Determination of exposure to wood dust

This paper is an update on the methods of Levy to determine occupational exposure to wood dust, following the new binding limit value fixed by the french regulations in December 2003.

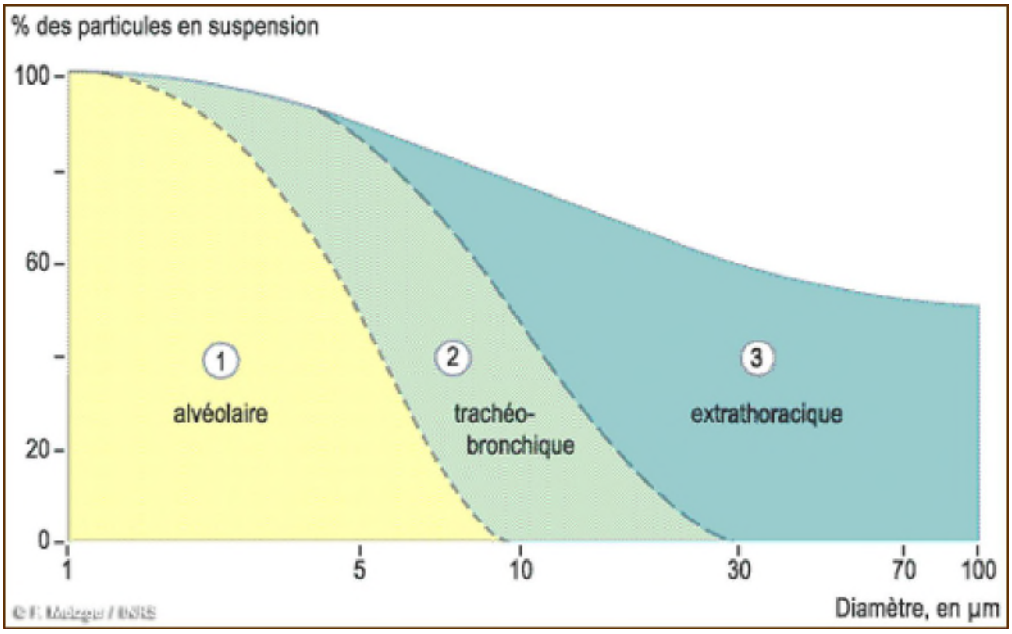
It presents the most used techniques (including other European countries) and makes some recommendations for the selection and use of these techniques.

Introduction Techniques used What (s) method (s) are recommended title (s)? Methods used in some European countries and factor (s) conversion Bibliography on the determination of wood dust and sampler

Following the publication of a decree No. 2003-1254 of 23 December 2003 setting among other values a

binding limit for wood dust (1 mg / m3 from 30 June 2005), we thought it useful to review the methods for the determination of occupational exposure to wood dust.

First, recall that for most it is the inhalable aerosol fraction is conventionally considered as representative of the exposure and it is also it is this fraction which is commonly referred when measuring most aerosols, with the exception of some substances for which it is the "thoracic" fraction or "alveolar" (as in the case of crystalline silica) is used.



The wood dust concentration is determined after sampling by gravimetric technique which, it should be noted, does not differentiate the various sizes of wood particles and does not differentiate between wood and other types particles that may be present. Although not precisely expressed in the decree, it therefore seems necessary to refer to the conventional inhalable fraction whose characteristics are

standard (NF ISO 7708) - in the past the concepts of "total dust" or fraction "maximum collected" have been used but are now gradually being abandoned-. Moreover, it is also has the inhalable fraction explicitly referred the EUROPEAN Directive 2004/37 / EC, which sets a limit value of 5 mg / m3 for wood dust. However, two problems arise:

The first is inherent in the same definition of the conventional inhalable fraction. In this convention the curve of the inhalable fraction suddenly stops for an aerodynamic diameter of 100 nm (which is not a natural phenomenon). The ISO 7708 standard does not to apply the inhalable convention to particles larger than 100 nm . It assumes that when the aerosol is rich in large particles (which may be the case of wood dust) we will have difficulties to strictly respect the 100 nm barrier of size, we must remember that the gravimetric determination, the proportion of particles in this size range will be dominant in the result.

The second problem is related to the efficacy of samplers outside of this critical area of 100 pm. Currently, if one refers to recent studies that have been published (see bibliography), we can say that in general, there is no system of "ideal" sampling and that it is free from flaws, for the inhalable fraction, and wood dust in particular. Each country has own designed sampler, and currently none have a sufficiently robust performance that is fully satisfactory or for which we have adequate validation data.

Techniques used

Among the techniques used include:

The closed face cassette: used in many countries. It is also so far the method used by the inter-regional chemistry laboratories CRAM (Regional Banks Health Insurance) for wood dust and to date the method cited in Metropol (based metrological data). However, work by INRS showed, especially on industrial aerosols of metal compounds, a portion of the particles could deposit on the walls of the cassette. This does not pose any problems when one can use a chemical attack in the cassette, as we use for the determination of metals, in contrast a gravimetric method as for wood dust, deposition on the walls can lead to an underestimation of the measured content since one only weighs the filter. There is therefore the fraction "collected" which is the partly made up of aerosols collected on the filter, and the fraction "sensed" that takes into account all that has been entered the cassette and is found on the the filter + walls. It is the “collected” fraction which approximates the inhalable fraction, which is actually the fraction we consider when sampling for most substances in the form of aerosols, the deposits deposited on the walls are analyzed (cf. section 1.2 of standard NF X 43-275 relating to the analysis of metals by atomic spectroscopy).

Is currently a lack of published showing the relative proportion of these deposits on the walls in the case of wood dust and yet we know that the large particles can deposit there, so with a non-negligible contribution in mass data. The work by the IRSST (unpublished) showed ratios of 2 to 3 between the results collected fraction (with a similar Accu-Cap system) and collected fraction. These results are confirmed (although the report is slightly lower) by the results of a series of comparisons performed using Accu-Cap in the wood industry presented in a communication to the American Industrial Hygiene Conference in San Diego (California) in 2002 by Roy J. Rando.

The IOM cassette (United Kingdom): also widely used by the Nordic countries for wood dust, its effectiveness in laboratory testing has shown good compliance with the inhalable fraction with the cassette being considered as a "reference". However, because of the IOM large open-entry diameter, this sampler promotes penetration of large, particulate matter (very marked phenomenon for the measurement of wood dust) larger than 100 microns, which are not part of the inhalable fraction and thus overestimate the result. This sampler has proved impractical to use in the field.