

Options resulting from a new method of exposure assessment

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Toluene is used in rotogravure printing as a production aid for the printing of mass media products such as magazines and catalogues. During the production process, toluene is released into the ambient air. Since a number of decades it has therefore been one of the main concerns of the Institution for statutory accident insurance and prevention in the printing and paper processing industry to ensure health protection for the workforce and exclude the risks of health hazards by providing state-of-art technical improvements, preventive occupational medical check-ups and accompanying studies.

Over a period of five years an extensive long-term study was performed to assess potential chronic effects on the nervous system. Based on comprehensive medical and psycho-physiological evaluations on more than 300 workers, the aim was to determine whether toluene exposure could cause long-term adverse effects.

Exact knowledge of the conditions existing at a workplace is crucial for identifying and assessing possible health risks. For this reason alternatives were proven. It is well known, that exposure depends on the time structure of daily activities, on work areas and technological parameters. Exposure also varies in order to personal behaviour, technological development and the general orders position over the years. Hence, we assessed the exposure in detail over the full period of 5 years.

Repeated personal air sampling is often expensive and time consuming. Nevertheless the exposure to toluene and noise of more than 300 workers was measured every half year. After each measurement work profiles and technical data were recorded in detail for 10 additional days.

The all in all obtained 100 protocols for each person allowed to develop a new and more precise modelling technique for better representative assessment of toluene exposure. Based on the individual measurements a statistical multiple linear regression model was computed. This model was used to calculate additional exposures for every worker leaned on the notes about daily

activities, technological parameters and working areas. Using these additional information, exposure assessment could be done with higher statistical power. In consequence the variance on individual exposures could be reduced significantly.

First of all the new method of exposure assessment was basis for the determination of possible long-term effects on health at an exposure level below the OEL of 50 ppm.

Some sporadic acute effects concerning the annoyance of exposure or perception of smell were detected, but they were non-significant for health. No toluene-induced long-term effects were found. Thus, the threshold limit value of 50 ppm is adequate and its application provides safety against the risks from toluene exposure.

Further more, a facilitated measurement for controlling special areas could be achieved. A special BG/BIA-recommendation corresponding to German law was published. A strategy for easy direct measurement of toluene exposure was developed. Measurement can be done by using a photoionisation detector.

Also appropriate prevention tools could be developed. Ventilation-techniques of machines were optimised. Working time in areas with high exposure was reduced and the more intensive use of washing machines helped to avoid manual cleaning activities.

Literature:

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