

The Use of Fume Hood Measurements in the Risk Assessment and Management of Laboratory Work

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Abstract

The classification of fume hoods in laboratories was conducted as a occupational protection part of risk assessment and management procedure. The fume hoods (n = 296) in laboratories were classified according to the observed face velocities. Classification scheme included descriptions of recommended use. Only 30 % of fume hoods were recommended for normal laboratory duties and 7 % were recommended not at all to be used.

Introduction

Fume hoods play an essential role in occupational health protection of laboratory workers. The proper function and prudent use of fume hoods determine eventually their safety value. Effectiveness of ventilation systems usually impairs over the time. Therefore it is important that performance of ventilation systems decreasing occupational exposure are monitored continuously or at least periodically. It is also very important that the information from these measurements is easy to apply to needs of risk assessment and management of laboratory work.

Materials and Methods

A ISO 9000 based quality management system is being applied at the University of Kuopio. An occupational risk assessment procedure was decided to be enclosed with this system. About the same time a comprehensive study of performance of laboratory ventilation systems, particularly fume hoods, was carried out. In order to apply the results of the ventilation study to practical risk assessment procedure, a fume hood classification scheme was developed. Main idea of the classification system is to provide for both laboratory workers and personnel responsible for occupational risk assessments, easily understandable information about performance of fume hoods. First step was to reliably measure the face velocities of fume hoods. Classification scheme was then developed using information and observations resulted in fume hood study and in literature and standards. Results of the fume hood study were then adapted according to the classification scheme and reported to the personnel in different departments. Also training of laboratory personnel on using and monitoring fume hoods was implemented.

Results

Fume hood classification was carried out as a four category system. Simple and understandable instructions were given in what kind of laboratory duties are safe to do in each category of fume hoods. Simple fume hood classification scheme and criteria for this classification are introduced in tables 1 and 2.

Table 1. Simple classification scheme for laboratory fume hoods

CLASSIFICATION	RECOMMENDED USE
A	Fume hood is safe to use in normal laboratory work, providing that general instructions concerning safe use of a fume hood are followed.
B	Fume hood is safe to use in most laboratory duties where only minor quantities of chemicals are used. Not suitable for continuous use of hazardous chemicals or when a heat source is present.
C	Fume hood is suitable for handling only very small quantities of chemicals or storing tightly closed chemical containers. Fume hood is NOT at all suitable for handling toxic or carcinogenic chemicals. (e.g. T, T+, R45, R49, R23, R26)
X	Fume hood is not suitable for any kind of use until repairs are completed

Table 2. Criteria for fume hood classification scheme.

CLASSIFICATION	FACE VELOCITY m/s
A	0.4 – 0.6
B	0.3 – 0.4
C	0.2 – 0.3
X	Less than 0.2

Face velocities of 296 fume hoods were measured. Face velocity results were then applied to the classification scheme using the criteria presented in table 2. Distribution of fume hoods according to classification system is presented in table 3.

Table 3. Distribution of fume hoods according to classification.

CLASSIFICATION	NUMBER OF FUME HOODS	%
A	89	30
B	127	43
C	59	20
X	21	7
SUM TOTAL	296	100

According to the observed face velocity only 30 % of fume hoods were recommended for normal laboratory duties. Most fume hoods (43%) were categorised to be used only with minor quantities of chemicals. Some fume hoods (20 %) were recommended for only storing chemicals and 7 % were recommended not at all to be used.

Discussion

Continuous monitoring of fume hood performance guarantees safe working conditions in laboratories. Classification system presented helps laboratory workers to understand the meaning of fume hood monitoring as a part of occupational health protection.

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