

POISONING RISKS



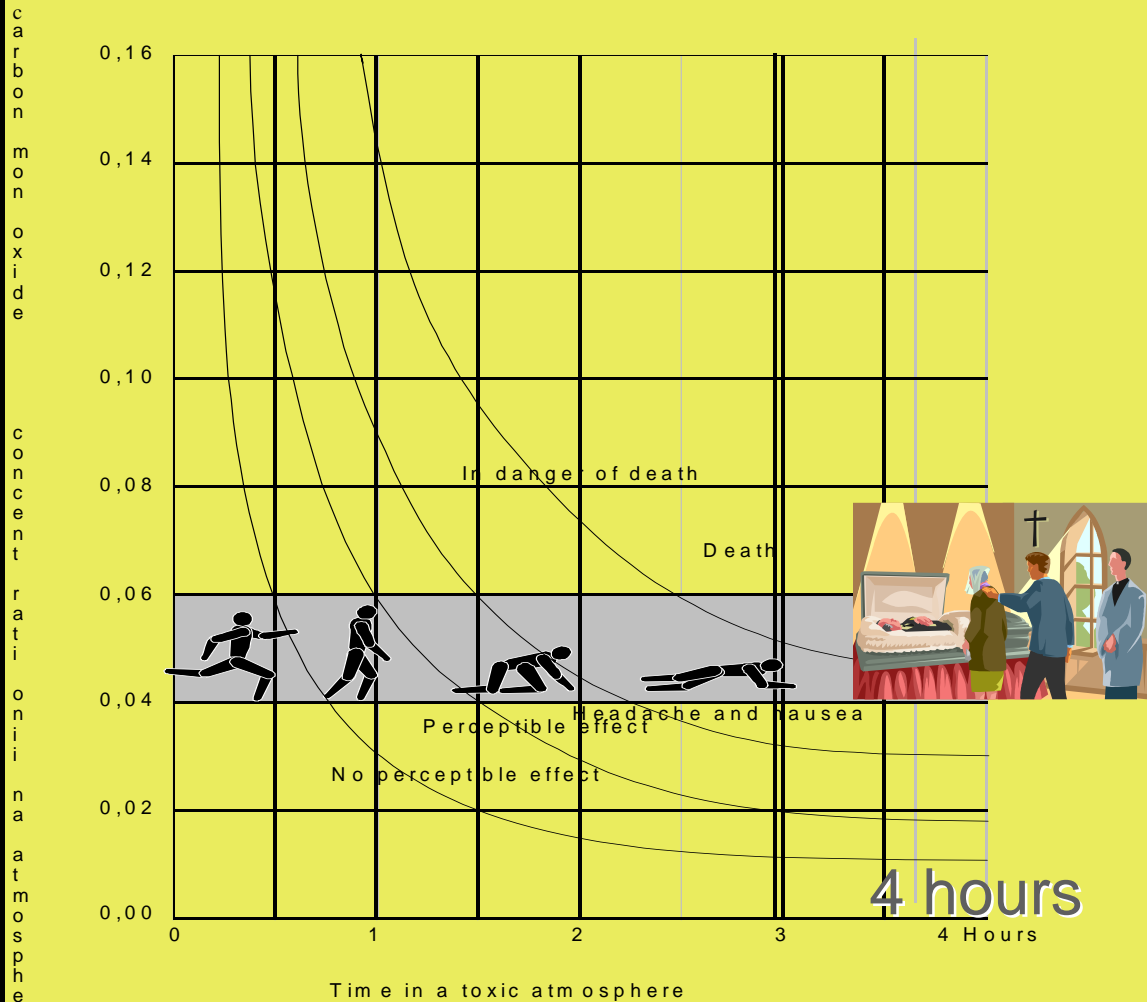
Where can we be poisoned ?

- In every place where these toxic products are: *used, manufactured, transformed, stored*
- Examples of toxic gas emission sources :
- Combustion (CO/NO/NO₂/SO₂)
- Incineration (H₂S/NH₃/HCL)
- Fermentation (H₂S/NH₃)



Example: toxicity caused by carbon monoxide in terms of time and concentration

% CO
in the air



Concept of **LIMIT VALUES**

- The Short Term Exposure Limit: **STEL**
- Time-weighted average: **TWA**
- *Gases and vapours limit values are in volume (ppm:part per million).*

STEL



- The **STEL** is admitted value for the medium in time, concentrations in which a worker is exposed for less than **15 minutes:**
 - *SUBSTANCES with* **IMMEDIATE EFFECTS.**

TWA

- **TWA** : the average concentration of contaminants over a specified time period (**8 hours : 5 days a week**):
 - *SUBSTANCES with main* **CUMULATIVE EFFECTS**

Effects of carbon monoxide (CO) exposure

ppm level*	effects	time
35	Max. permissible level	8 hours
200	Slight headache	3 hours
400-600	Headache, discomfort	1-2 hour
1000-2000	Staggering, heart palpitation	1.5 hour
2000 à 5000	Unconsciousness, death	0.5 – 1 hour

*values are approximate

CO has an affinity for human blood hemoglobin that is over 200 times greater than oxygene.

Effects of chlorine (CL2) exposure




ppm level*	effects	time
1	Max. permissible level	8 hours
3 - 6	Stinging eyes, nose, throat	minutes
15-30	Serious irritation	minutes
40-60	Respiratory damage	30 minutes
60 à 1000	Serious injury, death	minutes

*values are approximate

Toxic risks : generations

Gas	Use/Generation
O₂	Vehicles exhaust gas, beer cellars, chimneys, building yards, boiler for domestic use, food industry, cereals storage, greenhouses, incubators, mining industry, nuclear industry, oil platforms, draining waters industry
CO	Air quality, breathing analysis, chimneys, boiler for domestic use, fire survey, machine-shops, hothouses, mining industry, steelworks, tunnels, underground parkings
H₂S	Chemical industry, building yards, oil platforms, draining waters industry, tunnels
SO₂	Chemical industry, chimneys, boiler for domestic use, food industry, paper mills, PCB manufacturers, steelworks, swimming-pools, water treatment
NO	Vehicles exhaust gas, chimneys, boiler for domestic use, mining industry
NO₂	Chemical industry, chimneys, boiler for domestic use, cereals storage, mining industry
CL₂	Chemical industry, paper mills, swimming-pools, water treatment
H₂	Battery rooms, breathing analysis, chemical industry, nuclear industry, oil platforms, semiconductor industry
HCN	Chemical industry, fumigation, semiconductor industry
HCl	Chemical industry, chimneys, PCB manufacturers, semiconductor industry
NH₃	Chemical Industry, chicken breeding, chimneys, plants for fertilizers, food industry, refrigeration, semiconductor industry.

RISKS WITH OXYGEN



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Risks with OXYGEN

- The oxygen is essential for the life, it represents **20.9 %** of the air that we breathe.
- A **deficiency** of oxygen is as important as an oxygen **enrichment**, each variation will provoke important effects on human beings.

Effects of **OXYGEN** :

- **20.9 % --> Normal concentration**
- **19 %** ---> tiredness and yawn...
- **14 %** ---> pulse up, impaired co-ordination, perception and judgement...
- **10 %** ---> Nausea, mental failure, fainting, unconsciousness, ashen face, blueness of lips, and vomiting
- **8 %** ---> Coma in 40 seconds, convulsions, respiration ceases, death
- **3-5 %** ---> life expectancy; 3-5 minutes.

An oxygen deficiency in confined spaces can be explained by:

- A defect of the ventilation system or a lack of ventilation
- the presence of another gas in full quantity (accidental leak)
- an oxygen consumption during a chemical reaction such as combustion
- Inertion

Where are you exposed ?

Confined areas:

- Soldering and cleaning of tanks
- Reparation of furnaces
- Visit of inert stocking
- Penetration in silos
- Premises without ventilation

In the trenches, the low places:

- in research of leak
- in visit of control
- in the cellars and the sewers...

A moderate oxygen enrichment:

- can however cause accidents
- It provokes an **EUPHORIA** causing a modification of the sense of DANGER and vision !

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Effects of OXYGEN:

- **> 22 %** ---> euphoria, modification of the sense of danger and vision = maximum safe level (OSHA)
- **< 22 %** --> no respiratory troubles,
- **20.9 %** --> oxygen content in “AIR”

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PROCESSES using OXYGEN

- **For its energetic properties:**
- **During combustion**, to have more calories or a higher T° than air...
- In oxypropane, oxyacetylene **flames**, examples of applications:
 - welding, soldering, surface hardening, forming
 - stripping, flame spray coating
 - oxycutting
 - iron and steel industry, foundry, glassworks burners
 - blast enrichment in blast furnaces.

PROCESSES using OXYGEN



- **For its oxidant properties:**
- in the iron and steel industry, it 's used in pure oxygen converters, to refine cast iron and steel
- in non-ferrous metal metallurgy, it 's used to refine copper, roast sulfurous ores, assay carbon in metals
- in the paper industry, to bleach paper pulp.