

## ASBESTOSIS IN TEXTILE PROCESSING

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### ABSTRACT

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A coincidental finding led to a discovery of extreme asbestos danger in a shop where used hemp, jute, and plastic sacking were re-worked for other purposes. These sacks had been used for delivery of asbestos to a factory manufacturing asbestos cement.

The dust concentrations, determined conimetrically as well as gravimetrically, lay above the current limit values for asbestos in nearly all stages of production. From among 28 clinically examined employees, six women aged from 27 to 65 years, with exposure times between 4 and 26 years showed manifest asbestosis.

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As a coincidental finding, the chest X-ray of a 50-year-old woman showed pulmonary changes, later verified as pulmonary fibrosis in the sense of asbestosis.

The woman was employed for 16 years as a seamstress in a textile-processing shop which produced sacks, tents, and tarpaulins. Ten per cent of the total production entailed re-working of used hemp or jute sacks, in which asbestos from various countries had been delivered to a factory producing asbestos cement, to sacks for coal, potatoes and grain.

The soiled sacks were first cleansed of adhering asbestos by means of a vacuuming installation, the dust-laden air was subsequently filtered and blown back into the workroom. This suction fan had been in operation for only four years. The sacks were then cut to new formats with the help of a band saw and mechanically sewn into new sacks.

The Leoben office of the Austrian Institute for Dust Control determined 13% asbestos in the sedimentary dust, 60% in the filter dust of the sewing department and, in the sack-cleansing installation, 50% asbestos by means of an infra-red spectrophotometer.

The air at the different production stages was then sampled with a standard conimeter, and the asbestos fibres under 5  $\mu\text{m}$  in length and over 3  $\mu\text{m}$  in diameter were determined microscopically at 250-fold magnification. Under three fibres per  $\text{cm}^3$  of air was taken as permissible maximum value.

The measurement showed 11 fibres per  $\text{cm}^3$  of the respiratory air between two sewing machines during the sewing step, 3.4 fibres during the cleansing of

the sacks and 2.8 fibres during cutting. The ambient air in the sewing room contained 6.9 fibres per  $\text{cm}^3$ . It must be assumed that the dust concentrations before the installation of the suction fan were considerably higher.

Most recently, asbestos is increasingly delivered in plastic sacks which are also re-worked in this shop for other purposes of utilization. The working procedure is, in this case, basically the same.

With the help of an infra-red spectrophotometer, 37% asbestos in the filter dust in the vicinity of the sewing machines and 43% asbestos in the dust of the cutting room was ascertained in this case. Concurrently, the air at the individual production stages was sampled with the standard conimeter HS, and the samples were examined as to the number of asbestos fibres with a light microscope at 200-fold magnification.

During the sewing of the asbestos-soiled plastic sacking, the number of fibres amounted to 5.8 per  $\text{cm}^3$  in the respiratory air and 3.5 in the ambient air, during shaking-out and cutting 14.8 in the respiratory air and 8.4 in the ambient air.

In addition to the conimeter, a gravimetric sampler device Gravikon, type VC 25 by the Sartoriuswerke, Göttingen was put to use. Samples of suspended dust were taken from the air at the individual points of measurement, and the dust quantities deposited on the microsorban filters, as well as their respective proportions of asbestos, were determined. The dust concentrations were calculated with allowance for the volume of air sucked through the device.

These amounted to 2.8 mg total dust and 1.04 mg asbestos/ $\text{m}^3$  in the ambient air during the sewing stage and to 4.6 mg total dust and 1.7 mg asbestos per  $\text{m}^3$  in the cutting room.

The technical concentration standard set for the conimeter measurement was under three fibres per  $\text{cm}^3$  and, for the gravimetric measurement 0.15 mg per  $\text{m}^3$  with respect to occurrence of asbestos. At the present time, no standard concentration is known for limitation of the carcinogenic risk.

Subsequently, all the employees of the shop who occupied the exposed workplaces, as well as persons who had previously left the firm, were exhaustively examined at the Special Medical Clinic for Occupational Diseases of the Austrian General Accident Insurance Establishment in Tobelbad. This included 28 persons, 22 of them female and six male, aged between 20 and 70 years, with exposure times from 2–26 years.

In detail, the following examination procedures were used: chest X-ray in hard-ray technique posterior-anterior, including partly shuttered target exposures of the lower fields; pulmonary function tests for ventilation, diffusion and respiratory mechanics in the form of forced expiratory volume (1 second), maximum breathing capacity, intrathoracic gas volume, resistance, compliance, total capacity and determination of the blood gases at rest and upon exertion.

The devices employed were first of all an equipment for pulmonary function measurement with a body-plethysmograph by the Jaeger Company, while blood gas analysis was carried out with the help of an AVL Gas-Check.

Of the 28 candidates, six women showed manifest asbestosis or pulmonary fibrosis with a clearly measurable reduction of the performance spectrum in the sense of a restrictive disturbance of ventilation or diffusion. In three cases there was a reason for suspecting the beginning of pulmonary fibrosis without impairment of function.

The most severe damage concerned a 27-year-old woman with an exposure time of 12 years. The X-ray showed a moderate symmetrical fibrosis in both lower fields (Fig. 1). The pulmonary function test revealed a restrictive disturbance of ventilation with pronounced lowering of pulmonary elasticity and marked disturbance of diffusion with reduction of  $\text{PaO}_2$  upon slight exertion by 20 Torr. The diminution of fitness for work was, in this case, assessed at 40%.

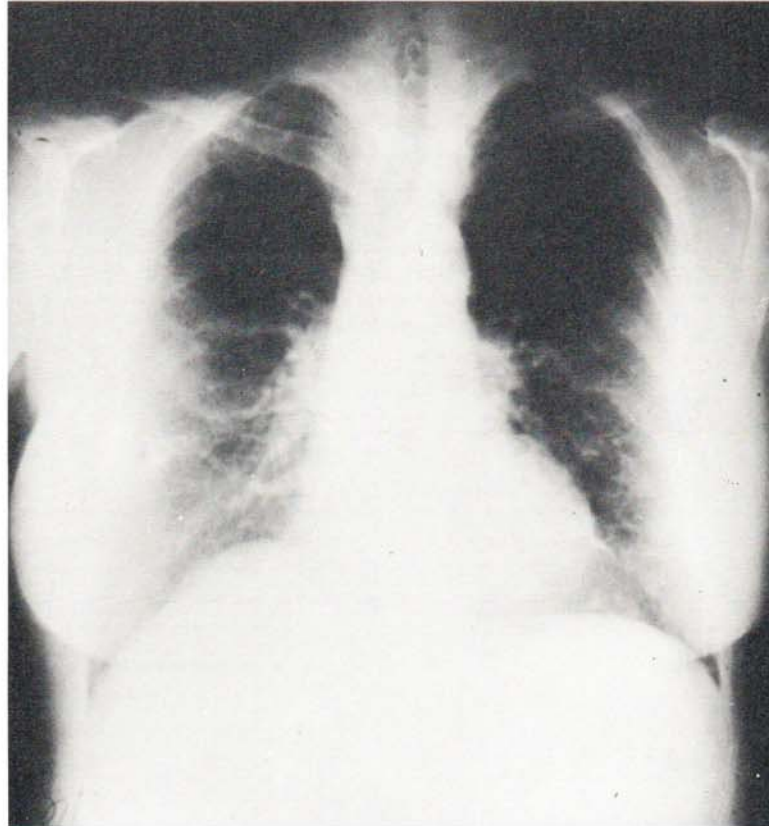


FIG. 1 - Moderate symmetrical fibrosis in a 27-year-old woman.

The diminution of fitness for work in three further workers amounted to 30%, at ages 52, 62 and 63 years and exposure times of 4, 12 and 26 years

respectively. In two employees' reduction of fitness for work was estimated at 20% at an age of 53 and 65 years after 12 and 24 years of asbestos exposure.

Four of the affected workers were seamstresses, one a sorter and one a cleaning woman; in the last case, the time of exposure was only four years. In all these cases, there was a restrictive disturbance of function and a marked reduction of pulmonary compliance, without disturbance of diffusion.