

SYSTEM FOR PROTECTION AGAINST EXPOSURE TO ASBESTOS IN A FACTORY FOR DE-INSULATION OF RAILWAY CARS

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INTRODUCTION

The Manufacturing of asbestos or the handling of products containing asbestos, provoke contamination of environments both in and out of work areas. The significant efforts made in the last few years, have shown that it is possible to control the work exposure risk within maximum safety limits. In fact, both the use of good procedure regulations and suitable personal protection means, together with constant and detailed instruction of personnel, can reduce professional exposure to levels of only a few fibers for liter of air.

On the contrary, it is not easy to prevent the dispersion of the fibers outside the work sites due to the large quantity of asbestos that moves around the continuous traffic of personnel in some way contaminated. Currently available information does not allow us to establish a threshold limit where the risk of cancer is null; in fact, the W.H.O. and other research agencies' projections require fiber dispersion to be practically null in external environments.

RESEARCH OBJECTIVES

Our research began by noting that currently existing recommendations and regulations regarding good procedures are not able to assure adequate environmental protection. In our opinion, one of the main causes of environmental contamination is, paradoxically, attributed to the workers means of protection. In fact, in order to achieve maximum safeguarding of workers, we are forced to constantly use personal means of protection, from the semi-protective mask to the positive pressure helmet. This creates the need for frequent breaks in decontaminated and clean areas, where the concentration of fibers is practically the same as the outside environment.

In order to obtain these conditions, the workers must pass through various areas where they remove their overalls, shoes and protective covering; in order to ascertain complete and safe decontamination, it is often compulsory to complete the latter under a shower of water (erf. Circular n. 45, Ministry of Health, Italy). It has been proven that simple, air spraying showers do not assure good decontamination of workers, thus the water shower appears to be indispensable if a perfectly clean rest area is desired. However, it is difficult to require the workers to take several showers, and they most probably will be tempted to pass quickly through, thwarting the efforts made to keep the rest area clean.

MATERIALS AND METHODS

In order to solve this problem, we thought of creating waterproof overalls that are attached to a sack-like helmet, which in turn is fed by a pump equipped with an absolute filter. The overalls are made of a light-weight polyester fabric (Figure 1) lined with a water vapor, permeable PTFE film. They weigh less than 500 grams. The overalls have a double zipper which closes in the front to assure that they are waterproof (Figure 2). There is also a long, semi-stiff collar (Figure 3) over which the neckline of the helmet is tightened (Figure 4). The inside of the helmet is equipped with an overturned "U" shaped diffusor that prevents the pump's air streams from fogging up the visor and from directly striking the workers face and head. Once the helmet is placed on the head and properly fitted and tightened around the overalls, the air penetrates the overalls slightly inflating them and finally exiting from the wrists and ankles (Figure 5), assuring transpiration from the workers body.

We tested this simple and easy to use personal protection system in a railway car de-insulation industry.

Upon exiting the work area, the workers pass through a multiphase decontamination system.

1. A water filled tank, approximately 20 cm in height, is used for the first washing of the rubber boots;
2. A first stall where a strong blast of air removes the larger fibers;
3. A second stall where a water shower thoroughly cleans the overalls and helmet, removing even the smallest of fibers (Figure 6);
4. A third stall where a stream of air dries the overalls and helmet;
5. By passing through a second water filled tank for an additional boot washing and two air locks, the workers have access to an area where they can remove their overalls, helmet and boots and then move on to the rest area dressed in the cotton clothing that they wear under the overalls.

The first tests we carried out show that with adequate worker training and careful study of work-break cycles, it is possible to limit the environmental concentration of the rest area, where some 50 people pass through, to 1-5 fibers/liter of air. The use of this decontamination system allowed us to reduce the environmental concentration of asbestos fibers. In fact, it was possible to soak the material to be de-insulated in a diluted solution of a tensio-active substance, thus reducing

environmental pollution from approximately 200 ff/ml to approximately 5 ff/ml during the highest pollution production phase. With the previous air-spray decontamination system, it was not possible to wet the asbestos. We are currently

researching ways to optimize this study, reducing the metabolic charge as much as possible, in order to limit perspiration, thus improving the workers comfort and reducing the frequency of breaks.

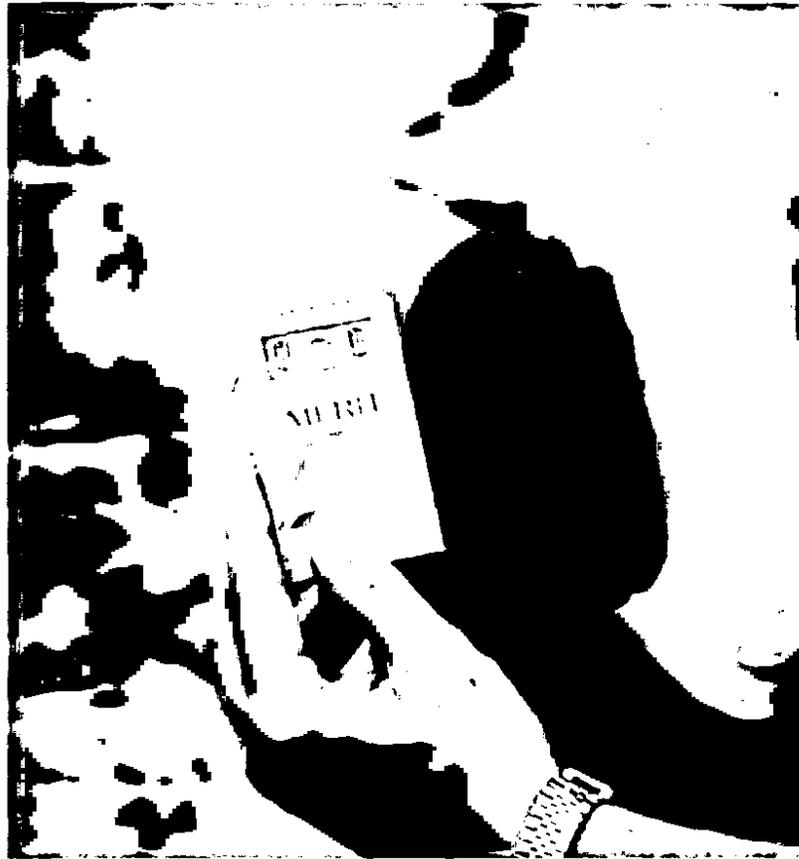




Figure 2.

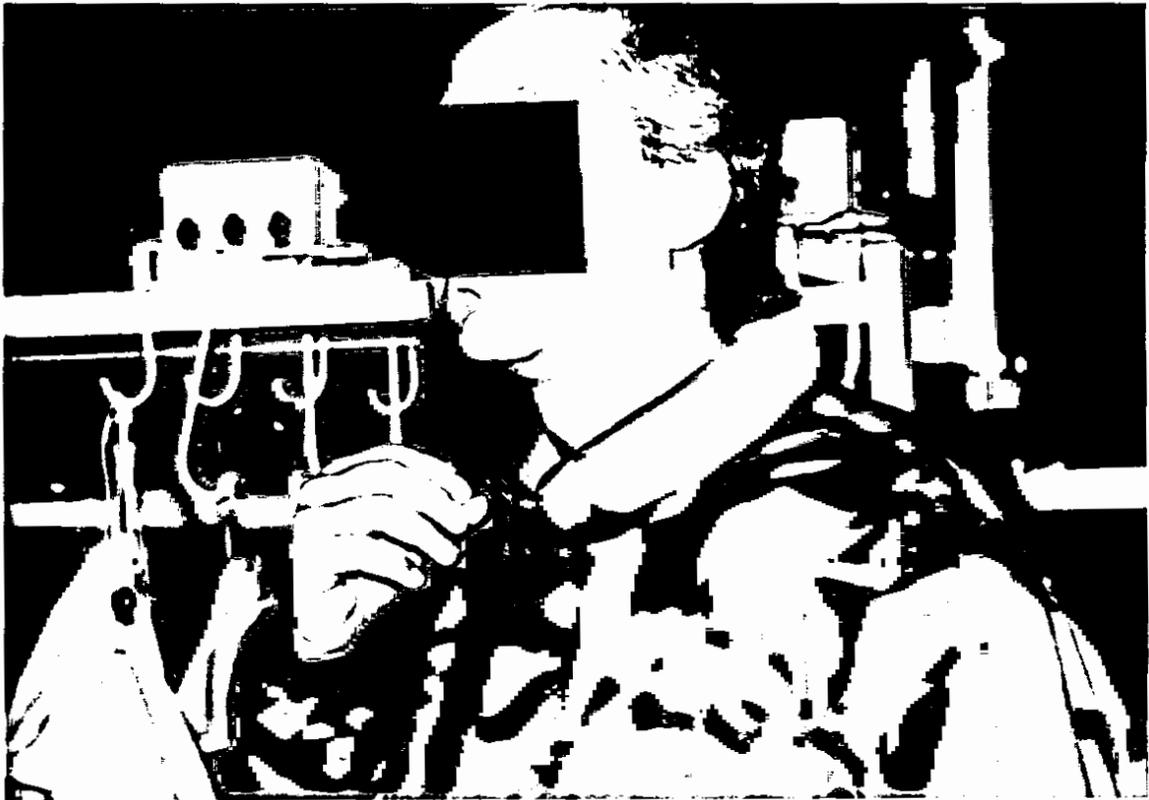


Figure 3.



Figure 4.

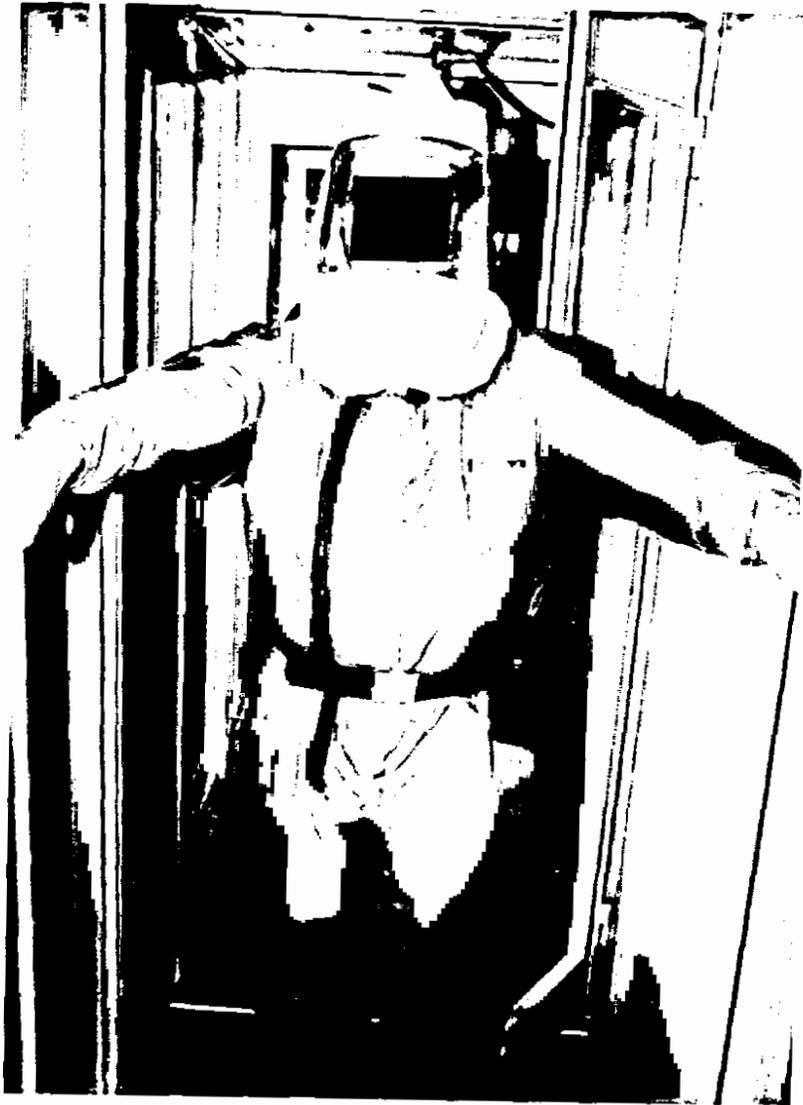


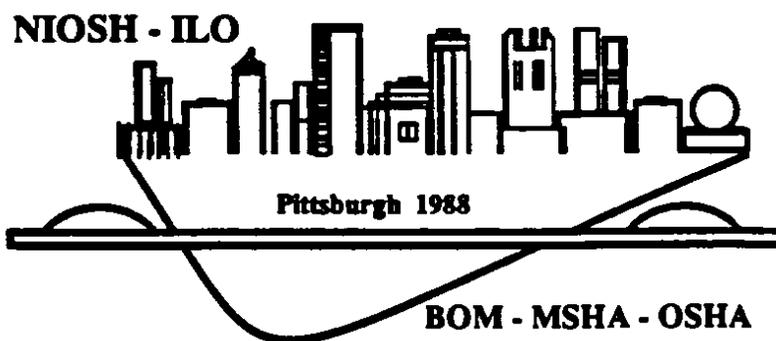
Figure 5.



Figure 6.

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