OCCUPATIONAL EXPOSURE LIMITS FOR COTTON AND WOOL DUSTS IN THE UK

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Abstract

The incidence of ill-health in textile factories can be reduced by controlling dust levels to set limits. The paper describes how the level and status of the limit for cotton dust are being changed, in consultation with industry and epidemiologists to reflect a move from static to personal workplace sampling methods. The proposed new limit will be raised from 0.5 to 2.5 mg/m^3, although it is not intended to change the level of worker protection. Independently a new limit for wool process dust is being set following research into health effects from occupational exposure. The paper distinguishes the legal status of the 2 kinds of UK limit (OES and MEL) and mentions the new UK industry health and safety consultative body TEXIAC-Textiles Industry Advisory Committee.

Introduction

The cotton dust occupational standard in the UK is 0.5 mg/m^3. This compares with the American limit of 0.2 mg/m^3 , using a different test method. The gap between the limits is likely to widen still further when the UK standard rises to 2.5mg/m^3. What is happening?

In the UK occupational exposure limits are set by the Health and Safety Commission which oversees the work of the Health and Safety Executive (HSE). HSE is a national government body with about 4,000 staff. It has the job of protecting people at work and from work - in factories, mines, agriculture, nuclear installations, off-shore oil extraction, railways and many other workplaces.

TEXIAC and Co-operation with Industry

Much of the work of HSE's inspectors is guided by discussions with employers and trade unions. Since 1993 the forum for discussion in the textile industries has been a body called TEXIAC - Textiles Industry Advisory Committee - although inspectors have been talking to both sides of the industry for much longer than this. The first Joint Standing Committee (for Cotton) was established in the 1920's.

TEXIAC embraces all the textile manufacturing sectors including clothing and comprises 14 members nominated equally by employers and trade unions, plus an HSE chairman.

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Its main output is guidance on agreed health and safety standards but it acts as a voice for the industry to respond to proposals from HSE. Examples of such proposals are the new exposure limits for cotton and wool dusts.

Standard Setting

HSE's system for setting exposure limits for chemicals and substances operates through another tripartite body known as the Advisory Committee on Toxic Substances - ACTS which is an offshoot of the Health and Safety Commission.

ACTS has a Working Group on the assessment of toxic chemicals - WATCH. The employers and union representatives on ACTS generally have a wide range of other industrial responsibilities, but WATCH consists of technical experts nominated by employers and trade unions, and academics. The tripartite structure is considered important (Ogden 1995) even at this technical level, because, with incomplete information and various possible interpretations, a measure of judgement enters into interpretation of scientific data.

Regulatory Framework

The limits set by ACTS go through an external consultation exercise and are approved by the Health and Safety Commission. They fit into the regulatory framework for the control of chemicals in Great Britain - the Control of Substances Hazardous to Health Regulations 1988/1994 (COSHH). COSHH requires employers to assess the risk to health of employees and other peoplefrom a hazardous substance and then to prevent or adequately control it. COSHH also requires the maintenance of control measures - containment, exhaust ventilation, respiratory protection etc. Other requirements include the monitoring of exposure where this is necessary to control or protect health, health surveillance where appropriate, and information and training. HSE publishes detailed guidance on all of these matters.

Numerical exposure limits are needed for judging when control complies with the Regulations. There are two sorts of limit. An occupational exposure standard (OES) can be set for a substance for which it is possible to identify a no-injury level of exposure. A maximum exposure level (MEL) is set if a no-injury level cannot be identified, or if it is too low to be attained in practice.

COSHH applies these two limits differently. For an OES substance, control as far as inhalation is concerned is defined as adequate if the OES is not exceeded or, if it is exceeded, actions are planned to reduce exposure. For a MEL substance the MEL must not be exceeded, and unlike OES substances, inhalation exposure must be reduced further "as far as is reasonably practicable". Non-

inhalation routes of exposure must also be controlled whatever the substance and the type of limit.

Cotton MEL

The current British OES for cotton is unusual in that it is based on static sampling. This is because it goes back to epidemiology in the 1960s when personal sampling was not commonplace.

The apparatus comprises a 50 litre per minute sampling pump with integral weighed filter inside a wire mesh enclosure which is intended to catch the long fibres floating in the air - the so-called fly. What is measured is therefore dust less fly.

The disadvantages of static methods are well known. They can be useful indicators of the relative cleanliness of workplaces, but many studies have shown them to be poor estimators of personal exposure and therefore of risk. HSE Occupational Hygienists and researchers at the London School of Hygiene and Tropical Medicine examined several types of personal sampler, and after recommending one, suggested a level for the occupational standard based on use of that personal sampler.

The question of fly seemed to be the most difficult, but after lengthy evaluation of six types of sampler, with wire mesh filters, cowls and multi-orifice plates they came to the conclusion that fly should not be artificially screened out. On personal samplers, the total dust bears a constant relationship to total dust less fly.

The IOM sampler, designed by the Institute of Occupational Medicine in Edinburgh was the favoured instrument. This has a filter within a cassette and dust is trapped both on the filter and the walls of the cassette. No attempt is made to remove the filter, and the entire cassette is weighed to determine the dust concentration from the known volume of workroom air which has passed through it.

In the second phase of this work which was published in 1993 by Ogden et al it became apparent that there could be no conversion table to translate static results into personal ones. The authors categorise mills as "clean" or "dirty" on the basis of the static results, and these were correlated with the values from the personal samples. In about two-thirds of "clean" processes personal exposure of at least 80% of those employed was less than about 2-2.5 milligrams per cubic metre. Only about one tenth of the "dirty" processes met this standard.

Personal exposures tend to be higher than results from static samples in the same room by a factor of 3 to 5, sometimes more, sometimes less, depending on whether the operator is well separated from the process or working deeply in the process. Subsequent survey work in Manchester has shown that the ratio is highest usually in the early processes such as opening.

In the opening processes the worker is physically much closer to the cotton, handling the bale, and is exposed to a higher concentration. In later processes one worker may tend several machines, for example carding machines, and not approach the source of dust as closely. The effect of more numerous smallsources will be to create a homogeneous dust level in the room, leading to a coincidence of personal and background levels.

It is not possible to review here the considerable weight of data on the epidemiology of cotton dust disease but a MEL was proposed rather than an OES, because under the criteria explained above, notably an absence of a no-effect level, a MEL was considered the appropriate type of level for the standard. A consultative paper will be published in March 1996 summarising the arguments for a MEL and containing a Cost Benefit Analysis. It is likely that the new limit based on personal sampling will come into force on 1 January 1997 after approval by Parliament.

In conclusion it is not correct to state that the UK limit for cotton is being raised. The limit is being changed to reflect a move from a static method with limited size selection to an unselective personal sampling method. This contrasts with the ACGIH static method using a highly selective sampler (vertical elutriator).

Wool Dust

Concern has been expressed about the potential health effects of wool dust since the results of a small local HSE study were published in 1983.

Between 1983 and 1992 the Institute of Occupational Medicine (IOM) undertook a comprehensive study of wool dust commissioned by HSE. The final report on this study was presented in 1992.

The IOM obtained information on the respiratory health of 2,153 workers based in 15 woollen mills in West Yorkshire, England. Additionally information was obtained concerning occupational history and measurements of total and respirable dust were taken.

The results indicated that chronic bronchitis, breathlessness, persistent rhinitis, and persistent conjunctivitis were all clearly dust related. Logistic regression models were used to project the prevalence of the symptoms in a workforce containing similar proportions of smokers, non-smokers, males, females, Europeans and Asians. They showed that for all symptoms:-

a. prevalence increased with increasing exposure;

b. the relationship was non-linear. The curve on the graph comparing prevalence of symptoms with dust exposure rises steeply at low concentrations and thereafter only gradually.

c. there is no obvious threshold of dose effect.

d. lung function tests and x-rays performed on a sub-group of workers provided no clear evidence of physical changes which could be related to the symptoms and to exposure.

Breathlessness has been mistaken in some workers for asthma but this does not stand up to examination. In relation to lung function changes, conclusions have yet to be drawn on further work in this area (Zuskin, 1995). The general opinion of the WATCH Committee is that wool dust may be no different from other low toxicity dusts for which an overall limit of 10 mg/m^3 8 hour time weighted average is applied. For wool dust, however, the symptoms are observable to very low levels and therefore the proposal is that a limit of 10 mg/m^3 should be designated as a maximum exposure limit.

Although exposures at many processes are low there are particular problems in opening and blending operations which can be very dusty and in back winding operations associated with the production of carpet yarns.

Few mills have carried out assessments of the health of workers as required by the Regulations as there is no tradition in the industry of treating wool as harmful to health. HSE see the setting of a MEL as helping to change attitudes. The principle of setting MELs for both wool and cotton has the backing of the Textiles Industry Advisory Committee (TEXIAC).

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