

Health and safety for the staff assigned to measurement and sampling

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The “Centro Olfattometrico Regionale” (below COR) of the “Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto” (ARPAV) always does a risk analysis before performing a new investigation.

The COR executes a preliminary inspection on plant and comes required to the responsible if it has done a surveying on the occupational risks deriving from the exposure to chemical and biological agents relative to the own workers.

Data emission are also requested as obtained by self-performed controls, at least by the last twelve months.

The informations received by the company are compared with literature data in order to obtain the highest values for each substance.

The maximum values are compared with the existing limits of toxicity respectively derived from:

Legislative Decree n. 626 of 19th sep, 1994 - Article 72-ter (D.Lgs. 626/94)

ACGIH “Threshold limit values”;

NIOSH “Pocket Guide to Chemical Hazards”.

If the maximum concentration value exceeds the limits of acute toxicity prescribed (D.Lgs. 626/94 – short term, IDLH – NIOSH), must be assessed the minimum number of dilutions to be made, so that the sample presented to the panel not constitutes a health risk.

As regards the health of the technician who executes the sampling, must evaluate, case by case, the use of specific personal protective equipment.

In any case, the panelists are informed about the risk assessment before the session of measurement.

1. Preliminary inspection

Like previewed from EN 13725 - Appendix J, the COR of ARPAV does always a preliminary inspection in order to estimate, between the other, the toxicity and the possible risk for the panelists about all the samples that will be taken. Indeed, the olfactometrical analysis that will follow will affect the air circulating inside the plant (1.1) and that is released into the atmosphere (1.2).

1.1 For the first argument, during the preliminary inspection, the responsible is asked if it has done a surveying on the occupational risks deriving from the exposure to chemical and biological agents relative to the own workers.

1.2 For the second argument, is requested the values of emissions of the plant, as obtained by self-performed controls, at least by the last twelve months.

1.3 For the wider issues, related to other possible sources of risk (fall, electric shock, etc.), the Italian law requires a statement on existing risks, under Article. 7, D.Lgs. 626/94.

All requests are then formalized in a report of inspection.

2. Data Processing

The informations received are reported in a spreadsheet, continually updated, which contains the concentration values obtained from previous investigations and other ones derived from the literature. The data are organized by type of plant, for example:

- Poultry farms,
- Landfill,
- Foundries,
- Plastics processing plants,
- Fertilizer production plants,
- Wastewater treatment plants,
- Waste treatment plants

For each compound, it is necessary to identify the most value between what declared by the company and what is already present in the database.

The maximum values of each substance are compared with the existing limits of toxicity respectively derived from:

- Legislative Decree n. 626 of 19th sep, 1994 - Article 72-ter (D.Lgs. 626/94)
- ACGIH - AIDII “Valori limite di soglia”.
- NIOSH “International Chemical Safety Cards”.

All the references define the occupational limits reported at the time of exposure. You must pay particular attention to:

- 2.1 Short term limit value: threshold value above which there must not be exposure and refers to a period of 15 minutes. It's like the TLV-STEL limit for ACGIH.
- 2.2 IDLH (Immediately Dangerous to Life or Health): refers to a concentration limit value which can occur instantly damage to human health. The current NIOSH definition (1987) is a situation “that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.” It is also stated that the purpose of establishing an IDLH is to “ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment.”.
- 2.3 TWA (Time Weighted Average): is the time-weighted average concentration for a working day (8 hours a day and 40 hours a week), on which nearly all workers may be exposed day after day without adverse effects





Part of this informations are derived from publications: it's the case of “Valori limite di soglia” that, every year, the “Associazione Italiana Degli Igienisti Industriali” (AIDII) translates in Italian the corresponding publication of the “American Conference of Governmental Industrial Hygienists” (ACGIH).

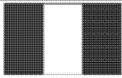
The use of the italian version of the NIOSH “International Chemical Safety Cards” is more practical, as obtainable through the Internet connection “<http://www.cdc.gov/niosh/ipcs/italian.html>”, that produces the following information:

- [1] the "CAS Number";
 [2] some of the "Occupational Exposure Limits";
 [3] the "Short Term Exposure Effects";
 [4] other informations, about the symptoms, contained on the bottom of the card in the "Notes".

Schede Internazionali di Sicurezza Chimica

AMMONIACA (ANIDRA) ICSC: 0414










NH₃
 Massa molecolare: 17.03
 (bombola)
 (cylinder)

ICSC # 0414
 CAS # 7664-41-7
 RTECS # BO0875000
 NU # 1005
 CE # 007-001-00-5



[1]

AMMONIACA (ANIDRA) ICSC: 0414

D A T I I M P O R T A N T I	<p>STATO FISICO; ASPETTO: GAS COMPRESSO LIQUEFATTO INCOLORE, CON ODORE PUNGENTE.</p> <p>PERICOLI FISICI: Il gas è più leggero dell'aria.</p> <p>PERICOLI CHIMICI: Composti sensibili agli urti sono formati con ossidi di mercurio, argento e oro. La sostanza è una base forte, reagisce violentemente con acidi ed è corrosiva. Reagisce violentemente con forti ossidanti e alogeni. Attacca rame, alluminio zinco e le loro leghe. Si scioglie in acqua producendo calore.</p> <p>LIMITI DI ESPOSIZIONE OCCUPAZIONALE: TLV: 25 ppm come TWA 35 ppm come STEL (ACGIH 2004). MAK: 20 ppm 14 mg/m³ (Categoria limitazione di picco: I(2); Gruppo di rischio per la gravidanza: C; (DFG 2004).</p>	<p>VIE DI ESPOSIZIONE: La sostanza può essere assorbita nell'organismo per inalazione.</p> <p>RISCHI PER INALAZIONE: Causa una perdita, può essere raggiunta molto rapidamente una concentrazione dannosa di questo gas in aria.</p> <p>EFFETTI DELL'ESPOSIZIONE A BREVE TERMINE: La sostanza è corrosiva per gli occhi la cute e il tratto respiratorio. Inalazione di elevate concentrazioni può causare edema polmonare (vedi Note). Una rapida evaporazione del liquido può causare congelamento.</p> <p>EFFETTI DELL'ESPOSIZIONE RIPETUTA O A LUNGO TERMINE:</p>
[2]	[3]	
PROPRIETA FISICHE	Punto di ebollizione: -33°C Punto di fusione: -78°C Densità relativa (acqua=1): 0.7 a -33°C Solubilità in acqua, g/100ml a 20°C: 54 Tensione di vapore, kPa a 26°C: 1013 Temperatura critica (NON sulla scheda): 132.4°C	Densità di vapore relativa (aria=1): 0.59 Temperatura di auto-accensione: 651°C Limiti di esplosività, vol% in aria: 15-28 Energia minima di accensione (NON nella scheda): 680mJ
DATI AMBIENTALI	La sostanza è molto tossica per gli organismi acquatici.	
NOTE		
I sintomi dell'edema polmonare spesso non si manifestano prima di alcune ore e sono aggravati dallo sforzo fisico. Sono pertanto essenziali il riposo e l'osservazione medica. Si deve prevedere l'immediata somministrazione di una appropriata terapia inalatoria da parte di un medico o personale da lui/lei autorizzato. Capovolgere la bombola che perde nella parte superiore per prevenire fuoriuscita di gas liquefatto.		
[4]	Transport Emergency Card: TEC (R) - 20S1005 or 20G2TC. Codice NFPA: H3; F1; R6;	

Using the link “<http://www.cdc.gov/niosh/npg/>” you log on to “NIOSH Pocket Guide to Chemical Hazards”, from which you extract more information:
 [5] other values for the Exposure Limits, in particular IDLH;
 [6] the conversion factor from ppm to mg/m³.

 	
CDC Home CDC Search CDC Health Topics A-Z Search NIOSH NIOSH Home NIOSH Topics Site Index Databases and Information Resources NIOSH Products Contact Us September 2005	
NIOSH Pocket Guide to Chemical Hazards	
NPG Home Introduction Synonyms & Trade Names Chemical Names CAS Numbers RTECS Numbers Appendices Search	
Ammonia	CAS 7664-41-7
NH₃	RTECS BC0875000
Synonyms & Trade Names Anhydrous ammonia, Aqua ammonia, Aqueous ammonia [Note: Often used in an aqueous solution.]	DOT ID & Guide 1005 125 (anhydrous) 2672 154 (10-35% solution) 2073 125 (>35-50% solution) 1005 125 (>50% solution)
Exposure Limits [5]	NIOSH REL: TWA 25 ppm (18 mg/m ³) ST 35 ppm (27 mg/m ³) OSHA PEL†: TWA 50 ppm (35 mg/m ³)
IDLH 300 ppm See: 7664417	Conversion 1 ppm = 0.70 mg/m ³ [6]
Physical Description Colorless gas with a pungent, suffocating odor. [Note: Shipped as a liquefied compressed gas. Easily liquefied under pressure.]	
MW: 17.0	BP: -28°F
VP: 8.5 atm	IP: 10.18 eV
FLP: NA (Gas)	UEL: 28%
	FRZ: -108°F
	RGasD: 0.60
	LEL: 15%
	Sol: 34%

This search is performed for each of the identified compounds.

3. Risk assessment

You update a Table or build a new one, which is part of the document titled “Assessment of risks from exposure to toxic compounds in olfactometry”. This document is organized into chapters, one for each of the types of plant mentioned above.

The exceedances of Immediately Dangerous to Life or Health concentrations (IDLH - NIOSH) are highlighted. For these, there is more attention.

The exceedances of the reported exposure limits for the entire working life are also highlighted (TWA – NIOSH and TWA – ACGIH).

For all compounds identified are derived the "effects of short-term" on human health, from safety data sheets NIOSH.

2.4 EFFETTI DEGLI INQUINANTI SULLA SALUTE UMANA

Vengono di seguito descritti i sintomi e i rischi connessi all'inalazione dei composti inquinanti evidenziati in Tabella 2.1 e in Tabella 2.2 (International Programme on Chemical Safety, 1999).

- Ammoniaca: senso di bruciore, tosse, affaticamento respiratorio, gola secca; è corrosiva nei confronti di occhi, pelle, e apparato respiratorio. I sintomi possono manifestarsi in tempi differiti. L'inalazione di ammoniaca ad elevate concentrazioni può causare edema polmonare.
- Benzene: mal di testa, nausea, affaticamento respiratorio, convulsioni, perdita di conoscenza; è irritante per occhi, pelle, e apparato respiratorio. In concentrazioni elevate può causare perdita di conoscenza e morte. L'esposizione prolungata o ripetuta può avere effetti sul sistema immunitario, e provocare una diminuzione delle cellule sanguigne. È una sostanza cancerogena.

You proceed with the evaluation of risks, stressing the aspects listed below:

- 3.1 are been considered the maximum concentration values found in the literature; some of these values represent specific situations that may occur in extreme conditions;
- 3.2 the concentration exceeding TWA values do not represent a danger to the panelists, because the olfactometric analysis provides they smell the odorous sample for a few seconds;
- 3.3 you must bear in mind that the samples are never presented to the panelists as such, but diluted from a minimum of 2.5 to a maximum of approx. 10^6 times;
- 3.4 If the maximum concentration value exceeds the limits of acute toxicity prescribed (D.Lgs. 626/94 – short term, IDLH – NIOSH), must be assessed the minimum number of dilutions to be made, so that the sample presented to the panel not constitutes a health risk.

As regards the health of the technician who executes the sampling, must evaluate, case by case, the use of specific personal protective equipment.

In any case, the panelists are informed about the risk assessment before the session of measurement (EN 13725 - 8.6).

4. Conclusions

The proposed method has not certain the claims to be exhaustive. But, using a “dynamic approach” (the document is updated with each new investigation) and taking advantage of the availability of data from the web, is practical and accessible to anyone having the least knowledge that are required for the assessment of the toxicity of chemical compounds. In some cases, it has also been extended to the toxicity of biological pathogens.

5. References

Decreto Legislativo 19 settembre 1994, n. 626, Attuazione delle direttive 89/391/CEE, 89/654/CEE, 89/655/CEE, 89/656/CEE, 90/269/CEE, 90/270/CEE, 90/394/CEE, 90/679/CEE, 93/88/CEE, 95/63/CE, 97/42/CE, 98/24/CE, 99/38/CE, 99/92/CE, 2001/45/CE, 2003/10/CE e 2003/18/CE e 2004/40/CE riguardanti il miglioramento della sicurezza e della salute dei lavoratori durante il lavoro.

National Institute for Occupational Safety and Health (NIOSH), 2005, Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention (<http://www.cdc.gov/niosh/npg/>).

Associazione Italiana Degli Igienisti Industriali (AIDII), 2007, Valori Limite di Soglia.

National Institute for Occupational Safety and Health (NIOSH), 2008, International Chemical Safety Cards (<http://www.cdc.gov/niosh/ipcs/italian.html>).