deionised water, nickel sulphate, nickel chloride and boric acid.

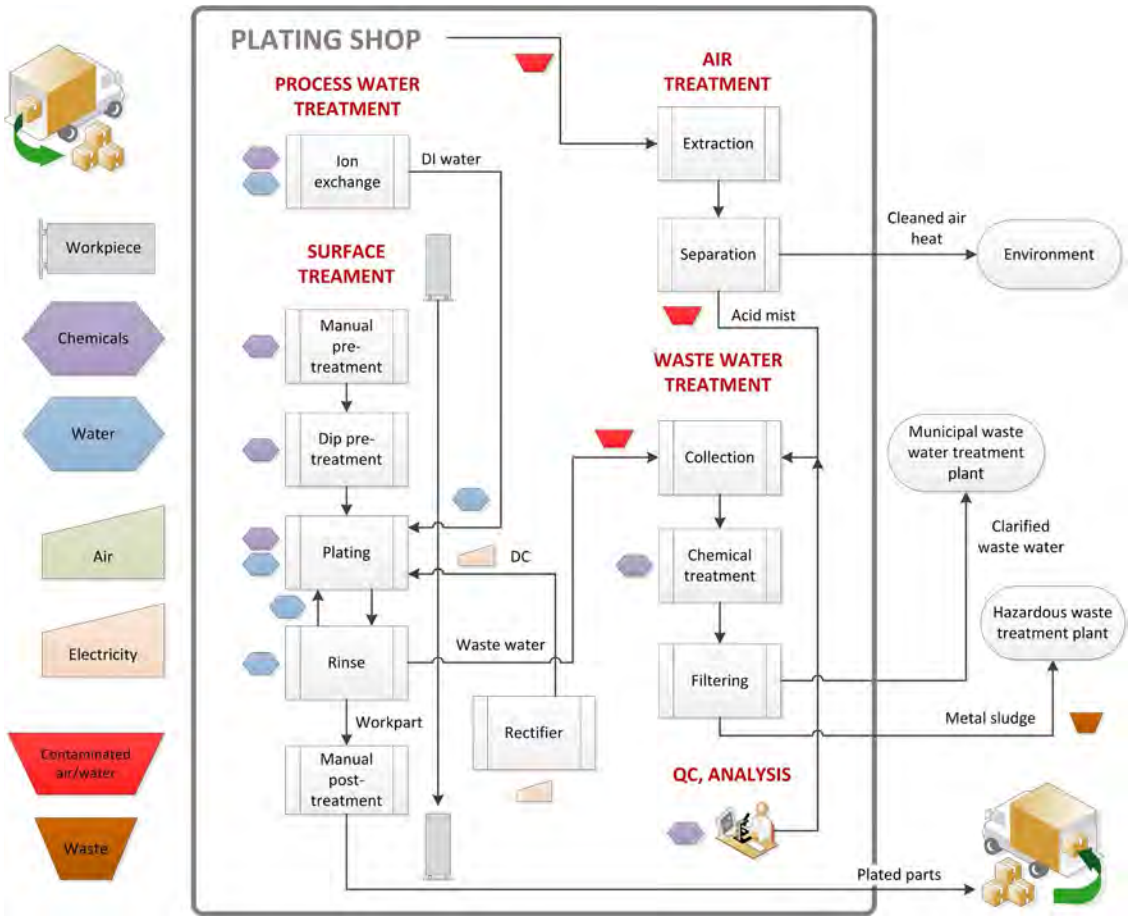


FIGURE 1: PLATING SHOP OVERVIEW

3 http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/index_en.htm

The facility is a dedicated site for nickel plating located in an industrial area in the vicinity of a large city. The workshop contains one process line and has a total volume of treatment tanks exceeding 30 m3. The line also includes a tank reserved for the removal of the nickel layer in case there were some problems during the plating process. The production area and all the process tanks are located in a sump. In addition to the process line, the workshop is equipped with supporting facilities such as polishing and welding facilities. It is also equipped with its own waste water treatment plant. Most of the process tasks involve manual work. The surface treatment solutions are kept in the process vats. Other chemicals are stored in dedicated chemical storage.

Definition of technical terms written in italics can be found in Appendix 1. List of terms.

The processes and main material flows are summarised in Figure 1.

2. Processes

2.1 SURFACE TREATMENT

The parts to be plated are delivered to the workshop by the contractor. They are unpacked and undergo preparations before being loaded onto the process line. These preparations include entry into the production managing system, visual check, manual surface cleaning with a solvent if needed (to remove residues of packaging material or grease) and masking.

The work pieces are then loaded onto plating racks or jigs by hand, shielded (if necessary) and lifted into the surface treatment line using an overhead crane. The plating rack is moved from tank to tank according to the production specifications.

The first section of the surface treatment line (alkaline cleaning and acid cleaning/pickling) prepares the surface of the work piece for the actual plating process (the second section of the line). Rinsing of the work piece with demineralised water in-between the different stages happens either in separate rinsing tanks or manually above the process tank depending on the process stage.

After the plating process is completed the work pieces are rinsed, unloaded from the racks or jigs, the masking is removed and the work pieces left to dry. All these tasks are done by hand. Once dry, the pieces are finished by polishing if needed, quality checked, packed and sent back to the contractor. Polishing operations are carried out in a different section of the workshop.

In the unlikely event of an unsuccessful plating process, the work piece is loaded into the nitric acid bath, where the nickel layer is removed chemically. After that the work piece is sent back to the beginning of the process.

2.1.1 Nickel electroplating

Nickel electroplating is a process where nickel is deposited onto the surface of a work piece with the help of a direct electric current passing through a plating solution.

In order to achieve the desired properties, the plating solution must be heated to around 50°C.

The work piece is connected as a cathode and nickel metal (pellets or briquettes) are used as soluble anodes. Under the effect of the direct electric current fed into the system, the anodes dissolve into the solution. Nickel cations in the plating solution migrate towards the cathode and are reduced onto it to form the metallic layer of nickel (see Figure 2 below).

Hydrogen and oxygen evolution depend on cathode and anode efficiency respectively. The cathode efficiency is typically about 90 – 97 % and therefore some of the current is consumed in hydrogen gas formation. The anode efficiency is almost always 100 % and usually very little or no oxygen is evolved at the anode. Thanks to the high electrode efficiency, gas evolution in nickel plating is minimal.

The solution is agitated mechanically to ensure optimum nickel deposition.

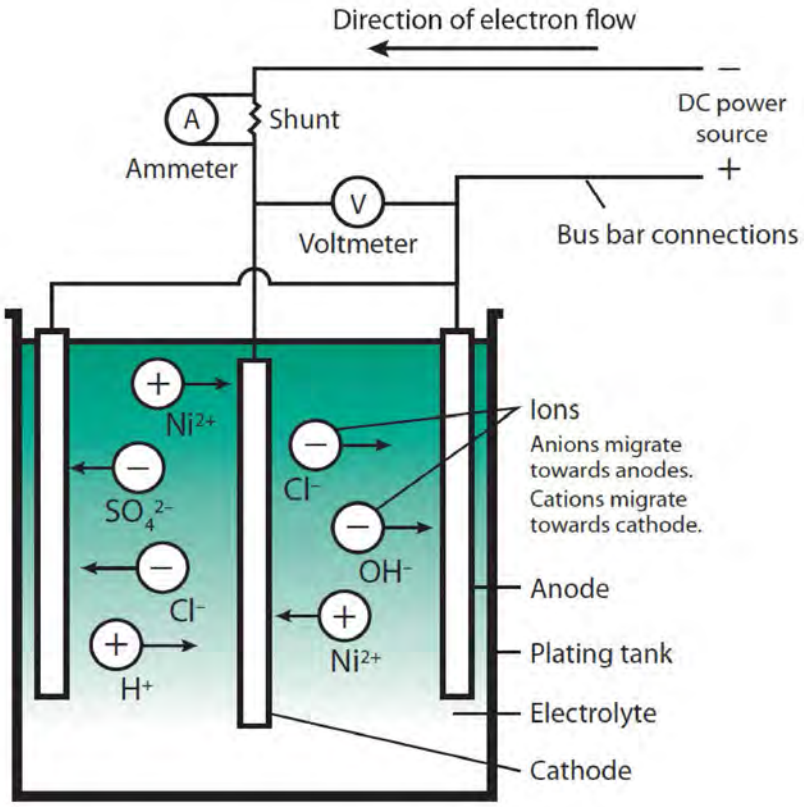


FIGURE 2: PRINCIPLE OF NICKEL ELECTROPLATING
FROM: NICKEL PLATING HANDBOOK, NICKEL INSTITUTE, 2014

The main chemicals in use in the company are presented in the table below.

TABLE 1: CHEMICALS USED

PROCESS	CHEMICALS SUBSTANCES OR MIXTURES INVOLVED
Work part surface preparation	
Alkaline cleaning	Sodium hydroxide, sodium carbonate
Acid cleaning or pickling	Sulphuric, hydrofluoric and/or nitric acids
Degreasing	Acetone
Masking, stop off	Lacquer, wax
Work part electroplating	
Electrodeposition (source of metal)	Nickel
Electrodeposition (additives)	Nickel sulphate, nickel chloride, boric acid, sulphuric acid, nickel carbonate, brighteners
Waste water treatment	
pH adjustment, precipitation	Sulphuric acid, sodium hydroxide, slaked lime

2.2 MAINTENANCE

2.2.1 Monitoring of process solutions

In order to guarantee the quality of the deposited layer of nickel, the nickel plating solution undergoes continuous filtering. Additionally, all surface treatment solutions in use in the company are tested on a weekly basis in-house. The level of major ions and impurities is analysed and the chemical composition of the solutions are adjusted accordingly.

2.2.2 Maintenance of facilities

Once per quarter the production shuts down for a maintenance day. The facilities (treatment tanks, chemical piping and pumping system, air extraction system, electrical system, chemical store, water treatment facilities etc.) are emptied, cleaned, inspected and repaired if needed.

3. Control measures

3.1 ENVIRONMENT

3.1.1 Air

The air extraction system of the facility works according to the push-pull system. The air inflow is fed to the production area via forced air inlet ducts placed along the surface treatment line and the air extraction is driven by lateral exhaust hoods along both long sides of the treatment tanks.

Due to the high cathode efficiency, the generation of solution mist is minimal. Additionally the air extraction system is equipped with wet scrubbers to remove any mist.

Volatile organic compounds are generated to a small extent by degreasing and surface cleaning (manual wiping of work pieces) before plating operations.

The power required for the different activities is supplied by the municipal power supply. Therefore the company does not operate its own power generation system and has no related emissions to the air.

Polishing operations take place in a separate section of the workshop. The polishing machines are enclosed and equipped with local exhaust ventilation and a cyclone dust collector.

3.1.2 Water

Wastewater from the process and supportive activities (rinsing water, washing of facilities e.g. floors) that cannot be re-used in the process is first collected in a sump (separate to the process tanks sump) and then pumped to the on-site waste water treatment plant. The waste water is neutralised and the nickel ions are precipitated/separated to nickel hydroxide sludge.

After sedimentation, the sludge is dewatered with a filter press to a nickel hydroxide cake of maximum 20-25 % dry material to avoid dust generation and then transferred to flexible intermediate bulk containers (big bags). About twice a year, the big bags are sent to a dedicated recycling facility. The waste water treatment process is mostly automated. Only a few steps are done manually such as transfer of hydroxide cake into big bags, connection/disconnection of big bags, and sampling and analysis of clarified water for the environmental permit compliance check.

The clarified waters are discharged into the municipal sewage network and directed to the municipal

wastewater treatment plant.

3.1.3 Soil

No direct soil contamination from the processes is expected as the activities are carried out indoors and physical barriers are installed to prevent contamination. The production area and all the process tanks are located in the sump in such a way that the tanks can be easily checked. The sump is equipped with a leak alarm system and its inside surfaces are coated with a chemical resistant coating.

Secondary contamination is possible via air emissions (dry or wet deposition).

3.1.4 Wastes

The monitoring programme of the surface treatment solutions (see 2.2 Maintenance) ensures that solutions stay of the required quality and do not need to be changed frequently. Occasionally, when solutions need to be replaced, they are disposed of as a hazardous waste. Additionally, the company collects the different waste streams separately.

3.1.5 Human health

Workers wear chemical resistant work clothing, shoes and goggles while working in the premises. The use of the lateral exhaust hoods on process tanks reduces contamination of the workplace air and therefore exposure of workers during normal plating activities. This is confirmed by air monitoring conducted once a year.

Additionally workers use dedicated gloves (nitrile rubber) when performing activities incurring a risk of dermal contact with the treatment solutions. Such contact is possible during loading/unloading work pieces, rinsing etc. Similar gloves are also used while performing the manual steps of wastewater treatment. During degreasing activity and process maintenance activities the workers use specific PPE (for example respirator or chemical suit) as prescribed in the company's operating procedures.

Polishing operations are carried out in a separate section of the workshop. The polishing machines are enclosed and equipped with local exhaust ventilation and a cyclone dust collector. The air is not recirculated.

The exposure of workers to nickel is monitored biologically by analysing the nickel content of a urine sample of the worker taken at least once a year at the end of the working week and the working shift. Additionally the workers have an annual general medical check.

4. Legal requirements considered

The company has legal obligations under REACH and other European Union (EU) directives. In this case study, only the main environmental and occupational safety and health legislations will be taken into account (IED, CAD and CMD). The legal requirements will be taken into consideration at a generic EU level, therefore not considering potential differences resulting from the transposition of directives at national level.

4.1 REACH

The company sources chemical products for its activities from EU-based suppliers and is therefore a downstream user (end user) according to REACH4. The company prepares plating solutions by mixing together various chemicals substances but this is done for its own use only.

The generic obligations of the company under REACH are summarised in Table 2 below.

4 Regulation (EC) No 1907/2006 on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

TABLE 2: MAIN OBLIGATIONS FOR DOWNSTREAM USERS UNDER REACH

REACH OBLIGATIONS		APPLIES TO
Documentation of actions	All REACH related actions should be documented	All substances on their own or in mixtures
Communication with supplier	Make your uses of substances known to the registrants before they register the substances by communicating with your suppliers. This is actually optional but this way, your use can be included in the registration. Your sector organisation may be able to assist in this task. Communicate to your supplier any new information on the hazards of the substance or on the appropriateness of the risk management measures.	All substances on their own or in mixtures
Safety data sheet (SDS)	When you receive a safety data sheet (SDS), you need to identify and apply appropriate measures to adequately control the risks at your site, both for workers and the environment. The information found in the safety data sheet can help you do this. If the substance has been registered, check that your use is covered.	Substance on their own or in mixture for which an SDS is required. That means: 1. substance or mixture meets the criteria for classification as hazardous or 2. substance (as such) is PBT or vPvB or 3. substance (as such) is included in the Candidate List for reasons other than 1. or 2.
Exposure scenario	When you receive an exposure scenario with the SDS, you must check whether the exposure scenario covers your own use of the substance and your conditions of use. If your conditions on-site correspond to the exposure scenario, then no further action is required, except to document that fact. If not, you must take one of the following actions: • Adapt your own activities to match the conditions of safe use, as specified in the exposure scenario. • Ask your supplier to provide you with an exposure scenario that covers your actual conditions of use. • Look for a suitable alternative solution and stop the use of the substance in question. • Look for another supplier of the same substance who provides a safety data sheet with an exposure scenario that covers your use. • Carry out your own downstream user chemical safety assessment (some exemptions apply).	Substance as such which : 1. are hazardous or PBT or vPvB and 2. the manufacturer / importer has registered at or above 10 tonnes per year. Exposure scenarios may be provided for substances in mixtures.
Authorisation	If any substance you use is on the Authorisation List, you may decide to substitute it with a safer alternative or ensure your use is authorised. If you use a substance included in the Authorisation List for which an authorisation has been granted that covers your use within your supply chain, you have to notify ECHA of your use, and comply with any conditions included in the authorisation.	All substances subject to authorisation
Restrictions	If any substance you use is on the list of Restrictions, you have to comply with any conditions imposed on the substance.	All substances subject to restriction
Producers of articles containing SVHCs on the candidate list	You need to provide information to enable safe use of these articles to your customers.	Articles which contain a concentration above 0.1 % w/w of a substance identified as an SVHC

Note: this excludes obligations of downstream users who supply chemicals further downstream.

The company can expect to receive a safety data sheet for all hazardous substances and mixtures used in the plating process. It is very likely that all the substances used by the company are or will be registered under REACH but all of them will not necessarily have exposure scenarios attached. If a substance has been registered, the registration number should be communicated down the supply chain.

At the time of writing, the substances used by the company are not subject to authorisation and the restriction on nickel and its compounds does not apply to the articles which the company manufactures.

Boric acid has been identified as a substance of very high concern (SVHC) and added on the candidate list of SVHCs for authorisation in 20105 and recommended to be included to the Authorisation list in 20156. When producing nickel-plated articles, any residual traces of boric acid should be well below 0.1% w/w of the article. If this is not the case, the requirements regarding substances in articles will apply. In this case study we will not take into consideration these requirements.

The lists of substances subject to authorisation or restriction are updated on an ongoing basis and therefore the company should check them regularly.

4.2 INDUSTRIAL EMISSIONS DIRECTIVE (2010/75/EU, IED)

The installation falls into category 2.6 of Annex I to the IED: "Surface treatment of metals or plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m3." Therefore the company is subjected to the IED and must apply for an integrated permit7. Provisions related to the use of organic solvents (acetone is used for surface cleaning of the work piece) will be dealt with as part of the integrated permit.

The main obligations of installations falling under Annex I to the directive are:

- preventive measures are taken against pollution;
- the best available techniques (BAT) are applied;
- no significant pollution is caused;
- waste is reduced, recycled or disposed of in the manner which creates least pollution;
- energy efficiency is maximised;
- accidents are prevented and their impact limited;
- sites are remediated when the activities come to an end.

The Best Available Techniques Reference (BREF) document "Surface Treatment of Metals and Plastics" adopted in 2006 applies8. This BREF documents presents a large amount of process-integrated and end-of-pipe techniques to address the key environmental issues of the Surface Treatment of Metals and Plastics industry. No Best Available Technique (BAT) conclusion9 document is available yet for this BREF.

5 Decision ED/30/2-10

6 http://echa.europa.eu/documents/10162/13640/6th_a_xiv_recommendation_01july2015_en.pdf

7 http://echa.europa.eu/documents/10162/13640/6th_a_xiv_recommendation_01july2015_en.pdf
The integrated approach means that the permits must take into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. The purpose of the Directive is to ensure a high level of protection of the environment taken as a whole. http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm

8 http://eippcb.jrc.ec.europa.eu/reference/

9 BAT conclusions" as defined in Article 3(12) means a document containing the parts of a BAT reference document laying down the conclusions on best available techniques, their description, information to assess their applicability, the emission levels associated with the best available techniques, associated monitoring, associated consumption levels and, where appropriate, relevant site remediation measures

4.3 CHEMICAL AGENTS DIRECTIVE (98/24/EC, CAD)

The company uses chemical agents[10] in its processes and is therefore subject to the Chemical Agents Directive (CAD).

The aim of the Chemical Agents Directive is to lay down minimum requirements for the protection of workers from risks to their safety and health arising, or likely to arise, from the effects of chemical agents that are present at the workplace or as a result of any work activity involving chemical agents.

The Directive places obligations on authorities and employers and workers, and provides for the drawing up of indicative and binding occupational exposure limit (OEL) values as well as biological limit values at EU level.

Section II of the Directive sets out the employer's obligations in respect of hazardous chemical agents, which includes chemical agents that meet the criteria for classification as hazardous under the CLP Regulation[11].

The key obligations of employers are:

- Identifying which hazardous chemical agents are present at the workplace
- Assess the risk of all hazardous chemical agents in the workplace in combination
- Apply the general principles for prevention of risks associated with hazardous chemical agents, in accordance with the hierarchy of controls
- Apply specific protection and prevention measures if the assessment carried out reveals a risk to the safety and health of workers
- Establish procedures to deal with accidents, incidents and emergencies
- Provide safety information and training to workers

Employers also have to carry out appropriate health surveillance for workers if the assessment shows a risk to health.

4.4 HIERARCHY OF CONTROLS

According to the CAD, risks should be eliminated or reduced to a minimum by taking preventive measures, in the following order of priority:

Substitution with a non or less hazardous chemical agent

Reduction of the risk to a minimum by application of, in order of priority:

a) Work processes, engineering controls, equipment and materials, to avoid or minimise the release of hazardous chemical agents (e.g. closed process);
a) Collective protection measures at the source of the risk (e.g. LEV);
a) Individual protection measures (such as personal protective equipment, PPE).

In doing so, an employer should draw on information on safety and health provided by the supplier e.g. the relevant safety data sheet which is compiled by the supplier in accordance with the REACH Regulation, to facilitate their assessment of the risks from hazardous chemical agents in the workplace.

10 According to the CAD, "chemical agent" means any chemical element or compound, on its own or admixed, as it occurs in the natural state or as produced, used or released, including release as waste, by any work activity, whether or not produced intentionally and whether or not placed on the market;

11 Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures

4.5 CARCINOGENS OR MUTAGENS AT WORK DIRECTIVE (2004/37/EC, CMD)

The company uses substances that are classified as carcinogens (category 1A/1B) in its processes (nickel compounds such as nickel metal, nickel sulphate or nickel chloride) and must therefore comply with the obligations set by the CMD.

The CMD aims to protect workers against health and safety risks from exposure to carcinogens or mutagens at work. The Directive considers activities likely to involve a risk of exposure, sets obligations to both authorities and employers and lays down minimum requirements to achieve protection, including limit values.

The key obligations of employers are similar but generally more stringent than the obligations incurred by the CAD, with an emphasis on exposure prevention either by substitution, limitation of exposure or technical means. Also some additional requirements related to carcinogen/mutagen substances are set (keeping record of exposed workers, making certain information available to the competent authority upon request) and consultation with workers/representatives is enhanced.

Health surveillance is called for in both the CAD and the CMD but its practical organisation is left to the member states to establish, in accordance with national laws and/or practice.

5. Notes on other legislations

Other legislations may also apply to the company depending upon the scale and the type of its activities. Some of them are identified here but will not be considered further in the case study.

5.1 SEVESO

The Seveso directive (Directive 2012/18/EU) is triggered depending on the amount and classification of dangerous substances present within an establishment. The larger the quantities of dangerous substances present within an establishment, the stricter the rules ('upper-tier' establishments have bigger quantities than 'lower-tier' establishments and are therefore subject to more requirements and tighter control). Some substances specific thresholds are given but most of the thresholds are set according to classification categories of the CLP Regulation (EC No 1272/2008).

Seveso may be applicable to the installation depending on the amount of dangerous substances on site and their classification.

5.2 PRODUCT DIRECTIVES

Directive 2001/95/EC on general product safety does not apply to the company because the nickel plating services are not provided to consumers but to industrial customers.

Directive 2006/42/EC on machinery does not apply directly to the company because it works as a subcontractor and therefore doesn't produce or assemble machinery nor place it on the market.

5.3 PERSISTENT ORGANIC POLLUTANTS

The Regulation (EC) 850/2004 on Persistent Organic Pollutants (POP) implements in the EU two international environmental agreements to eliminate the production and use of the internationally recognised POPs (the Stockholm convention on POPs and the Protocol on POPs)

The electroplating industry often uses perfluorooctane sulfonic acid (PFOS) as wetting agents and mist suppressant to prevent the release of hazardous mist from the electroplating solution during the deposition process. PFOS is listed under Annex I of the regulation but the metal plating uses benefit from specific exemptions.

B. Illustration of information use

Safety data sheets (SDS) have been a key tool to convey safety information about hazardous substances and mixtures well before the REACH Regulation came about. However safety data sheets are now an integral part of REACH and this change has brought new requirements to the format and content of these documents.

Safety data sheets (SDS) are the main tool for ensuring that suppliers communicate enough information along the supply chain to allow safe use of their substances and mixtures.

Safety data sheets include information about the properties of the substance (or mixture), its hazards and instructions for handling, disposal and transport and also first-aid, fire-fighting and exposure control measures. This information can be found in the main body of the safety data sheet or in the annexed exposure scenarios (where applicable). The requirements for the compilation of the safety data sheets are specified in Annex II of REACH.

The REACH registration process and the obligation to assess the hazards of substances support the generation of new information where available information on substances is not adequate. The requirement to perform a chemical safety assessment of substances (when applicable) means that the uses and conditions of use of the substances are taken into account when assessing exposure and developing exposure scenarios. As a result, adequate, relevant and quality information should be communicated to downstream users in the SDS and exposure scenarios (ES).

If the information provided is not adequate or if some information is missing, the downstream user should, as a first measure, turn to his supplier and request for clarification or further information.

Other sources of information on chemicals exist (such as the ECHA dissemination portal) that can be used to supplement the information communicated via the supply chain.

It is worth noting that an important part of the information contained in the safety data sheets results from the implementation of the CLP Regulation (Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures). References to REACH information in the rest of the document is meant to cover both REACH and CLP generated information.

In this section, we identify which information communicated to the downstream user in the SDS and the ES, can be of benefit while performing duties under the previously described examples of legislations other than REACH. This section is not intended to give guidance on how to comply with the legal obligations mentioned.

Excerpts have been taken from the generic exposure scenarios (GES) of nickel compounds developed by the Nickel Consortia[12] (versions 2014) and publicly available safety data sheets from various chemical suppliers for the purposes of illustration.

Unlike SDS, the format of exposure scenarios is not set out by law and therefore variations in the way information is presented will exist. To help downstream users understand the information they can expect in the exposure scenarios, ECHA published three annotated ES templates[13] following a recommended format developed through a cross-stakeholder CSA/ES Roadmap[14] . References to specific sections of exposure scenario in the rest of the document are made according to these templates.

12 http://www.nickelconsortia.eu/downstream-user-generic-exposure-scenarios.html

13 http://echa.europa.eu/support/guidance-on-reach-and-clp-implementation/formats

14 http://echa.europa.eu/regulations/reach/registration/information-requirements/chemical-safety-report/csr-es-roadmap

6. Application for an IED integrated permit

Reminder: this section is not intended to give guidance on how to apply for an IED permit but to show where REACH information can be used to support the application for an IED integrated permit.

6.1 LEGAL OBLIGATION OF THE OPERATOR

There are two main cases where an industrial operator needs to submit an application for an IED permit:

1. Start of a new activity subject to the IED
2. Substantial change of an existing activity subject to the IED (update of permit)

Additionally, the competent authority needs to reconsider and update the content of the permit at a time interval which may be specified in the permit. The operator usually has to submit a similar application, with the difference that any information resulting from the industrial activity (such as monitoring or inspection data) can be used.

6.2 PARAMETERS NEEDED

The main parameters needed for the application for an IED integrated permit are set in Article 12 of the IED.

Article 12 Applications for permits

1. *Member States shall take the necessary measures to ensure that an application for a permit includes a description of the following:*
   a) *the installation and its activities;*
   b) *the raw and auxiliary materials, other substances and the energy used in or generated by the installation;*
   c) *the sources of emissions from the installation;*
   d) *the conditions of the site of the installation;*
   e) *where applicable, a baseline report in accordance with Article 22(2);*
   f) *the nature and quantities of foreseeable emissions from the installation into each medium as well as identification of significant effects of the emissions on the environment;*
   g) *the proposed technology and other techniques for preventing or, where this is not possible, reducing emissions from the installation;*
   h) *measures for the prevention, preparation for re-use, recycling and recovery of waste generated by the installation;*
   i) *further measures planned to comply with the general principles of the basic obligations of the operator as provided for in Article 11;*
   j) *measures planned to monitor emissions into the environment;*
   k) *the main alternatives to the proposed technology, techniques and measures studied by the applicant in outline.*

An application for a permit shall also include a non-technical summary of the details referred to in the first subparagraph.

2. *Where information supplied in accordance with the requirements provided for in Directive 85/337/EEC or a safety report prepared in accordance with Directive 96/82/EC or other information produced in response to other legislation fulfils any of the requirements of paragraph 1, that information may be included in, or attached to, the application.*

6.3 USE OF REACH INFORMATION IN THE APPLICATION

The operator of the installation will have access to the safety data sheets and exposure scenarios (if applicable) of the substances in use in the installation. If information is missing from the SDS provided, the operator should turn to its supplier(s) and request the missing data.

It is important to note that safety data sheets and exposure scenarios are specific to a chemical provided (substance or mixture) and contain information relevant to the uses identified in them. In comparison, the integrated approach of the IED means that the installation is taken into account as a whole. Such substance or mixture specific hazard assessment is not foreseen but emissions of the installation to the environment are considered. REACH information will not provide for process generated emissions or for categories or aggregated values of substances often referred to in BREFs. In depth knowledge of own industrial processes and other information sources (BREFs, technical literature etc.) will be required and should be the base of the information provided in the application.

However, the information contained in safety data sheets and exposure scenarios can be used to contribute to the application for permit in the following ways.

1. *Description of*

   b) *the raw and auxiliary materials, other substances and the energy used in or generated by the installation;*

Safety data sheets are the main source of information when describing the substances and mixtures used in the installation. Relevant information such as product identifiers, hazard classification, composition, concentration, physicochemical properties etc. (Sections 1, 2, 3 and 9 of the SDS) can easily be compiled in a table or a database and provided as part of the application documents.

The operator can add any other substance or mixture-related information (i.e. function of the chemical in the process, supplier's information, SDS receipt date, regulatory status, information related to other legislation etc.) that will be useful for him to monitor the chemicals-related information for other purposes as well. For this purpose the ECHA dissemination portal can be useful when looking for supplementary information. An example of such a table is provided in Appendix 2.

2. *Description of*

   c) *the sources of emissions from the installation;*
   d) *where applicable, a baseline report in accordance with Article 22(2);*
   e) *the nature and quantities of foreseeable emissions from the installation into each medium as well as*
   f) *identification of significant effects of the emissions on the environment;*
   g) *measures planned to monitor emissions into the environment*

Hazard classification and ecological information in Sections 2 and 12 of the SDS can help identify the substances and mixtures that are most critical in terms of environmental protection. The physical and chemical properties described in Section 9 of the SDS can also provide indications on emission routes (for example "gas" or "fine powder" referring to emissions to air). Similarly advice related to dust formation in various sections of the SDS (for example 7 or 8) can indicate potential for emissions to air.

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

1272/2008 (CLP)

Skin Irrit. 2, H315
Skin Sens. 1, H317
Muta. 2, H341
Acute Tox. 4, H302
Acute Tox. 4, H332
STOT RE 1, H372
Repr. 1B, H360D
Carc. 1A, H350I
Resp. Sens. 1, H334
Aquatic Acute 1, H400
Aquatic Chronic 1, H410

67/548/EEC - 1999/45/EC

T, N; R49-61-20/22-38-42/43-48/23-68-50/53

FIGURE 3: EXCERPT FROM SDS NICKEL SULPHATE SECTIONS 2 CLASSIFICATION INFORMATION

8.1.5 PNECs

RISK VALUES: Environment
Compartment
Category/ Threshold Value/ Relative Absorption Factor (RAF)/ Assessment Factor (AF)/ PNEC Value/ Comment
Aquatic
Freshwater /7.2 ug Ni/L (HC5) /Not relevant/ 2/ 3.6 ug Ni/L/ Bioavailability correction available
Marine /17.2 ug Ni/L (HC5) /Not relevant/2/ 8.6 ug Ni/L /No bioavailability correction available

Sediment
Freshwater /Pending outcome of testing program /Not relevant/ Pending outcome of testing program / Pending outcome of testing program
Marine/Pending outcome of testing program/ Not relevant /Pending outcome of testing program/ Pending outcome of testing program

Terrestrial /Soil /59.8 mg Ni/kg (HC5) /Not relevant/ 2/ 29.9 mg Ni/kg/ Based on 10th percentile of abiotic soil parameters in EU. Bioavailability correction available

Sewage Treatment Plant (STP)/Microbial activity/ 33 mg Ni/L (Lowest NOEC)/ Not relevant/ 100/ 0.33 mg Ni/L

Secondary Poisoning: Aquatic/
Oystercatcher (aquatic bird) /123 mg Ni/kg/ 1/ 10/ 12.3 mg Ni/kg
European otter (freshwater mammalian)/ 23 mg Ni/kg/ 0,025/ 10/ 2.3 mg Ni/kg
Harbor seal (marine mammalian) 46 mg Ni/kg/ 0,025/ 10/ 4.6 mg Ni/kg

Secondary Poisoning: Terrestrial/
Earthworm eating bird /85 mg Ni/kg/ 1/ 10/ 8.5 mg Ni/kg
Shrew (terrestrial mammalian)/ 1.2 mg Ni/kg/ 0.036 (100% worms) 0.025 (30% worms, 70% isopods) /10/ 0.12 mg Ni/kg

8.2 Exposure controls

8.2.1 Appropriate engineering controls

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.
Avoid contact with skin and eyes. Do not breathe dust. Avoid repeated exposure. Skin protection Ensure that eyewash stations and safety showers are close to the workstation location. Remove soiled or soaked clothing immediately. Clean skin thoroughly after work. At work do not eat, drink, smoke or take drugs. Keep away from food, drink and animal feedingstuffs. Keep working clothes separately.

8.2.2.1 Respiratory protection

Use a respirator with filter model P3 (DIN 3181).

8.2.2.2 Hand protection

Protective gloves:Rubber; Butyl-rubber; Neoprene; PVC;

FIGURE 4: EXCERPT FROM SDS NICKEL SULPHATE SECTIONS 8 THRESHOLD VALUES AND ADVICE RELATED TO DUST FORMATION.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity

12.1.1 Aquatic toxicity

Aquatic acute 1 Very toxic to aquatic life.
Aquatic chronic 1 Very toxic to aquatic life with long lasting effects.

Ecotoxicity Reference Value (ERV) nickel compounds
- Acute 120 µg Ni/L (pH 6), 68 µg Ni/L (pH 8)
- chronic 2.4 µg Ni/L

Short term Toxicity
Invertebrates. 48h LC50
Fresh water 0.013-4970 mg Ni/L
Sea water 0.23-415 mg Ni/L
fish 96h LC50
Fresh water 0.23-320 mg Ni/L
Sea water 26.6-350 mg Ni/L

Long term Toxicity
Invertebrates.
Fresh water 1.4-1379 µg Ni/L
Sea water 22.5-335 µg Ni/L
fish
Fresh water 40-1548 µg Ni/L
Sea water EC10 3599-20760 µg Ni/L

12.2 Persistence and degradability

12.2.1 Biodegradation

Not applicable.

12.2.2 Chemical degradation

Not applicable.

12.3 Bioaccumulative potential

Bioconcentration factor (BCF) 270
Bioconcentration Terrestrial Compartment BSAF 0.013-1.86

12.4 Mobility in soil

K_p-Soil: log K_{psoil} 2.86

12.5 Results of PBT and vPvB assessment

The PBT and vPvB criteria of Annex XIII to the regulation does not apply to inorganic substances.

12.6 Other adverse effects

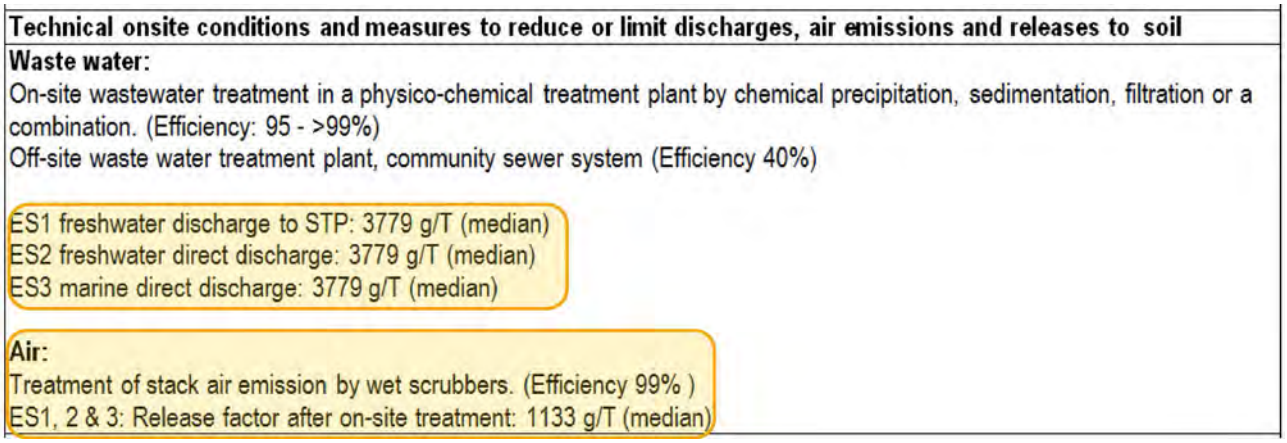
No studies have been found.

FIGURE 5: EXCERPT FROM SDS NICKEL SULPHATE SECTIONS 12 ECOLOGICAL INFORMATION

In addition to the data provided in the SDS, the information contained in the exposure scenario, such as discharge information or release rate, can contribute to estimate the release of the substance to the different environmental compartments. This can be useful especially if the company doesn't have measured data available when applying for the permit (for example for a new installation).

However one should take into consideration the source of the data (measured or modelled) to fully understand the information provided.

The combined information can also contribute to indicate if the substance should be considered when planning for a baseline report or for monitoring activities.



Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Waste water:
On-site wastewater treatment in a physico-chemical treatment plant by chemical precipitation, sedimentation, filtration or a combination. (Efficiency: 95 - >99%)
Off-site waste water treatment plant, community sewer system (Efficiency 40%)

ES1 freshwater discharge to STP: 3779 g/T (median)
ES2 freshwater direct discharge: 3779 g/T (median)
ES3 marine direct discharge: 3779 g/T (median)

Air:
Treatment of stack air emission by wet scrubbers. (Efficiency 99%)
ES1, 2 & 3: Release factor after on-site treatment: 1133 g/T (median)

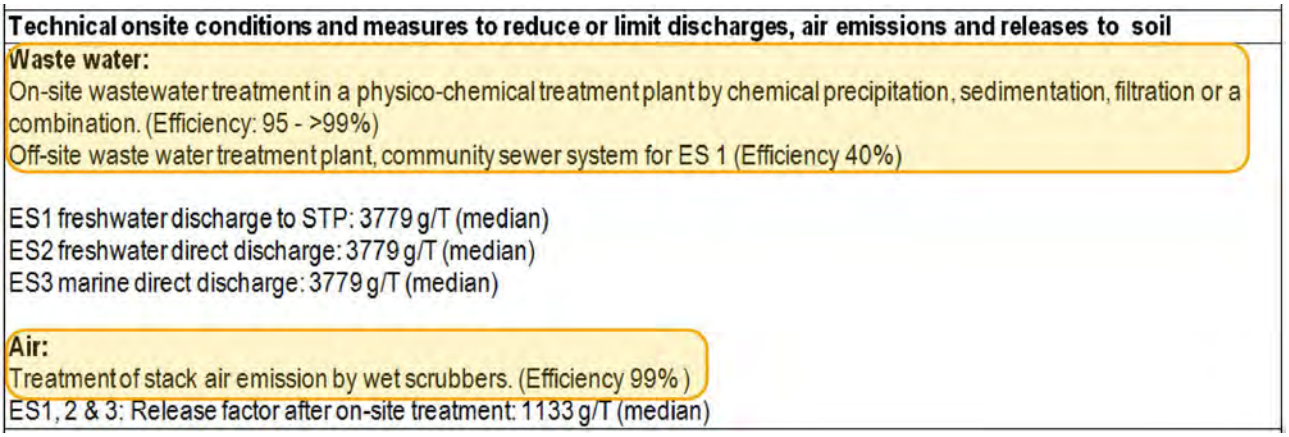
FIGURE 6: EXCERPT FROM GES2: METAL SURFACE TREATMENT: NICKEL CHLORIDE - ELECTROPLATING, NICKEL ELECTROFORMING, ELECTROLESS NICKEL PLATING

3. *Description of*

   g) *the proposed technology and other techniques for preventing or, where this is not possible, reducing emissions from the installation;*

The details of operational conditions and risk management measures described in extended safety data sheet (SDS and exposure scenario annexed) can complement other sources of information (for example BREF document) in the description of the installations especially when applying for the permit at the start of the operations or for example when updating the permit to include a new process.

For instance, exposure scenario may give technical conditions or organisational measures (for example training of staff) to prevent or limit discharges, emissions and releases to the environment. At the same time, the operator can check if the technology chosen is in line with the technology recommended in the exposure scenario.



Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Waste water:
On-site wastewater treatment in a physico-chemical treatment plant by chemical precipitation, sedimentation, filtration or a combination. (Efficiency: 95 - >99%)
Off-site waste water treatment plant, community sewer system for ES 1 (Efficiency 40%)

ES1 freshwater discharge to STP: 3779 g/T (median)
ES2 freshwater direct discharge: 3779 g/T (median)
ES3 marine direct discharge: 3779 g/T (median)

Air:
Treatment of stack air emission by wet scrubbers. (Efficiency 99%)
ES1, 2 & 3: Release factor after on-site treatment: 1133 g/T (median)

FIGURE 7: EXCERPT FROM GES10: METAL SURFACE TREATMENT – NICKEL ELECTROPLATING AND NICKEL ELECTROFORMING

4. *Description of*

   h) *measures for the prevention, preparation for re-use, recycling and recovery of waste generated by the installation;*

The operator should check Section 13 of the SDS for guidelines on proper waste management or appropriate treatment methods of the substance or mixture waste. Advice on treatment methods for contaminated packaging should also be provided if necessary.

SECTION 13. DISPOSAL CONSIDERATIONS

Council Directive 91/689/EEC on hazardous waste.
EWC Waste code 060499 - wastes not otherwise spesified
The listed waste code numbers, according to the European Waste Catalogue (EWC), are to be understood as a recommendation (2000/532/EC).

13.1 Waste treatment methods
Contaminated packaging should be emptied as far as possible. Packaging that cannot be cleaned should be disposed as special waste in compliance with local and national regulations.

13.2 Waste from residues / unused products
Contact manufacturer. Dispose of as special waste in compliance with local and national regulations.

FIGURE 8: EXCERPT FROM SDS NICKEL BRIQUETTES, SECTION 13

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

FIGURE 9: EXCERPT FROM SDS NICKEL CHLORIDE, SECTION 13

The exposure scenario also contains a section on conditions and measures related to treatment of wastes. This information sometimes contains recommendations for recovery or recycling, and can be useful when describing measures used in the installation.

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:

- 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

- 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.

FIGURE 10: EXCERPT FROM GES10: METAL SURFACE TREATMENT – NICKEL ELECTROPLATING AND NICKEL ELECTROFORMING AND GES2: METAL SURFACE TREATMENT NICKEL CHLORIDE – ELECTROPLATING, ELECTROFORMING, ELECTROLESS PLATING

5. Description of

k) the main alternatives to the proposed technology, techniques and measures studied by the applicant in outline;

Information contained in the exposure scenario can indicate several methods to control the risks. The company may use one of them and present the other ones as alternative technologies

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Waste water: On-site wastewater treatment in a physico-chemical treatment plant by chemical precipitation, sedimentation, filtration or a combination. (Efficiency: 95 - >99%) Off-site waste water treatment plant, community sewer system (Efficiency 40%) ES1 freshwater discharge to STP: 3779 g/T (median) ES2 freshwater direct discharge: 3779 g/T (median) ES3 marine direct discharge: 3779 g/T (median) **Air:** Treatment of stack air emission by wet scrubbers. (Efficiency 99%) ES1, 2 & 3: Release factor after on-site treatment: 1133 g/T (median)

FIGURE 11: EXCERPT FROM GES2: METAL SURFACE TREATMENT NICKEL CHLORIDE – ELECTROPLATING, ELECTROFORMING, ELECTROLESS PLATING

If some of the substances used by the operator are subject to a regulatory risk management process under REACH (especially authorisation or restriction) an analysis of alternatives may be available in the application for authorisation dossier or in the restriction dossier.

This information can be accessed from the ECHA website:

- Application for authorisation http://echa.europa.eu/addressing-chemicals-of-concern/authorisation/applications-for-authorisation. Either directly from the list of current consultations or via the link to "Adopted opinions and previous consultations on application for authorisation"
- Restriction http://echa.europa.eu/restrictions-under-consideration. Either directly from the list of current consultations or via the link to "Adopted opinions".

However, this is valid only for the substances subject to these specific measures. More information can be found in BREF documents for the industry sector. Also public websites such as the substitution support portal (http://www.subsport.eu/) can help when looking for alternatives to hazardous substances.

7. Risk assessment for CAD and CMD

Reminder: this section is not intended to give guidance on how to conduct a risk assessment but to show where REACH information can be used to support the process.

7.1 LEGAL OBLIGATIONS OF THE EMPLOYER

The employer has a duty to determine and assess the risks that hazardous chemical agents have on the workers.

This evaluation of risks and implementation of preventive measures needs to be done before any new activity is started and needs to be kept up-to-date. Triggers for a review of the assessment include monitoring results (health, exposure or technical) indicating a concern or significant changes in working conditions ("significant changes" according to the CAD, "any change in the conditions which may affect worker's exposure" according to the CMD). This also includes changes such as new classification under the CLP resulting in the substance being classified as a carcinogen or mutagen.

The Article 4(1), 4(3) and 4(4) of the CAD gives the following guidelines:

Article 4 Determination and assessment of risk of hazardous chemical agents

1. *In carrying out the obligations laid down in Articles 6(3) and 9(1) of Directive 89/391/EEC, the employer shall first determine whether any hazardous chemical agents are present at the workplace. If so, he shall then assess any risk to the safety and health of workers arising from the presence of those chemical agents, taking into consideration the following:*

- *their hazardous properties,*
- *information on safety and health that shall be provided by the supplier, (e.g. the relevant safety data sheet in accordance with Regulation (EC) No 1907/2006of the European Parliament and of the Council)15,*
- *the level, type and duration of exposure,*
- *the circumstances of work involving such agents, including their amount,*
- *any occupational exposure limit values or biological limit values established on the territory of the Member State in question,*
- *the effect of preventive measures taken or to be taken,*
- *where available, the conclusions to be drawn from any health surveillance already undertaken.*

The employer shall obtain additional information which is needed for the risk assessment from the supplier or from other readily available sources. Where appropriate, this information shall comprise the specific assessment concerning the risk to users established on the basis of EU legislation on chemical agents.

3. *Certain activities within the undertaking or establishment, such as maintenance, in respect of which it is foreseeable that there is a potential for significant exposure, or which may result in deleterious effects to safety and health for other reasons, even after all technical measures have been taken, shall be included in the risk assessment.*

4. *In the case of activities involving exposure to several hazardous chemical agents, the risk shall be assessed on the basis of the risk presented by all such chemical agents in combination.*

Additionally, Article 3(3) and 3(4) of the CMD specifies:

15 The REACH Regulation

Article 3 Scope — determination and assessment of risks

3. *When assessing the risk, account shall be taken of all other routes of exposure, such as absorption into and/or through the skin.*

4. *When the risk assessment is carried out, employers shall give particular attention to any effects concerning the health or safety of workers at particular risk and shall, inter alia, take account of the desirability of not employing such workers in areas where they may come into contact with carcinogens or mutagens.*

General note:

It is important to note that the risk assessment needs to be performed for any hazardous chemical agents present at the workplace. According to Article 2(a) of the CAD, "Chemical agent" means any chemical element or compound, on its own or admixed, as it occurs in the natural state or as produced, used or released, including release as waste, by any work activity, whether or not produced intentionally and whether or not placed on the market. This definition is wider than the definition of substance in REACH and therefore the REACH information will not provide for all chemical agents present at the workplace, e.g. process generated substances such as dust.

It is also important to note that SDS and ES contain information related to individual substances or mixtures while the workplace risk assessment has to be conducted for all hazardous chemical agents present in combination.

Additionally, in an already existing workplace where several hazardous chemicals are used, the conditions in place will probably not match exactly each and every condition described in the SDS and ES. The company will need to understand whether their process and precautionary measured used corresponds to those described in the relevant ES(s) and develop a method to comply with the different obligations:

- performing a combined risk assessment for all hazardous chemical agents present
- finding a set of risk management measures suitable for the different tasks included in the process

7.2 WORKPLACE RISK ASSESSMENT

There are no binding rules at EU-level about how to undertake a workplace risk assessment; however the European Commission issued the "Guidance on risk assessment at work"[16] in 1996. This guide is for Member States to use or adapt as they see fit in order to provide advice on how to perform risk assessment at work. In 2005 the European Commission also issued the "Practical guidelines of a non-binding nature on the protection of the health and safety of workers from the risks related to chemicals agents at work"[17] . The purpose of these practical guidelines is to assist Member States in drawing up their national policies and to facilitate compliance with their regulations on the protection of the health and safety of workers.

Many national authorities have developed their own guidance and tools to support employers.

In these documents, the following approach to risk assessment is proposed:

1. Identifying hazards and those at risk
2. Evaluating and prioritising risks
3. Deciding on preventive action to eliminate or control the risks
4. Taking action to put in place the preventive and protective measures
5. Monitoring and reviewing the assessment to ensure that it remains up to date

16 https://osha.europa.eu/en/legislation/guidelines/guidance-on-risk-assessment-at-work

17 http://bookshop.europa.eu/en/practical-guidelines-of-a-non-binding-nature-on-the-protection-of-the-health-and-safety-of-workers-from-the-risks-related-to-chemical-agents-at-work-pbKE6805058/

In most existing companies, these steps are part of an Environment, Health and Safety (EHS) function and the time interval to review the assessment is defined internally. As mentioned earlier, REACH supports the generation of new information on substances that is in turn communicated to downstream users. The REACH obligations of downstream users (see Table 2) related to safety data sheets and exposure scenarios have their own timelines. This brings a new element into the stepwise approach of workplace risk assessment and into the company's internal cycle of revision.

Downstream users/operators have to assess the incoming new information, determine what actions are needed to ensure REACH compliance, identify any impact of these actions on CAD/CMD obligations and act upon these as well, if needed.

For example, a change in the hazard classification of a substance may require changes in the risk management measures used on site to minimise release. This should trigger a review of the risk assessment of processes where the substance is used before the changes are implemented. This review should take into account the risk management measures described in the exposure scenario.

Such reviews, where necessary supported by monitoring or measurements, support the continuing obligation that the technical and organisational measures in place to prevent exposure to workers continue to provide adequate control of risk from hazardous chemicals.

7.3 USE OF REACH INFORMATION IN THE RISK ASSESSMENT

The safety data sheets and exposure scenarios (if applicable) provided by suppliers of chemicals will contain a great deal of useful information to support the part of the risk assessment that deals with hazardous chemicals.

Step 1: Identifying hazards and those at risk

As described in the guidance on risk assessment at work, the first step is about looking for those agents at work that have the potential to cause harm to human health, and identifying the workers who may be exposed to them.

In a safety data sheet, the following sections will help identify which are the substances or mixtures of main concern for the human health, what are the possible consequences of exposure and if there are specific groups of workers that require additional protection (for example avoiding exposure of pregnant women to chemicals that may or are suspected to damage the unborn child).

Section 2: Hazard classification, label elements and hazard statements.

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

1272/2008 (CLP)
Skin Sens. 1, H317
STOT RE 1, H372
Carc. 2, H351

67/548/EEC - 1999/45/EC
T; R40-43-48/23

2.2 Label elements

CLP Article 23 d labelling derogation

1272/2008 (CLP)

GHS07 - GHS08
Signal word **Danger**

Hazard Statements

H317	May cause an allergic skin reaction.
H372	Causes damage to lungs through prolonged or repeated exposure by inhalation.
H351	_Suspected of causing cancer via inhalation.

Precautionary Statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.

2.3 Other hazards

The PBT and vPvB criteria of Annex XIII to the regulation does not apply to inorganic substances.

FIGURE 12: EXCERPT FROM SDS NICKEL BRIQUETTES SECTION 2

Information on other hazards that do not result in classification contained in subsection 2.3 can also be relevant.

Section 8.1: Threshold limits for human exposure (control parameters).

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Threshold limits

7440-02-0	Nickel	1 mg/m^3 (8 h) Ni HTP Finland 2012

8.1.4 DNELs

Workers
Route/Descriptors [corrected] /DNEL/DMEL
Acute-systemic effects
Inhalation (mg Ni/m3)/ NOAEC = 12,000/ DNEL = 680, (MMAD <12 µm)

Acute-local effects
Inhalation (mg Ni/m3)/ LOAEC = 4.0 (from 28 d study)/DNEL= 4.0 (MMAD = 1.5 µm)

Long term-systemic effects
Inhalation (mg Ni/m3)/ SCOEL proposed nickel OEL = 0.01 "inhalable" /OEL = 0.05 (inhalable fraction)

Long term -local effects
Dermal (mg Ni/cm2) /NOAEL= 0.07/ DNEL = 0.07
Inhalation (mg Ni/m3)/ SCOEL proposed nickel OEL = 0.05 "inhalable" / OEL = 0.01(inhalable fraction)

FIGURE 13: EXCERPT FROM SDS NICKEL BRIQUETTES SECTION 8

Section 9: Physical and chemical properties.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES		
9.1	**Important Health Safety and Environmental Information**	
9.1.1	**Appearance**	Appearance: Solid Colour: Silver
9.1.2	**Odour**	odourless
9.1.3	**Odour threshold**	Not applicable.
9.1.4	**pH**	insoluble
9.1.5	**Melting point/freezing point**	1455ºC
9.1.6	**Initial boiling point and boiling range**	2730 ºC
9.1.7	**Flash point**	Not applicable.: inorganic
9.1.9	**Flammability (solid, gas)**	The product is not flammable.
9.1.10	**Explosive properties**	
9.1.10.1	**Lower explosion limit**	Not explosive
9.1.10.2	**Upper explosion limit**	Not explosive
9.1.11	**Vapour pressure**	1 mmHg 1810°C
9.1.13	**Relative density**	3.3-4.5 g/cm³
9.1.14	**Solubility(ies)**	
9.1.14.1	**Water solubility**	insoluble
9.1.15	**Partition coefficient: n-octanol/water**	Not applicable.: inorganic
9.1.16	**Auto-ignition temperature**	The product is not flammable.
9.1.18	**Viscosity**	Not applicable.
9.1.19	**Explosive properties**	Not explosive
9.1.20	**Oxidising properties**	Not oxidizing
9.2	**Other information**	

FIGURE 14: EXCERPT FROM SDS NICKEL BRIQUETTES SECTION 9

Section 11: Toxicological information and the concise description of the toxicological symptoms and effects exposure to the chemical can give rise to.

SECTION 11. TOXICOLOGICAL INFORMATION	
11.1	**Information on toxicological effects**
11.1.1	**Acute toxicity** If swallowed: LD50/oral/rat = >9000 mg/kg In case of skin contact: No studies have been found. If inhaled: NOAEC (66 min) >=10.2 mg/L
11.1.2	**Irritation and corrosion** According to the classification criteria of the European Union, the product is not considered as being a skin irritant. According to the classification criteria of the European Union, the product is not considered as being an eye irritant.
11.1.3	**Sensitisation** Skin sensitizer Skin Sens 1: H317 May cause an allergic skin reaction. Not classified as Respiratory sensitizer.
11.1.4	**Subacute, subchronic and prolonged toxicity** Not Rated mutagenic, Toxic to reproduction Classification of the substance : Cat. 2 H351 - Suspected of causing cancer if inhaled. If inhaled
11.1.6	**STOT-repeated exposure** STOT RE 1: H372 - Causes damage to the kidneys/liver/eyes/brain/respiratory system/central nervous system through prolonged or repeated exposure if inhaled. LOAEC = 0.1 mg Ni/m³ If inhaled Target Organs : Lungs
11.1.7	**Aspiration hazard**

FIGURE 15: EXCERPT FROM SDS NICKEL BRIQUETTES SECTIONS 11

Section 3 of the SDS will also give more information on the composition of the chemical and will give information on the classification of the different components presents in a mixture.

SECTION 3: Composition/information on ingredients

· **3.2 Chemical characterization: Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**		
CAS: 7786-81-4 EINECS: 232-104-9 Index number: 028-009-00-5 Reg.nr.: 01-2119439361-44-xxxx	**nickel sulphate** T Repr. Cat. 2 R49-61-48/23 Xn R20/22-68 Xn R42/43 Xi R38 N R50/53 Carc. Cat. 1, Muta. Cat. 3 Resp. Sens. 1, H334; Muta. 2, H341; Carc. 1A, H350i; Repr. 1B, H360D; STOT RE 1, H372; Aquatic Acute 1, H400; Aquatic Chronic 1, H410; Acute Tox. 4, H302; Acute Tox. 4, H332; Skin Irrit. 2, H315; Skin Sens. 1, H317	21.5 - 24.5%
CAS: 10043-35-3 EINECS: 233-139-2 Index number: 005-007-00-2	boric acid T Repr. Cat. 2 R60-61 Repr. 1B, H360FD	1 - 10%
CAS: 7664-93-9 EINECS: 231-639-5 Index number: 016-020-00-8	sulphuric acid C R35 Skin Corr. 1A, H314	1 - 4%
CAS: 7791-20-0	**Nikkelchloride** T R25 Xn R40 Xn R42/43 N R50/53 Acute Tox. 3, H301; Acute Tox. 3, H331; Resp. Sens. 1, H334; Muta. 2, H341; Carc. 1A, H350i; Repr. 1A, H360D; STOT RE 1, H372; Aquatic Acute 1, H400; Aquatic Chronic 1, H410; Skin Irrit. 2, H315; Skin Sens. 1, H317	0.2 - 0.7%

· **SVHC**	
10043-35-3	boric acid

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

FIGURE 16: EXCERPT FROM SDS NICKEL BATH SOLUTION, SECTION 3

Hazard can also arise from reactions happening between chemicals or under certain conditions. Information on stability and reactivity of the chemical can be found in Section 10 of the SDS and sometimes information on incompatibilities is also reported in Section 7.2.

SECTION 10. STABILITY AND REACTIVITY

10.1	**Reactivity** No dangerous reaction known under conditions of normal use.
10.2	**Chemical stability** Stable under recommended storage conditions.
10.3	**Possibility of hazardous reactions** No dangerous reaction known under conditions of normal use.
10.4	**Conditions to avoid** Avoid dust formation.
10.5	**Incompatible materials** Oxidizing agents; Reacts with acids to form flammable/explosive hydrogen gases.
10.6	**Hazardous decomposition products** Metallic oxides;

FIGURE 17: EXCERPT FROM SDS NICKEL BRIQUETTES SECTION 10

SECTION 7. HANDLING AND STORAGE

7.1	**Precautions for safe handling** Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work. Safe handling advice Avoid contact with skin, eyes and clothing. If workplace exposure limits are exceeded, respiratory protection approved for this particular job must be worn. Avoid dust formation. Technical measures/Precautions Provide good ventilation of working area (local exhaust ventilation if necessary).
7.2	**Conditions for safe storage, including any incompatibilities** Always keep in containers of same material as the original one. Keep containers tightly closed in a dry, cool and well-ventilated place.
7.3	**Specific end use(s)** Exposure scenario is attached. Genric exposure scenario available from: http://www.nickelconsortia.org/exposure-scenario-library.html

FIGURE 18: EXCERPT FROM SDS NICKEL BRIQUETTES SECTION 7

In the title section of the exposure scenario, the description of the workers contributing scenarios relates to the different tasks which workers undertake during the use of the substance. This will help to identify all the workers that handle and therefore are potentially exposed to the chemical.

Processes, tasks, activities covered (workers)	Contributing exposure scenario ES 10.1 {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: 5 Mixing or blending in batch processes for formulation of preparations* and articles (multistage and/or significant contact) : PROC 8a: Raw material handling PROC 8b:Transfer of substance or preparation PROC 13: Plating operations PROC 15: Use as a laboratory reagent Contributing exposure scenario ES 10.2: PROC 0: Cleaning and maintenance

FIGURE 19: EXCERPT FROM GES10: METAL SURFACE TREATMENT NICKEL METAL– NICKEL ELECTROPLATING AND NICKEL ELECTROFORMING

Step 2: Evaluating risks

When evaluating the risks, the probability of exposure and severity of consequences have to be considered and appraised.

The severity of consequences will depend on the intrinsic properties of the chemicals and on the possible interaction with other hazardous chemicals used at the same time.

The REACH information on intrinsic properties of the chemical and possible interactions and incompatibilities are described in Step 1 above.

The probability of exposure to actually happen will depend on:

- the use pattern (amounts used, duration, frequency etc.)
- the general organisation of the work
- the equipment and technology used
- the working procedures.

Section 7 of the SDS provides advice on safe handling and storage and Section 8.2 of the SDS describes the appropriate exposure control (engineering controls and PPE).

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.
Safe handling advice
Avoid dust formation. Avoid contact with skin and eyes. If workplace exposure limits are exceeded, respiratory protection approved for this particular job must be worn.
Technical measures/Precautions
Provide good ventilation of working area (local exhaust ventilation if necessary).

7.2 Conditions for safe storage, including any incompatibilities
Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances (SEVESO II directive)
Technical measures/Storage conditions
Always keep in containers of same material as the original one. Keep containers tightly closed in a dry, cool and well-ventilated place.
Incompatible products
Acids;

7.3 Specific end use(s)
Exposure scenario is attached. Generic exposure scenario available from:
http://www.nickelconsortia.org/exposure-scenario-library.html

FIGURE 20: EXCERPT OF SDS NICKEL SULPHATE, SECTION 7 AND 8.2

8.2 Exposure controls

8.2.1 Appropriate engineering controls
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.
Avoid contact with skin and eyes. Do not breathe dust. Avoid repeated exposure. Skin protection Ensure that eyewash stations and safety showers are close to the workstation location. Remove soiled or soaked clothing immediately. Clean skin thoroughly after work. At work do not eat, drink, smoke or take drugs. Keep away from food, drink and animal feedingstuffs. Keep working clothes separately.

8.2.2.1 Respiratory protection
Use a respirator with filter model P3 (DIN 3181).

8.2.2.2 Hand protection
Protective gloves:Rubber; Butyl-rubber; Neoprene; PVC;

8.2.2.3 Eye/face protection
Goggles; Face-shield;

8.2.2.4 Skin protection
Clothing as usual in the chemical industry.

8.2.3 Environmental exposure controls
The employer shall fulfill requirements of IPPC Directive.

FIGURE 21: EXCERPT OF SDS NICKEL SULPHATE, SECTION 7 AND 8.2

Additionally, Section 2 of the exposure scenario provides information on the operational conditions and risk management measures that ensure adequate control of risk for a specific use of the substance. This information relates closely to use and equipment/technology parameters.

Product characteristic
Ni/$NiSO_4$-containing powder and $NiSO_4$ solution
Amounts used
Not relevant
Frequency and duration of use/exposure
Duration of exposure during cleaning and maintenance is considered to average 1 hour per day for surface finishing including tank emptying, refilling tank solutions and replenishing tank solutions. Frequency of addition of salts to tank depends on process and through-put rate of plated items down the line and ranges from once per shift to once every 2 or 3 weeks.

Technical conditions and measures at process level (source) to prevent release
The $NiSO_46H_2O$ powder (or $NiSO_4$ solution) is carefully added to the tank solution where the process is not automated, in order to avoid throwing the $NiSO_4.6H_20$ powder along the length of the tanks and creating liquid splashes and powder becoming airborne.
Technical conditions and measures to control dispersion from source towards the worker
Local (where appropriate) and general exhaust ventilation. Vacuuming or suitable wet removal methods for cleaning settled dust etc. from plant and premises. Avoid inappropriate cleaning methods such as dry brushing.
Organisational measures to prevent /limit releases, dispersion and exposure
Training to reinforce good wokplace 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: Use of suitable chemical gloves (EN 374, protection level 6, PVC or equivalent) goggles and special safety clothing is required to control dermal exposure Protective equipment should be chosen based on activities being undertaken, potential for exposure to airborne Ni Hydroxycarbonate and other relevant workplace hazards and may include protective suit with hood (conforming to EN13982-1 Type 5), safety shoes (*e.g.* according to EN 20346).

FIGURE 22: EXCERPTS FROM GES4: METAL SURFACE TREATMENT NICKEL SULPHATE – NICKEL ELECTROPLATING, NICKEL ELECTROFORMING AND ELECTROLESS NICKEL PLATING

Step 3: Deciding on preventive action

As a result of step 1 and 2 of the risk assessment for the chemicals used in the company, a number of specific risks will have been identified and evaluated. In order to choose the appropriate measures to eliminate or control these risks, the company will need to:

- consider the information provided in SDS and ES for each chemical and
- decide on a set of risk management measures suitable for the different tasks and substances used in the process, including process generated risks.

Information provided in the exposure scenario under the heading "Guidance to DU to evaluate whether

he works inside the boundaries set by the ES" may include the boundaries for the flexibility allowed when checking whether the conditions of use of the substance in the workplace match those recommended in the exposure scenario, or a link to where this scaling advice can be obtained. This will help to achieve the adequate level of protection for the human health and the environment.

4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling method - Workers
Exposure estimation tool used: ECETOC TRA v3.
Scalable Parameters Workers
exposure duration maximum concentration
Non scalable parameters
Other parameters (different from those indicated under scalable parameters) have to be taken (with no change) from the Exposure Scenario provided
Boundaries of Scaling
RCR not to be exceeded are described in Section 3 above.
Scaling instructions
For Scaling instructions please go to the following website: http://companyX-reach/scaling/

FIGURE 23: HYPOTHETICAL EXAMPLE OF THE CONTENT OF SECTION 4 OF AN EXPOSURE SCENARIO. THIS EXAMPLE HAS BEEN DRAFTED BY ECHA AND IS FORMATTED ACCORDING TO THE TEMPLATES FOR AN EXPOSURE SCENARIO 18

Also, the first aid measures described in Section 4 of the SDS (including antidotes, contraindications or immediate treatment that should be available at the workplace) will be especially useful to minimise consequences in case of accidental exposure.

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures
When symptoms persist or in all cases of doubt seek medical advice.

4.1.2 Inhalation
If inhaled, remove to fresh air. Call a physician.

4.1.3 Skin contact
Before washing use a dry brush to remove dust from skin. Immediately flush skin with large amounts of water. Remove contaminated clothing. If irritation develops, get medical attention.

4.1.4 Eye contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses. Get medical attention.

4.1.5 Ingestion
Rinse mouth with water. Do not induce vomiting. Drink water. Call physician immediately.

4.2 Most important symptoms and effects, both acute and delayed
Eye damage/irritation, Skin irritation. May cause irritation of respiratory tract.

4.3 Indication of immediate medical attention and special treatment needed
Treat symptomatically.

FIGURE 24: EXCERPT FROM SDS SLAKED LIME, SECTION 4

18 http://echa.europa.eu/support/guidance-on-reach-and-clp-implementation/formats

8. Information and training for workers

8.1 LEGAL OBLIGATIONS OF THE EMPLOYER

The IED does not specifically require operators to train their workers but the BREF document on "Surface Treatment of Metals and Plastics" considers training, awareness and competence of staff as an element of best available technique from the environmental management perspective to contribute the overall environmental performance of the installation.

As part of the general obligation to ensure the safety and health of workers in every aspect related to the work, the employer has the duty to give adequate safety and health training, in particular in the form of information and instructions, to the workers[19].

The CAD (Article 8(1)) and CMD (Article 11) set what kind of information, instruction and training has to be provided to workers and/or their representatives and how the information is provided. and in what manner. These Articles also specify for when information, instruction or training has to be updated or repeated. It is an obligation to provide access to safety data sheets to workers and/or their representatives.

CAD, Article 8 Information and training for workers

1. Without prejudice to Articles 10 and 12 of Directive 89/391/EEC the employer shall ensure that workers and/or their representatives are provided with:

- *the data obtained pursuant to Article 4 of this Directive, and further informed whenever a major alteration at the workplace leads to a change in these data,*
- *information on the hazardous chemical agents occurring in the workplace, such as the identity of those agents, the risks to safety and health, relevant occupational exposure limit values and other legislative provisions,*
- *training and information on appropriate precautions and actions to be taken in order to safeguard themselves and other workers at the workplace,*
- *access to any safety data sheet provided by the supplier in accordance with Article 31 of Regulation (EC) No 1907/2006 ;*

and that the information is:

- *provided in a manner appropriate to the outcome of the risk assessment pursuant to Article 4 of this Directive. This may vary from oral communication to individual instruction and training supported by information in writing, depending on the nature and degree of the risk revealed by the assessment required by the said Article,*
- *updated to take account of changing circumstances.*

2. Where containers and pipes for hazardous chemical agents used at work are not marked in accordance with the relevant Community legislation on the labelling of chemical agents and on safety signs at the workplace, the employer shall, without prejudice to the derogations provided for in the abovementioned legislation, ensure that the contents of the containers and pipes, together with the nature of those contents and any associated hazards, are clearly identifiable.

3. Member States may take measures necessary to ensure that employers may, preferably from the producer or supplier, obtain on request all information on hazardous chemical agents needed to apply Article 4(1) of this Directive, insofar as neither Regulation (EC) No 1907/2006, nor Regulation (EC) No 1272/2008

19 Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the health and safety of workers at work.

include any obligation to provide information.

CMD, Article 11 Information and training of workers

1. Appropriate measures shall be taken by the employer to ensure that workers and/or workers' representatives in the undertaking or establishment receive sufficient and appropriate training, on the basis of all available information, in particular in the form of information and instructions, concerning:

a) potential risks to health, including the additional risks due to tobacco consumption;
b) precautions to be taken to prevent exposure;
c) hygiene requirements;
d) wearing and use of protective equipment and clothing;
e) steps to be taken by workers, including rescue workers, in the case of incidents and to prevent incidents.

The training shall be:

- *adapted to take account of new or changed risk, and*
- *repeated periodically if necessary.*

2. Employers shall inform workers of installations and related containers containing carcinogens or mutagens, ensure that all containers, packages and installations containing carcinogens or mutagens are labelled clearly and legibly, and display clearly visible warning and hazard signs.

8.2 USE OF REACH INFORMATION IN TRAINING

Reminder: this section is not intended to give guidance on how to organise or conduct training but to show where REACH information can be used to support this activity.

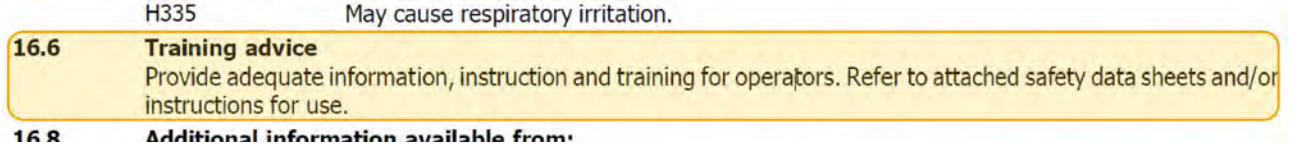
As previously mentioned, according to the CAD, it is an obligation to provide access to safety data sheets to workers and/or their representatives. Additionally, one of the basic obligations of the operator under the IED is to take the necessary measures to prevent accidents and limit their consequences.

The safety data sheets and exposure scenarios contain information that can be used in planning and structuring the training of workers to improve chemical safety, reduce accidents and limit their consequences.

It is the resort of the employer to decide what is the appropriate level of detail needed and in what way the training needs to be organised but it can be useful to differentiate between training for normal work conditions and training for response to accidents.

8.2.1 Normal work conditions

Section 16 of the SDS provides general advice on any training appropriate for workers to ensure protection of the human health and the environment.



	H335	May cause respiratory irritation.
16.6	**Training advice**	Provide adequate information, instruction and training for operators. Refer to attached safety data sheets and/or instructions for use.
16.8	**Additional information available from:**	

FIGURE 25: EXCERPT FROM SDS SLAKED LIME SECTION 16

Section 2 of the SDS describes the hazards of the substance or mixture and the appropriate warnings associated with those hazards. Label elements help users to recognise at a glance the key hazards and protective measures. Training is especially needed to make sure workers recognise and understand the new hazard classes, pictograms, hazard and precautionary statements introduced with the CLP.

SECTION 2. HAZARDS IDENTIFICATION

2.1 **Classification of the substance or mixture**
1272/2008 (CLP)
Skin Irrit. 2, H315
Skin Sens. 1, H317
Muta. 2, H341
Acute Tox. 4, H302
Acute Tox. 4, H332
STOT RE 1, H372
Repr. 1B, H360D
Carc. 1A, H350I
Resp. Sens. 1, H334
Aquatic Acute 1, H400
Aquatic Chronic 1, H410
67/548/EEC - 1999/45/EC
T, N; R49-61-20/22-38-42/43-48/23-68-50/53

2.2 **Label elements**
1272/2008 (CLP)
GHS09 - GHS07 - GHS08

Signal word **Danger**

Hazard Statements

H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H341	Suspected of causing genetic defects <state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard>.
H302	Harmful if swallowed.
H332	Harmful if inhaled.
H372	Causes damage to lungs through prolonged or repeated exposure by inhalation.
H360D	May damage the unborn child.
H350I	May cause cancer by inhalation.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary Statements

P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P270	Do no eat, drink or smoke when using this product.
P363	Wash contaminated clothing before reuse.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308+P313	IF exposed or concerned: Get medical advice/attention.

2.3 **Other hazards**
The PBT and vPvB criteria of Annex XIII to the regulation does not apply to inorganic substances.

FIGURE 26: EXCERPTS FROM SDS NICKEL SULPHATE SECTIONS 2.1 AND 2.2

Handling and storage instructions in Section 7 associated to exposure protection in Section 8.2 and disposal consideration in Section 13 of the SDS should be the backbone of how workers deal safely with the chemicals in normal work conditions.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid dust formation. Avoid contact with skin and eyes. Do not wear contact lenses. Use personal protective equipment. Provide for appropriate exhaust ventilation and dust collection at machinery. For more information please see the relevant exposure scenario, available via your supplier/given in the Appendix, and check section 2.1: Control of worker exposure. Note also Directive 90/269/EEC.

7.2 Conditions for safe storage, including any incompatibilities
Keep in a dry place. Avoid: Exposure to air or moisture over prolonged periods. Keep away from acids, significant quantities of paper, straw, and nitro compounds. Keep out of the reach of children. Do not use aluminium for storage if there is a risk of contact with water.

FIGURE 27: EXCERPT FROM SDS SLAKED LIME SECTION 7

8.2 Exposure controls

8.2.1 Appropriate engineering controls
If user operations generate dust, use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne dust levels below recommended exposure limits.
Exposure scenario attached.

8.2.2 Individual protection measures

8.2.2.1 Respiratory protection
Provide sufficient air exchange and/or exhaust in work rooms. Respirator with a particle filter (EN 143) See also the exposure scenario.

8.2.2.2 Hand protection
Protective gloves: Nitrile rubber.

8.2.2.3 Eye/face protection
Tightly fitting safety goggles. Do not wear contact lenses.

8.2.2.4 Skin protection
Long sleeved clothing, close fittings at openings. Footwear protecting against chemicals.

8.2.2.5 Hygiene measures
Wash hands and face before breaks and immediately after handling the product. If needed: Use protective skin cream before handling the product. When using, do not eat, drink or smoke.

8.2.3 Environmental exposure controls
Exhaust ventilation equipped with filters. Do not flush into surface water or sanitary sewer system. See also the exposure scenario.

FIGURE 28: EXCERPT FROM SDS SLAKED LIME SECTION 8.2

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Empty containers: Can be landfilled or incinerated, when in compliance with local regulations.

13.2 Waste from residues / unused products
Dispose of in compliance with local and national regulations.

FIGURE 29: FIGURE 27: EXCERPT FROM SDS SLAKED LIME SECTION 13

In the exposure scenario, the section describing the conditions of use affecting exposure contains important information related to conditions of safe use for the environment (sometimes under the headings "Environment contributing scenario"). This information can be useful for training purposes.

Amounts used	
Maximum daily use at a site	ES 1: 0.036 tonnes/day (median 50th % emission days) ES 2: 0.017 tonnes/day (median 50th % emission days) ES 3: 0.036 tonnes/day (median 50th % emission days)
Maximum annual use at a site	ES 1: 8 tonnes Ni; Discharge to STP ES 2: 3.8 tonnes Ni; Direct discharge ES 3: 8 tonnes Ni; Marine discharge
Frequency and duration of use	
Pattern of release to the environment	Water: 240 days per year per site (median 50th %) Air: 220 days per year per site (median 50th %)

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Waste water: On-site wastewater treatment in a physico-chemical treatment plant by chemical precipitation, sedimentation, filtration or a combination. (Efficiency: 95 - >99%) Off-site waste water treatment plant, community sewer system for ES 1 (Efficiency 40%) ES1 freshwater discharge to STP: 3779 g/T (median) ES2 freshwater direct discharge: 3779 g/T (median) ES3 marine direct discharge: 3779 g/T (median) **Air:** Treatment of stack air emission by wet scrubbers. (Efficiency 99%) ES1, 2 & 3: Release factor after on-site treatment: 1133 g/T (median)

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: - 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%

FIGURE 30: EXCERPTS FROM GES4 METAL SURFACE TREATMENT NI SULPHATE – NICKEL ELECTROPLATING, NICKEL ELECTROFORMING AND ELECTROLESS NICKEL PLATING– 2.1 CONTROL OF ENVIRONMENTAL EXPOSURE

Similarly, the section describing the conditions of use affecting exposure for workers contains important information related to conditions of safe use that can be included in training activities.

This information is sometimes presented under the heading "Worker contributing scenario".

Frequency and duration of use/exposure	
Duration of exposure during cleaning and maintenance is considered to average 1 hour per day for surface finishing including tank emptying, refilling tank solutions and replenishing tank solutions. Frequency of addition of salts to tank depends on process and through-put rate of plated items down the line and ranges from once per shift to once every 2 or 3 weeks.	
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	
None	
Technical conditions and measures at process level (source) to prevent release	
The $NiSO_46H_2O$ powder (or $NiSO_4$ solution) is carefully added to the tank solution where the process is not automated, in order to avoid throwing the $NiSO_4.6H_20$ powder along the length of the tanks and creating liquid splashes and powder becoming airborne.	
Technical conditions and measures to control dispersion from source towards the worker	
Local (where appropriate) and general exhaust ventilation. Vacuuming or suitable wet removal methods for cleaning settled dust etc. from plant and premises. Avoid inappropriate cleaning methods such as dry brushing.	
Organisational measures to prevent /limit releases, dispersion and exposure	
Training to reinforce good wokplace 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: Use of suitable chemical gloves (EN 374, protection level 6, PVC or equivalent) goggles and special safety clothing is required to control dermal exposure Protective equipment should be chosen based on activities being undertaken, potential for exposure to airborne Ni Hydroxycarbonate and other relevant workplace hazards and may include protective suit with hood (conforming to EN13982-1 Type 5), safety shoes (*e.g.* according to EN 20346).	

FIGURE 31: EXCERPT FROM GES4 METAL SURFACE TREATMENT NI SULPHATE – NICKEL ELECTROPLATING, NICKEL ELECTROFORMING AND ELECTROLESS NICKEL PLATING – 2.2 CONTROL OF WORKERS EXPOSURE FOR CONTRIBUTING EXPOSURE SCENARIO 4.2

8.2.2 Response to accidents (exposure, fire, spillage)

First aid measures described in Section 4 of the SDS are important to minimise consequences of accidental exposure for the victim but sometimes also for the person providing first aid.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Hydrofluoric (HF) acid burns require immediate and specialized first aid and medical treatment. Symptoms may be delayed up to 24 hours depending on the concentration of HF. After decontamination with water, further damage can occur due to penetration/absorption of the fluoride ion. Treatment should be directed toward binding the fluoride ion as well as the effects of exposure. Skin exposures can be treated with a 2.5% calcium gluconate gel repeated until burning ceases. More serious skin exposures may require subcutaneous calcium gluconate except for digital areas unless the physician is experienced in this technique, due to the potential for tissue injury from increased pressure. Absorption can readily occur through the subungual areas and should be considered when undergoing decontamination. Prevention of absorption of the fluoride ion in cases of ingestion can be obtained by giving milk, chewable calcium carbonate tablets or Milk of Magnesia to conscious victims. Conditions such as hypocalcemia, hypomagnesemia and cardiac arrhythmias should be monitored for, since they can occur after exposure.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

FIGURE 32: EXCERPT FROM SDS HYDROFLUORIC ACID SECTION 4

In Section 5 of the SDS, unsuitable extinguishing media and special hazards arising from the chemical in case of fire are important to emphasize during training. Further advice for the disposal of residues may also be provided. This will help minimise consequences and avoid dangerous reactions when fighting a fire involving chemicals.

SECTION 5. FIREFIGHTING MEASURES

5.1 Extinguishing media

5.1.1 Suitable extinguishing media
The product itself does not burn. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment e.g.: Dry powder; Carbon dioxide (CO2); Water spray jet;

5.1.2 Extinguishing media which must not be used for safety reasons
Strong water jet;

5.2 Special hazards arising from the substance or mixture
In the event of fire the following can be released: Metal dust; Metallic oxides; Sulphur oxides (SOx);

5.3 Advice for firefighters
Wear self-contained breathing apparatus and protective suit.

5.4 Specific methods
Collect contaminated fire extinguishing water separately. Neutralise with e.g. sodium hydroxide. Do not discharge into the drains/surface waters/groundwater.

FIGURE 33: EXCERPT FROM SDS NICKEL SULPHATE SECTION 5

Accidental release measures described in Section 6 of the SDS also contain information on personal precautions, protective equipment to be used and environmental precautions to be observed when dealing with accidental spills or leaks. This adivce will be useful to minimise consequences of accidental release for the environment and the human health.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

FIGURE 34: EXCERPT FROM SDS HYDROFLUORIC ACID SECTION 6

9. Risk management of daily operations

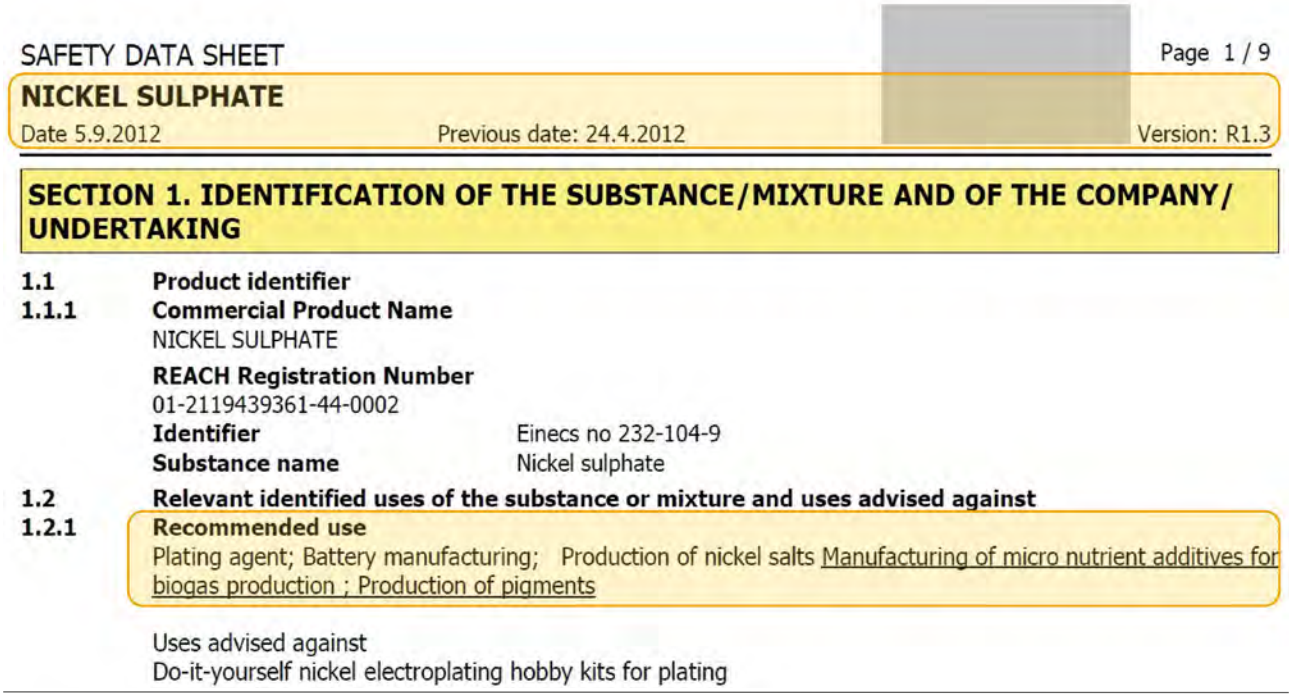
Risk management is part of normal daily business operations and a core aspect of the IED, CAD and CMD. The aim is to ensure that the operations are managed in a way that first assesses and then controls the risks.

An additional important step is to make sure the assessment is reviewed regularly or whenever there is a need for update. Changes in the process, near misses or incidents are typical triggers for review.

New information provided in the SDS and ES can also trigger a review. For example a change in hazard classification of a substance or mixture can have wide repercussions on risk management measures and may require an update of the risk assessment or even of the environmental permit. Also changes in the exposure scenarios can have similar consequences.

When a safety data sheet (and exposure scenario if applicable) is supplied to the downstream user, the easiest way to identify if the document is a revised version is to check the first page of the SDS where revision information must be indicated.

Section 16 of the SDS contains indication of where changes have been made to the previous version of the SDS. This will help identify if the changes made to the SDS have some influence on risk management. Also if the changes indicated are not clear enough you can ask further explanations form your supplier.



SAFETY DATA SHEET Page 1 / 9

NICKEL SULPHATE

Date 5.9.2012 Previous date: 24.4.2012 Version: R1.3

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/ UNDERTAKING

1.1 Product identifier

1.1.1 Commercial Product Name

NICKEL SULPHATE

REACH Registration Number

01-2119439361-44-0002

Identifier Einecs no 232-104-9

Substance name Nickel sulphate

1.2 Relevant identified uses of the substance or mixture and uses advised against

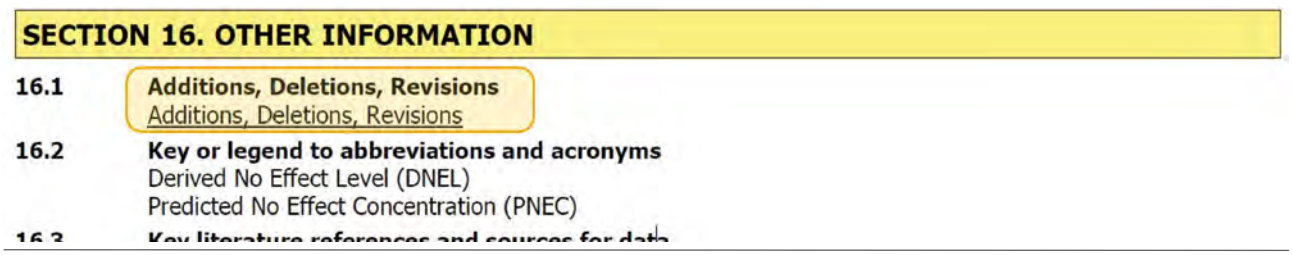
1.2.1 Recommended use

Plating agent; Battery manufacturing; Production of nickel salts Manufacturing of micro nutrient additives for biogas production ; Production of pigments

Uses advised against

Do-it-yourself nickel electroplating hobby kits for plating

FIGURE 35: EXCERPT OF SDS NICKEL SULPHATE SECTION 1



SECTION 16. OTHER INFORMATION

16.1 Additions, Deletions, Revisions

Additions, Deletions, Revisions

16.2 Key or legend to abbreviations and acronyms

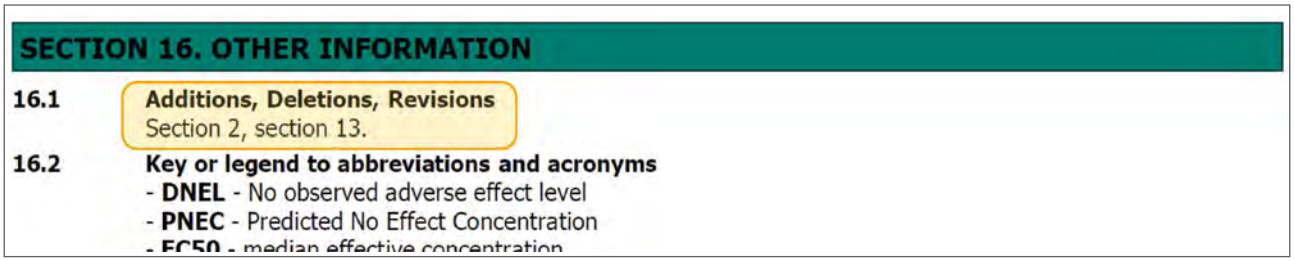
Derived No Effect Level (DNEL)

Predicted No Effect Concentration (PNEC)

16.3 Key literature references and sources for data

FIGURE 36: EXCERPT OF SDS NICKEL SULPHATE SECTION 16

The way changes are indicated in Section 16 can vary. In the example above, the supplier has chosen to underline the elements in the document that have been changed. Another example is provided here.



SECTION 16. OTHER INFORMATION

16.1 **Additions, Deletions, Revisions**
Section 2, section 13.

16.2 **Key or legend to abbreviations and acronyms**
- **DNEL** - No observed adverse effect level
- **PNEC** - Predicted No Effect Concentration
- **EC50** - median effective concentration

FIGURE 37: EXCERPT OF SDS SLAKED LIME SECTION 16

For an efficient treatment of the information received, it can be useful to build some reference list of information use. The list helps identifying what information has been used for which legal obligation. When the information changes it is easier to track the implications and implement changes accordingly. An example for such a list is shown in Appendix 3.

Appendix 1. List of terms

End user

Person or body using substances or preparations in an industrial or professional activity (e.g. not a consumer or distributor) who does not supply it further downstream.

Masking

Masking is employed in most any metal finishing operation where only a specifically defined area of the surface of a part must be exposed to a process.

Shielding

Shielding is used to divert excessive current from areas of high current density in order to prevent excessive build-up of the deposit.

Plating rack

A rack, or jig, is an electrically conducting device that supports the parts in a fixed position during the plating cycle. It must be highly conductive due to the necessity of connecting the part electrically to the bus bar and the DC power supply. The whole surface, except for the contact areas, is generally coated with chemically resistant and insulating plastic.

Sump

A pit or reservoir serving as drain or receptacle for liquids

Appendix 2: Chemical information summary table

This is an example of a table that might be prepared by a company to summarise some of the main information related to the substances and mixtures that the company uses. Column 6 contains the company's own description of the activities which involve the substances. Columns 7 to 11 record the way the company assigns its activities to the different use descriptor categories according to the Guidance on use description[20] . Other information can be added according to the individual needs of a company (for example: occupational exposure limit values, suppliers' contact details, SDS/ES receipt date, the REACH regulatory status of the substance[21] , information related to other legislation, quantity on site, packaging information, sector use map codes etc.)

This kind of summary will give an overview of the chemicals in use and it can facilitate monitoring changes for example when receiving an updated safety data sheet and exposure scenarios. In addition, information can easily be extracted for other purposes, as and when needed e.g. IED permit application, workplace risk assessment etc.

20 At the time of publication, the "Guidance on Information Requirements and Chemical Safety Assessment Chapter R.12: Use description" was under revision (publication expected by end 2015) http://echa.europa.eu/guidance-documents/guidance-on-information-requirements-and-chemical-safety-assessment

21 For example if the substance is included in the Candidate List or the Authorisation List etc.

TABLE 3: CHEMICAL INFORMATION SUMMARY TABLE

SUBSTANCE NAME						
NICKEL METAL	CONCN.	FORM	CAS	CLASSIFICATION (CLP REGULATION)	COMPANY'S OWN DESCRIPTION OF ITS ACTIVITIES	
	100	Solid, massive	7440-02-0	Skin Sens. 1 H317 Carc. 2 H351 STOT RE 1 H372 Aquatic Chronic 3 H412	Transfer from 50 kg drum to process bath Dipping of work piece Storage between uses	
	PROCESS CATEGORY (PROC)	ENVIRONMANTAL RELEASE CATEGORY (ERC)	PRODUCT CATEGORY	FUNCTION CATEGORY		
	PROC8a PROC13	ERC5	PC14	Plating agent		
SLAKED LIME	CONCN.	FORM	CAS	CLASSIFICATION (CLP REGULATION)	COMPANY'S OWN DESCRIPTION OF ITS ACTIVITIES	
	100	Solid, powder	1305-62-0	Skin Irrit. 2, H315 Eye Dam. 1 H318 STOT SE 3, H335	Transfer from 25 kg bag to water treatment process Mixing step Storage between uses	
	PROCESS CATEGORY (PROC)	ENVIRONMANTAL RELEASE CATEGORY (ERC)	PRODUCT CATEGORY	FUNCTION CATEGORY		
	PROC8a PROC5	ERC6b	PC37, PC20	pH-regulating agent		
SULPHURIC ACID	CONCN.	FORM	CAS	CLASSIFICATION (CLP REGULATION)	COMPANY'S OWN DESCRIPTION OF ITS ACTIVITIES	
	95-97	Liquid	7664-93-9	Skin Corr. 1A H314	Transfer from IBC to water treatment process Mixing step Storage between uses	
	PROCESS CATEGORY (PROC)	ENVIRONMANTAL RELEASE CATEGORY (ERC)	PRODUCT CATEGORY	FUNCTION CATEGORY		
	PROC8b PROC5	ERC6b	PC37, PC20	pH-regulating agent		

Appendix 3: Reference list of suggested information use

This table is a record of where the information contained in the safety data sheet and the exposure scenario has been suggested to be used to support compliance with the legal obligations described in the case study.

When updated information on chemicals is supplied, such a table can help assessing where the changes in the information received needs to be taken into consideration.

INFORMATION SOURCE	SUGGESTION OF INFORMATION USE
Safety data sheet	IED permit b
First page, heading	Risk management, evaluation of incoming info
SECTION 1: Identification of the substance/mixture and of the company/undertaking	
1.1 Product identifier	IED permit b
1.2. Relevant identified uses of the substance or mixture and uses advised against	IED permit b
1.3. Details of the Supplier of the Safety Data Sheet	
1.4 Emergency telephone number	
SECTION 2: Hazards identification	Risk assessment step 1
2.1 Classification of the substance or mixture	IED permit b IED permit c, e, f, j Risk assessment step 1 Worker's training
2.2: Label elementsW	Risk assessment step 1 Worker's training
2.3 Other hazards	IED permit b Risk assessment step 1
SECTION 3: Composition/information on ingredients	IED permit b Risk assessment step 1
3.1 Substances	
3.2 Mixtures	
SECTION 4: First aid measures	Risk assessment step 3 Worker's training
4.1 Description of first aid measures	
4.2 Most important symptoms and effects, both acute and delayed	
4.3 Indication of any immediate medical attention and special treatment needed	
SECTION 5: Firefighting measures	

INFORMATION SOURCE	SUGGESTION OF INFORMATION USE
5.1 Extinguishing media	Worker's training
5.2 Special hazards arising from the substance or mixture	Worker's training
5.3 Advice for fire-fighters	
5.4 Additional information	Worker's training
SECTION 6: Accidental release measures	Worker's training
6.1 Personal precautions, protective equipment and emergency procedures	
6.2 Environmental precautions	
6.3 Methods and material for containment and cleaning up	
6.4 Reference to other sections	
SECTION 7: Handling and storage	Risk assessment step 2 Worker's training
7.1 Precautions for safe handling	
7.2 Conditions for safe storage, including any incompatibilities	
7.3 Specific end use(s)	
SECTION 8: Exposure controls/personal protection	
8.1 Control parameters	Risk assessment step 1
OELs	
DNELs	
PNECs	
8.2 Exposure controls	IED permit c, e, f, j Risk assessment step 2 Worker's training
SECTION 9: Physical and chemical properties	IED permit b Risk assessment step 1
9.1 Information on basic physical and chemical properties	
9.2 Other information	
SECTION 10: Stability and reactivity	Risk assessment step 1
10.1 Reactivity	
10.2 Chemical stability	

INFORMATION SOURCE	SUGGESTION OF INFORMATION USE
10.3 Possibility of hazardous reactions	
10.4 Conditions to avoid	
10.5 Incompatible materials	
10.6 Hazardous decomposition products	
SECTION 11: Toxicological information	
11.1 Information on toxicological effects	Risk assessment step 1 Risk assessment step 2
SECTION 12: Ecological information	IED permit c, e, f, j
12.1 Toxicity	
12.2 Persistence and degradability	
12.3 Bioaccumulative potential	
12.4 Mobility in soil	
12.5 Results of PBT and vPvB assessment	
SECTION 13: Disposal considerations	
13.1 Waste treatment methods	IED permit h Worker's training
SECTION 14: Transport information	
14.1. UN number	
14.2. UN proper shipping name	
14.3. Transport hazard class(es)	
14.4. Packing group	
14.5. Environmental hazards	
14.6. Special precautions for user	
14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	
SECTION 15: Regulatory Information	
15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture	
15.2 Chemical Safety Assessment	

INFORMATION SOURCE	SUGGESTION OF INFORMATION USE
SECTION 16: Other information	
(i) Indication of changes	Risk management, evaluation of incoming information
(ii) Abbreviations and acronyms	
(iii) Training advice	Worker's training
(iv) Additional information	

INFORMATION SOURCE	SUGGESTION OF INFORMATION USE
Exposure scenario	
ES title (short title)	
1. Title section	Risk assessment step 1
ES/use name	
Scope	
2. Conditions of use affecting exposure	
2.1 Environment contributing scenario	Worker's training
Product (article) characteristics	
Amount used, frequency and duration of use (or from service life)	Risk assessment step 2
Technical and organisational conditions and measures	IED permit g IED permit c, e, f, j IED permit k
Conditions and measures related to sewage treatment plant	
Conditions and measures related to treatment of waste (including article waste)	IED permit h
Other conditions affecting environmental exposure	
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply	
2.2 Worker contributing scenario	Risk assessment step 2 Worker's training
Product characteristics	
Amount used (or contained in articles), frequency and duration of use/ exposure	
Technical and organisational conditions and measures	
Conditions and measures related to personal protection, hygiene and health evaluation	
Other conditions affecting workers exposure	
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply	
3. Exposure estimation and reference to its source	
3.1 Environment contributing scenario	
3.2 Worker contributing scenario	
4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES	Risk assessment step 3

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