Collective expert appraisal regarding the expert appraisal on recommending occupational exposure limits for chemical agents

Summary of discussion with conclusions for the

Assessment of health effects and methods for the measurement of exposure levels in workplace atmospheres for

Styrene [CAS Number: 100-42-5]

This document summarises the work of the Expert Committee.

Presentation of the issue

On 12 June 2007, the French Agency for Environmental and Occupational Health Safety (AFSSET) received a formal request from the French Directorate General of Labour to conduct an expert appraisal with the aim of determining occupational exposure limit values for styrene.
Through a government Circular[1], France set an indicative 8-h-OELV of 50 ppm or 215 mg/m^3 for styrene.
The Directorate General of Labour asked AFSSET to reassess this value and, if necessary, propose new exposure values in occupational environments based on health considerations.

Organisation of the expert appraisal

AFSSET commissioned the Expert Committee (CES) on expert appraisal for setting exposure limits for chemical agents in occupational environments (OEL Committee), to investigate this formal request. The Committee then mandated two rapporteurs from this CES to conduct the expert appraisal work.
The rapporteurs' work was regularly submitted to the Committee. The reports produced reflect the additional comments and information provided by the other Committee members.
This expert appraisal was therefore conducted by a group of experts with complementary skills. It was carried out in accordance with the French standard NF X 50-110 "Quality in Expertise" to ensure compliance with the following points: competence, independence, transparency, and traceability.

Description of the methodology

1- For the assessment of the effects on health:
The summary report on the health effects of styrene is based on bibliographical information based on the scientific literature published on styrene until 2009. The bibliographical research was conducted directly by the rapporteurs in the following databases: Medline, Toxline, HSDB, ToxNet (CCRIS, GENE-TOX, IRIS), and ScienceDirect. The rapporteurs reassessed the source

1 Circular of 19 July 1982, supplemented and modified by several circulars on concentration values for certain hazardous substances in workplace atmospheres: Styrene TWA 50 ppm or 215 mg/m^3.

articles or reports cited as references every time he considered it necessary or whenever the CES requested it.

2- For the evaluation of methods for measuring exposure levels in the workplace atmosphere
The summary report is based on a metrology data collection sheet that lists and classifies the existing measurement methods available up to October 2008. The sources searched are indicated in Part B, section 5, of the report. This research was conducted by an external organisation and was made available to the rapporteur appointed from among the experts of the committee.

The OEL Committee adopted the following reports:
- the health effects report, at its meeting held on 17 September 2009
- the summary report on methods for measuring exposure levels in the workplace, at the meeting held on 18 June 2009.

The OEL Committee adopted the summary and the conclusions of the collective expert appraisal on 4 December 2009.

Conclusions of the collective expert appraisal

The Committee recommends setting an occupational exposure limit value for 8 hours (8h-OEL) for styrene of 100 mg/m^3.

The purpose of this recommendation is to prevent any possible neurotoxic effects in the workplace. Most of the studies published in the scientific literature, as well as analyses conducted by renowned organisations such as the ACGIH (American Conference of Governmental Industrial Hygienists) and the European Union's SCHER (Scientific Committee on Health and Environmental Risks), are consistent with this proposal.

The CES also recommends fixing a short-term limit value: STEL of 200 mg/m^3.

This value is proposed in order to avoid peaks of exposure that may cause irritation of the respiratory system's mucous membranes. A study in humans [Stewart et al. (1968)] concluded that 50 ppm (or 213 mg/m^3) is the maximum styrene concentration which does not produce any irritation effects .

The Committee recommends assigning a "skin" notation, as quantitative information leads to the conclusion that dermal exposure can contribute substantially to the body burden.

The Committee also states that there are validated measurement methods suitable for evaluating occupational exposures. These methods allow measurement of the 8h-OEL of 100 mg/m^3, as well as the 15-minute STEL of 200 mg/m^3.

Therefore, the Committee recommends using active pumping methods based on trapping styrene vapours on activated carbon alone or impregnated with 4-tert-butylcatechol, followed by desorption in a solvent and analysis by GC/FID (gas chromatography/flame ionisation detection).

Since the Committee recommends including the "skin" notation for styrene, it wishes to draw the attention of AFSSET's Director General to the need to supplement this expert appraisal by the identification of reference values that can be used in biological monitoring. These values would supplement the current French regulations concerning assessment of exposure to chemical substances in the workplace.

Maisons-Alfort, 4 December 2009
On behalf of the Expert Committee

François Paquet, Committee Chairman