Assessment of the occupational risks in the workplace (multiplicative method):

Appendix 1 - Chemical risk

Foreword	This English version is translated from the original French reference version.

Contents

1 INVENTORY OF PRODUCTS

It is worthwhile having a full, up-to-date inventory of products present on the site, stating their locations. The inventory takes account of the following products:

- Raw materials;
- Intermediate synthetic products;
- Finished products;
- By-products (including those produced by processes and operations: combustion or thermal degradation agents, exhaust gas, smoke emissions, welding fumes, degradation products, fog, dust etc.);
- Auxiliary products (cleaning and maintenance products, etc.);
- Samples, waste.

The inventory must be regularly updated and archived to ensure the traceability of the products that may have been used in the company in the past.

2 ANALYSIS OF THE DATA ON THE SDS AND THE WORK CONDITIONS

The following data, which will be stated on any SDS, is essential to be able to assess the chemical risk:

- The hazard phrases (H3xx[1]), section 2 of the SDS, otherwise the hazard symbol on the label;
- The chemical name and CAS (or CE) number of each hazardous substance, section 1 and 3 of the SDS, along with any OEL (section 8);
- Physical-chemical data to calculate the severity G (vapor pressure or boiling point, grain size for solids);
- Potential exposure duration;
- Potential exposure conditions (airways, skin, oral; physical state. vapor pressure. temperature, etc.; quantities);
- Type of process: more or less dispersive in the workplace atmosphere.

There is no SDS for a number of chemical products that are not labelled either. These include agents emitted during the process (wood dust, welding fumes, exhaust gas, combustion or thermal degradation agents, etc.). Here, it's worthwhile checking the literature for the requisite information.

[1]In accordance with the GHS (Global Harmonized System) or CLP regulation.

3 QUALITATIVE ASSESSMENT OF THE CHEMICAL RISKS TO HEALTH

The risk assessment takes account of the various exposure paths (skin, airways, digestive system).

The exposure analysis is conducted for the normal conditions of use of chemical agents as well as reasonably conceivable deteriorated modes.

Note: Asphyxiating gases (which displace oxygen) that are not risk phrases (e.g. nitrogen) should be considered physical risks (see appendix 5 - § "Assessment of the risk associated with a confined atmosphere").

3.1 Severity rating G (general case)

Products are classified in five hazard categories, using the highest hazard phrase (H3xx) in section 2 of the SDS or on the label.

G	Health hazard category	Pictogram	Phrases H 3xx and EUHxxx (CLP/GHS regulations)	Exposure path
40	Acute toxicity cat. 1 & 2		**H300** – Fatal if swallowed **H330** – Fatal if inhaled **EUH032** – Contact with acids releases a highly toxic gas. **EUH206** – Important! Do not use in combination with other products. Can release hazardous gases (chlorine).	mixed
			H310 – Fatal in contact with skin	skin
15	Carcinogens cat. 1A & 1B		**H350** – Can cause cancer **H350i** – Can cause an allergic skin reaction	mixed
	Mutagens cat. 1A & 1B		**H340** – Causes serious genetic abnormalities	
	Reproductive toxicants cat 1A & 1B		**H360** – Can damage fertility or the unborn child **H360F** – Can damage fertility. **H360D** – Can damage the unborn child. **H360FD** – Can damage fertility. Can damage the unborn child **H360Fd** – Can damage fertility Likely to damage the unborn child **H360Df** – Can damage the unborn child Likely to damage fertility	
	STOT – single exposure cat. 1		**H370** – Proven risk of serious effects on the organs	
	CMR dust and aerosols	-	Asbestos, FCR CMR, hardwood dust, diesel particles, soot, tar and pitch, some nanoparticles, mercury, lead, silica (quartz, cristobalite, tridymite…), chrome VI… **EUH207** – Important! Contains cadmium - Hazardous fumes are formed during use.	mixed
	Contains lead		**EUH201** – Contains lead. Should not be used on surfaces liable to be chewed or sucked by children **EUH201A** – Important! Contains lead	mixed

G	Health hazard category	Pictogram	Phrases H 3xx and EUHxxx (CLP/GHS regulations)	Exposure path
7	Acute toxicity cat. 3		**H301** – Toxic if swallowed **H331** – Toxic if inhaled **EUH029** – Contact with water releases a toxic gas **EUH031** – Contact with acids releases a toxic gas	mixed
	Respiratory or skin sensitizers cat. 1		**H334** – Can causes allergic symptoms or asthma or breathing difficulties if inhaled	inhalation
	Carcinogens cat. 2		**H351** – Likely to cause cancer	mixed
	Mutagens cat. 2		**H341** – Likely to cause serious genetic abnormalities	
	Reproductive toxicants cat. 2		**H361** – Likely to damage fertility or the unborn child **H361f** – Likely to damage fertility **H361d** – Likely to damage the unborn child **H361fd** – Likely to damage fertility Likely to damage the unborn child **H362** – Can be noxious for babies feeding on breastmilk	
	STOT* – single exposure cat. 2		**H371** – Presumed risk of serious effects on the organs	mixed
	STOT – repeated exposure cat. 1 & 2		**H372** – Proven risk of serious effects on the organs following repeated or prolonged exposure **H373** – Presumed risk of serious effects on the organs following repeated or prolonged exposure	mixed
	Toxic if inhaled		**H304** – May be fatal if swallowed and enters airways	
7	Corrosion		**EUH071** – Corrosive for the airways	inhalation
	Alveolar dust without specific effect and aerosols	-	**Fiber less than 5µm**, ceramic/vegetable fiber… Fumes: paraffin, bitumen... Oil spray, machining with oil, cutting oils... Sanding, grinding products...	
	Acute toxicity cat. 3		**H311** – Toxic in contact with skin EUH 070 – Toxic in contact with eyes	skin
	Skin corrosion Skin irritation cat. 1ABC		**H314** – Serious skin burns and eye injuries **EUH202** – Cyanoacrylate - Hazard - Bonds skin and eyes in seconds. Keep out of the reach of children	
	Respiratory or skin sensitizers cat. 1		**H317** – Can cause a skin allergy **EUH203** – Contains chromium VI - Can cause an allergic reaction **EUH204** – Contains isocyanates. Can cause an allergic reaction **EUH205** – Contains epoxydic compounds. Can cause an allergic reaction **EUH208** – Contains “name of sensitizing substance” - Can cause an allergic reaction	

G	Health hazard category	Pictogram	Phrases H 3xx and EUHxxx (CLP/GHS regulations)	Exposure path
	Serious eye injuries and eye irritation cat. 1		**H318** – Causes serious eye injuries	
3	Acute toxicity cat. 4		**H302** – Noxious if swallowed **H332** – Noxious if inhaled	mixed
	STOT – single exposure cat 3		**H335** – Can irritate the airways	
			H336 – Can cause drowsiness or dizziness	
	Breathable dust without specific effect		**Fibre greater than 5µm,** glass/rock fibre, stone/brick/concrete/composite/graphite dust... combustion fumes...	
	Acute toxicity cat. 4		**H312** – Noxious in contact with the skin	skin
	Skin corrosion Skin irritation cat. 2		**H315** – Causes skin irritation **EUH066** – Repeated exposure can cause skin dryness or cracking	
	Serious eye injuries and eye irritation cat. 2		**H319** – Causes serious eye irritation	
1	Unlabeled substances and mixtures	without	No OEL. If OEL, see § 3.2	mixed

Table 1: Matrix - General severity G.

Examples: the severity of the SP fuel is 15, as the product is classified H 350, for gasoil or fuel oil it's 7, as these are classified H 351.

3.2 Severity rating G (particular case)

Unclassified products (without hazard phrase H3xx) with an OEL can be classified as follows:

G	OEL	Note the units!
40	OEL < 0.1mg/m^3	**mg/m^3** = (molar mass/V) x ppm **ppm** = (V/molar mass) x mg/m^3 where: V: 24.05 at 20°C and atmospheric pressure
15	0.1 ≤ OEL < 1mg/m^3	
7	1 ≤ OEL < 10mg/m^3	
3	10 ≤ OEL < 100mg/m^3	
1	-	

Table 2: Matrix - Particular severity G.

Examples:	OEL 8 hours (Europe)	OEL 8 hours (ACGIH)
Welding or thermal stripping fumes:	5mg/m^3 (FR) breathable	
- Aluminium/iron	5mg/m^3 (FR)	
- Copper	0.2mg/m^3 (FR)	0.2mg/m^3
- Magnesium	10mg/m^3 (FR)	
- Manganese/zinc	1mg/m^3 (FR)	
- Nickel	1mg/m^3 (FR)	0.1$^{(breathable)}$; 0.02$^{(alveolar)}$ mg/m^3
- Chromium VI	0.001mg/m^3 (FR)	

3.3 Rating of the exposure frequency and duration F

See the generic table 2 in the GM-GR-HSE-300 guide.

3.4 Potential exposure by inhalation probability rating P

The calculation of the inhalation score **S $_{inhalation}$** enables the potential exposure probability level P to be estimated (according to ND 2233-200-05). Three parameters must be taken into account:

1. The volatility of the product;
2. Type of process: more or less dispersive in the workplace atmosphere;
3. Collective protection provided by fixed ventilation.

Inhalation score formula: **S $_{inhalation}$**

S$_{inhalation}$ = Product volatility score x Process score x Collective protection score

3.4.1 Volatility score

This depends on the physical state of the substance.

For products in the liquid state, the score is determined by the vapor pressure (or boiling point/use temperature diagram).

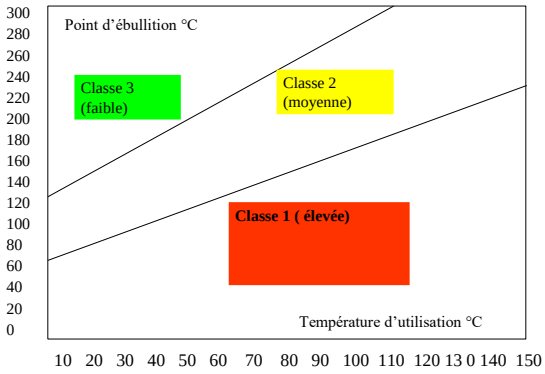
For solids, the score is based on the grain size.

Volatility score		
1 (low)	**10 (average)**	**100 (high)**
Vapor pressure at 20°C		
< 10hPa - e.g. gasoil/fuel oil	10-50hPa - e.g. jet A1 in summer	50hPa - e.g. high octane gasoline, LPG
Solid grain size		
The material is in the form of chips, granules, flakes of > 1mm, which produces little dust during handling. E.g. sand	The material is in the form of grains of 100µm - 1mm, which produces dust that is quickly deposited during handling. E.g. sugar	The material is in the form of powder of < 100µm, which produces dust that remains suspended in the air during handling. E.g. flour

Table 3: Volatility score.

If the volatility is not known, the boiling point can be used (see the diagram below):

Boiling point/use temperature depending on the diagram:



3.4.2 Process scores

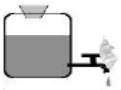
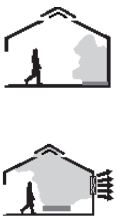
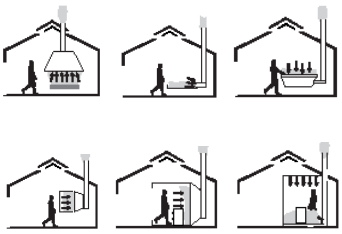
Process score				
1	**0.5**	**0.05**	**0.005.**	**0.001**
Type of process				
Dispersive	Open	Closed but regularly opened	Transient emission	Permanently closed
				
Bag/bucket emptied manually, cleaning with a rag etc.	**Dome loading**, decanting basin, draining of a tank into an open draining container, fuel volumeter without VRU, etc.	Sampling, tanks without floating roof, etc.	Micro-leaks in canalizations at valve level, non-watertight pumps, loading at source with VRU1, etc.	Reactor, closed column, etc.

Table 4: Process score.

3.4.3 Collective protection scores

Collective protection score (production)			
1	**0.7**	**0.1**	**0.001**
Type of collective protection equipment in production			
Absence of mechanical ventilation	**Exterior work,** presence of general mechanical ventilation, far from the emission source.	Extraction hood, suction outlet, extractor table, built-in extraction, small ventilated booth, cross-flow booth, down-flow booth, fuel volumeter with VRU 2...	Enclosed collection: fume chamber
			

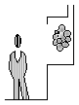
Collective protection score (laboratory)					
1	**0.7**	**0.5**	**0.1**	**0.01**	**0.001**
Type of collective protection equipment in the laboratory					
					
Predictable concentration					
> 10mg/m³	1-10mg/m³	0.1-1mg/m³	0.01-0.1mg/m³	0.001-0.01mg/m³	< 0.001mg/m³

Table 5: Collective protection score.

3.4.4 Potential exposure probability P by inhalation

Based on the score **S inhalation,** the potential exposure probability P is deduced using table 6.

P	Potential exposure probability by inhalation
10	**$S_{inhalation} > 50$**
6	**$10 < S_{inhalation} \leq 50$**
3	**$1 < S_{inhalation} \leq 10$**
1	**$0.5 < S_{inhalation} \leq 1$**
0.5	**$0.1 < S_{inhalation} \leq 0.5$**
0.2	**$0.001 < S_{inhalation} \leq 0.1$**
0.1	**$S_{inhalation} \leq 0.001$**

Table 6: Matrix - Potential exposure by inhalation probability P.

3.5 Residual potential exposure probability rating P' by inhalation

Reduction of P	Means/measures of prevention/protection against the chemical risk by inhalation
-1	**At least two procedural or organizational measures from:** - See Mp-type matrix, - cartridge-type respirator, - move away vents in the direction of the dominant wind, - rotation of staff at service station, - presence of detection and alert systems etc.
-2	- Temporary collective protection, - pulsed air, positive pressure breathing apparatus, chemical-resistant gloves, - self-service at the service station, - VRU1.
-3	- Operating methods in place and site verification (application and effectiveness) AND high-level PPE (self-contained breathing apparatus, totally encapsulated suit, specific chemical resistance gloves to ensure prevention of diffusion through the glove). - Permanent CPE (VRU1 and VRU2, magnetic gauge, stop measuring the volumeter rate with a level gauge, water-tightness of the electrical conduits between the volumeter and the cash register, etc.).

Table 7: Matrix - Reduction in potential exposure probability by inhalation.

By way of example, the potential exposure probabilities in a service station are provided in appendix 1.

Occupational exposure measuring campaigns can also be used to assess the residual probability of exposure as follows:

Reduction of P	Means/measures of prevention/protection against the chemical risk by inhalation
-1	- 10% OEL < exposure measurements < 50% OEL
-2	- Exposure measurements < 10% OEL
-3	- Exposure measurements ~ RTV

The use of the reduction is the decision of the hygiene expert (relevance of the method, strategy, representativity etc.).

3.6 Potential exposure probability rating P by contact with the skin

Several criteria are taken into account for chemical agents classified H3xx$_{skin}$ and/or classified "skin" in the national, European or ACGIH occupational exposure limit tables:

- the daily handled quantity;
- the surface area exposed; and
- the exposure scenario of the tasks entailing skin contact with the product.

P	Potential exposure probability through the skin
10	Immersion of part of the body in the product. E.g. manually placing or removing pieces in chemical product baths, rinsing operations, degreasing.
6	Possible contact with part of the body (two hands, legs, body/face) during the task. E.g. sampling, drainage, product transfer.
3	Possible contact with the hand during the task. E.g. cleaning with soaked cloth, handling of tools contaminated by a product.
1	Possible splashes/occasional skin contact (marks, droplets, etc.). E.g. projection of drops during pouring, projection of oil sprays by rotating machines.
0.5	
0.2	No possibility of contact between skin and product.

Table 8: Matrix - Potential exposure through skin contact probability P.

3.7 Residual potential exposure probability rating P' through skin contact

Reduction of P	Means/measures of prevention/protection against the chemical risk through skin contact
-1	**<u>At least two procedural or organizational measures from:</u>** - see Mp-type matrix, - adapted gloves, work trousers, long-sleeved work jacket, product-resistant security shoes, face screen, - wash hands, do not eat on site, etc.
-2	- device to check quality, cleanliness and/or effectiveness of PPE (provision of spare PPE, periodic inspection of masks and cartridges, etc.).
-3	- Airtight coveralls and procedure and training for putting on and taking off contaminated clothing etc.

Table 9: Matrix - Reduction in potential exposure through skin contact probability.

4 QUALITATIVE ASSESSMENT OF THE CHEMICAL RISKS TO SAFETY

Reminder: This method is limited to an assessment of the workplace risks where hazardous products are present.

4.1 Severity rating of flammable/explosive/oxidizing products

The assessment of a chemical product with regard to safety takes account of the phrases H2xx.

G	Safety hazard category	Pictogram	Phrases H 2xx
40	Explosives cat. 1.1 to 1.5		**H200** Unstable explosive, **H201** Explosive: mass explosion hazard, **H202** Explosive: serious projection hazard, **H203** Explosive: fire, blast injury or projection hazard, **H204** Fire or projection hazard, **H205** Mass explosion hazard in the event of fire
	Flammable gas cat. 1 & 2 (e.g. LPG)		**H220** Extremely flammable liquids, **H221** Flammable gas
	Flammable aerosol cat. 1		**H222** Extremely flammable aerosol
	Flammable liquids cat. 1 (ex. : High octane gasoline SP)		**H224** Extremely flammable liquids and vapor
	Flammable gases		**H280** Contains a pressurized gas; can explode under the influence of heat
	Self-reactive substances and mixtures cat. A/B		**H240** Can explode under the influence of heat, **H241** Can ignite under the influence of heat
	Organic peroxides cat. A/B		
	Combustible powder substances suspended in the air (dust) cat. 1		Diameter < 50µm
15	Oxidizing gases cat. 1		**H270** Can cause or aggravate a fire; oxidizer
	Oxidizing liquids cat. 1, 2 & 3		**H271** Can cause a fire or an explosion; powerful oxidizer **H272** Can cause a fire; oxidizer
	Flammable liquids cat. 2		**H225** Highly flammable liquid and vapor
	Flammable aerosol cat. 2		**H223** Flammable aerosol
	Flammable solids cat. 1 & 2		**H228** Flammable solid cat.

G	Safety hazard category	Pictogram	Phrases H 2xx
	Oxidizing solids cat. 1, 2 & 3		
	Self-reactive substances and mixtures cat. C, D, E & F		**H242** Can ignite under the influence of heat
	Pyrophoric liquids and solids		**H250** Ignites spontaneously in contact with the air
	Self-heating substances and mixtures		**H251** Self-heating matter; can ignite, **H252** Self-heating matter in large quantities; can ignite,
	Substances/mixtures that can release, in contact with water, flammable gases cat. 1, 2 & 3		**H260** Releases, in contact with water, flammable gases that can ignite spontaneously, **H261** Releases, in contact with water, flammable gases
	Organic peroxides cat. C, D, E & F		
	Combustible dust cat. 2		Diameter: 50-300µm E.g. wood dust, polyethylene/polystyrene, methylcellulose. paraformaldehyde, epoxide resin, pigment, etc.
7	-		-
3	Flammable liquids cat. 3 (E.g. gasoil, heating oil)		**H226** Flammable liquids and vapor
	Combustible dust cat. 3		Diameter: 300-500µm E.g. wood dust, sulfur, carbon/carbon black, PVC, starch, etc.
1	Liquids not subject to labeling		No phrase H2xx.
	Dust		Diameter > 0.5mm

Table 10: Matrix - Severity (safety).

4.2 Rating of the exposure frequency and duration F

See the generic table 2 in the GM-GR-HSE-300 guide.

4.3 Potential exposure probability rating P

P depends on:

- The daily quantity available at the workplace or the concentration of dust in the space in question;
- The storage (proximity of incompatible products);
- The physical state of the product at the working temperature (flashpoint of liquids, grain size of suspended dust, gas);

- The process (dispersive or non-dispersive: open, closed openable, closed for liquids, confined or non-confined for dust);
- The sources of inflammation close to the workplace;
- The conditions of use (e.g. friction of polymers against the loading chute produces static electricity);
- The presence of an explosive atmosphere: sufficient mixture of air and combustible gas/vapor/fog/dust;
- The existing, maintained ventilation or capture systems, the existing fixed storage conditions.

See the generic table 3 in the GM-GR-HSE-300 guide.

4.4 Residual potential exposure probability rating P'

Reduction of P	Means/measures of prevention/protection against fire or explosion
-1	**<u>At least two procedural or organizational measures from:</u>** - See Mp-type matrix, - grounding, limitation of quantities at the workplace, inertness, humidification..., - ATEX training, - use of PPE that provides good cover, is antistatic and fire resistant..., - extraction at the workplaces to limit dust, - retention, storage procedure, - detection and alarm system, - extinguishers, fire blanket, fire-fighting and evacuation drill...
-2	- Remote, demarcated and signed workplace, - extraction of vapor/dust at source, - use of ATEX material adapted to the area, - vents at height...
-3	- Products stored in a specific mechanically ventilated room, - firewall, - removal of flammable products away from energy sources...

Table 11: Matrix - Reduction in potential exposure probability (safety)

5 TERMS AND DEFINITIONS

HCA

Hazardous chemical agent

Chemical agent

Any chemical element or compound, whether pure or in a mixture, that is present in the natural state or produced, used or released, deliberately or otherwise, due to a professional activity.

A chemical agent is dangerous when it could present a risk to the health and safety of people due to its physical-chemical, chemical or toxicological properties and the circumstances of its presence in the workplace or its use, regardless of whether it meets the CLP or GHS classification criteria.

CLP (*Classification, Labelling and Packaging*)/GHS (*Global Harmonized System)*

The CLP regulation is the European Union enactment of the United Nations GHS (Global Harmonized System or Classification and Labelling of Chemicals) regulation.

It sets the labeling rules (risk phrases and pictograms).

CMR

Carcinogenic, mutagenic or toxic for reproduction.

Absence of occupational exposure

Exposure does not exceed the usual level in the general population of the country in which the operating entity is located, deemed an absence of occupational exposure. Ambient measurements are required for evidential purposes.

Absence of exposure to a chemical agent

- No chemical agent is present in the workplace.
- There is a permanent impassible physical barrier between the individual and the substance. The product goes round a completely closed circuit without fixed or mobile air-/watertight component.

Exposure to a chemical agent at a very low or unmeasurable health risk level

- All the metrological results are between the usual value for the general population (RTV) and 10x this usual value and absence of penetration of the skin or digestive system.
- All the metrological results are lower than the detection threshold for the analytical method validated for the occupational environment and absence of penetration of the skin or digestive system.

Exposure to a chemical agent at a very low or unmeasurable health risk level

- At least six metrological results representative of the exposure available for the same homogeneous exposure group, all less than 10% of the regulatory or indicative occupational exposure limit value and higher than 10x the RTV, the risk can be deemed low in the absence of penetration of the skin or digestive system (Source: EN 689).
- The risk is deemed low for measurements lower than or equal to 70 (multiplicative method in the GM-GR-HSE-300 guide) or for measurements lower than 6 (additive method in the GM-GM-GR-HSE-301 guide).
- The notion of low risk can be addressed in different ways by the regulations.

Note: It is hard to prove a low risk for respiratory sensitizers with the hazard label H 334 and for some endocrine disrupters that are suspected of causing effects below the threshold dose, which do not have a specific hazard phrase that makes them easy to locate.

Endocrine disrupters, chemical substances of natural or artificial origin foreign to the organism that can interfere with the functioning of the endocrine system and induce harmful effects for the organism of an individual or the individual's descendants (OMS, 2002) by mimicking the effects of a hormone at the wrong time. They are classified with the phrases H360/H361 F or D or H 340/341: can (or are likely to) damage fertility or the unborn child; can (or are likely to) produce genetic abnormalities.

Exposure to a chemical agent at a non-low or unmeasurable health risk level

The results are higher than 10% of the OEL and lower than the OEL.

The biological impregnation results are higher than the biological exposure index.

Severity

SDS

Safety data sheets.

Homogeneous Exposure Group (HEG)

Group of people with a similar exposure level based on the tasks they perform, the frequency of these tasks and the conditions in which these tasks are performed.

Mp type

Means/measures of prevention/protection type These are defined in paragraph 3.9 "Calculation of residual risk R'" of the GM-GR-HSE-300 guide.

STOT

Specific target organ toxicity.

Critical task

Task that can lead to significant injury to people or damage to products, property, installations or the environment if it is not performed or it is performed incorrectly.

VRU

Vapor recovery unit. VRU1 at the storage basin, VRU2 at the fuel pump.

ELR (excess lifetime risk) associated with the RTV (reference toxicology value) without threshold:

This is the additional probability, compared with an unexposed individual, that an individual develops a harmful effect after exposure to a unit of dose of the substance over a lifetime. The effect manifests itself regardless of the dose, the probability increases with the dose, but the severity does not depend on the dose. It is expressed in ELR (excess lifetime risk) related to the exposure by ingestion of food in µg/kg/d, by ingestion of liquid in µg/l and by inhalation in µg/m^3.

OEL (occupational exposure limit value)

Maximum average limit concentration of a chemical agent in the air that a person can breathe in over a given period without the risk of impairment to health.

These values are expressed as a volume (parts per million, ppm), as a weight (mg/m^3) or as fibres per unit of volume (f/m^3).

RTV (reference toxicology value)

Toxicological index used to establish the relationship between a dose and an effect (toxic at effect threshold) or between a dose and an effect probability (toxic without effect threshold). They are expressed in the form of concentrations in the air of a chemical substance or an unmanageable dose over a lifetime. Below these concentrations, the theoretical risk of impairment of health of residents is deemed acceptable (one case in 10^5 to one case in 10^6).

Example for benzene: 0.006mg/m^3.

6 REFERENCE DOCUMENTS

Reference	Title - Group documents
CR-GR-HSE-405	Industrial hygiene
GM-GR-HSE-300	Methodological guide for the assessment of the occupational risks in the workplace (multiplicative method)
GM-GR-HSE-400	Measuring exposure to chemical agents
GM-GR-HSE-403	Preventing risks associated with asbestos and CMR refractory ceramic fiber

7 BIBLIOGRAPHY

Europe

Directive 67/548/EC and 1999/45/EC on the classification, packaging and labelling of dangerous substances.

Regulation (EC) No 1272/2008 of 16 December 2008 on classification, labelling and packaging of substances and mixtures.

United Nations

GHS - Global Harmonized System of Classification and Labelling of Chemicals - Revised seventh edition.

France

Classification en zone explosive poussiéreuses - Rapport final MATE - DRA 00-20626/01 – D. CARSON – INERIS 2001.

Guide ED 891: Silos matières plastiques pulvérulentes – INRS.

Guide ED 2233-200-5: Méthodologie d'évaluation simplifiée du risque chimique : un outil d'aide à la décision – INRS. Nocivité des poussières - page 5.

Guide ND 2070-170-98: Caractéristiques d'explosivité de poussières industrielles – INRS.

Dust fire

STUVEX: http://www.stuvex.com/frontend/files/userfiles/files/Witboek_FR.pdf

APPENDIX 1

Example of potential exposure probability at a service station.

P	Potential exposure probability by inhalation
10	
6	E.g. Dome fuel loading, filling a fuel tank at a service station without VRU 2, working in the fuel vent impact zone, etc.
3	E.g. Transfer or delivery of fuel at a service station without VRU1 or at a customer, etc.
1	E.g. Filling a customer 1% benzene fuel tank at a service station without VRU 2, etc.
0.5	E.g. Filling a customer fuel tank at a service station with VRU 1 and 2, filling a gasoil dome basin, etc. working on a logistics depot in Europe, etc.
0.2	E.g. Shopkeeper/versatile person at the service station equipped with self-service VRU 1 and 2, etc.
0.1	E.g. Work in an office, etc.