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Risk assessment and safe handling practices while using Asbestos in industries

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ABSTRACT

Asbestos is the name given to a group of mineral fibers that was widely used as a building material prior to 1990s in a variety of products due to excellent strength, insulation, and fire resistant properties. The chrysotile fiber is also known as "White Asbestos" is used in the manufacturing of asbestos cement roof sheets and asbestos fiber cement sheets by implementing the "INDIAN STANDARDS" (IS 11451, IS 11767, IS 11768, IS 12078, IS 12079, IS 12080). The principal concerns are the development of Asbestosis, Lung cancer, Pleural thickening, and mesothelioma. These concerns can be controlled and prevented at a minimum level.

Keywords— *Asbestos, Chrysotile, White Asbestos, Lung cancer, Pleural thickening, Mesothelioma*

1. INTRODUCTION

Hazard Identification and Risk Assessment or HIRA system can act as a risk assessment tool which will assist users in identifying the hazard and estimating the risk involved each identified hazard. The risk assessment tool will identify possible hazard involved in each task in departments. Once the hazard has been identified, the risks involved will be estimated and categorized. Here in this paper, we're going to see the diseases that are exposed due to the usage of asbestos. [1]

1.1 Asbestosis

Asbestosis is a chronic lung disease caused by inhaling asbestos fibres. Prolonged exposure to these fibres can cause lung tissue scarring and shortness of breath. The asbestos fibres irritate and scar lung tissue, causing the lungs to become stiff. Asbestosis symptoms can range from mild to severe, and usually, don't appear until many years after continued exposure.

1.2 Lung Cancer

Lung cancer is a type of cancer that begins in the lungs. The lungs are two spongy organs in the chest that take oxygen while inhale and release carbon-di-oxide while exhale.

1.3 Pleural Thickening

Pleural Thickening, also known as Diffuse Pleural Thickening (DPT), is a lung disease in which extensive scarring thickens the lining of the lungs, (the pleura). The condition may cause chest pain and breathing difficulty, and it is one of the most commonly diagnosed signs of asbestos exposure.

1.4 Mesothelioma

Malignant Mesothelioma is a type of cancer that occurs in the thin layer of tissue that covers the majority of our internal organs (mesothelium). Mesothelioma is an aggressive and deadly form of cancer. Mesothelioma treatments are available, but for many people with mesothelioma, a cure isn't possible.

Doctors divide mesothelioma into different types based on what part of the mesothelium is affected. Mesothelioma most often affects the tissue that surrounds the lungs (pleura). This type is called pleural mesothelioma. Other rare types of mesothelioma affect tissue in the abdomen (peritoneal mesothelioma), around the heart and the testicles.

2. METHODOLOGY

These concerns can be controlled and prevented in minimum level by adopting the following **"Indian Standards"** IS.11451:1986, IS.11767:2005, IS.11768:1986, IS.11769.1:1987, IS.12078:1987, IS.12079:1987 and IS.12080:1987**.**

2.1 IS.11451:1986 Recommendations for Safety and Health Requirements Relating To Occupational Exposure to Asbestos:

This standard lays down the recommendations for safety and health requirements of workers exposed to asbestos dust in mining and milling of asbestos, manufacture of products containing asbestos, and transportation, storage and handling of asbestos or products containing asbestos. The provisions of this standard shall apply to any operation involving a risk of occupational exposure to airborne asbestos dust like mining and milling of asbestos, manufacture of products containing asbestos, and transportation, storage and handling of asbestos or products containing asbestos. For occasional work that may involve short term intermittent occupational exposure to asbestos at all places where there is a likelihood of exceeding the exposure limit, approved respiratory equipment shall be used. [2]

2.2 IS.11767:2005 Recommendations for Cleaning Of Premises and Plants Using Asbestos Fibres

This standard lays down the recommendations for cleaning of premises and plants using asbestos fibres.

(a) The provision of this standard shall apply to any place where any form of asbestos fibre is stored, handled, processed or applied in such a way that airborne dust is likely to be generated.

(b) The provisions shall not apply to the storage of asbestos-containing products which do not release dust during normal cleanings, such as locked-in or encapsulated products.[3]

2.3 IS.11768:1986 Recommendations for the Disposal of Asbestos Waste Material

This standard lays down the recommendations for the disposal of asbestos waste materials without significant generation of airborne asbestos dust. The provisions of this standard shall apply to any place where any form of asbestos waste is generated, stored, transported and finally disposed of. [4]

2.4 IS.11769.1:1987 Guidelines for Safe Use of Products Containing Asbestos

This standard lays down the guidelines for the safe use of asbestos cement products. The provisions of this standard shall apply to any operation involving a risk of exposure to airborne asbestos dust arising during handling and installation of asbestos cement products. [5]

2.5 IS.12078:1987 Recommendations for Personal Protection of Workers Engaged In Handling Asbestos

This standard lays down the recommendations for personal protection of workers engaged in handling asbestos in asbestos mines and factories manufacturing products containing asbestos. The provisions of this standard shall apply to any operation involving the process of handling the asbestos fibre and products containing asbestos. [6]

2.6 IS.12079:1987 Recommendations for Packaging, Transport and Storage of Asbestos

This standard lays down the recommendations for packaging, transport and storage of asbestos fibres so as to prevent the release of airborne asbestos fibre during these operations. The provisions of this standard shall apply to any operation involving the packaging, transport and storage of asbestos fibres and asbestos-containing products. [7]

2.7 IS.12080:1987 Recommendations for Local Exhaust Ventilation Systems in Premises Manufacturing Products Containing Asbestos

This standard lays down the recommendations for local exhaust ventilation systems in premises engaged in processing and use of asbestos fibre and in the manufacture of products containing asbestos. The provisions of this standard shall apply to any operation involving the use of asbestos and manufacture of asbestos-based products where there is a possibility of asbestos dust emission, such as fibre preparation, blending, spinning, mixing, forming, sheeting, cutting, polishing, braiding, carding, doubling, weaving, plaiting, machining, etc., [8]

3. RESULTS AND DISCUSSION

3.1 Risk Assessment and Risk Rating Matrix

The Risk Assessment and Risk Rating Matrix shows that the number of risks involved in an action and the risk level in it. It also shows that the rating of the risk level mentioned below.

$$Risk\ Rating\ (R)\ =\ Severity\ (S)\ \times\ Probability(P)$$

Table 1: Risk Assessments and Risk Rating Matrix

		Probability				
		1 Rare	**2 Unlikely**	**3 Possible**	**4 Likely**	**5 Almost Certain**
Severity	5 Catastrophic	5 Moderate	10 High	15 Extreme	20 Extreme	25 Extreme
	4 Major	4 Moderate	8 High	12 High	16 Extreme	20 Extreme

	3 Moderate	3 Low	6 Moderate	9 High	12 High	15 Extreme
	2 Minor	2 Low	2 Moderate	6 Moderate	8 High	10 High
	1 Negligible	1 Low	2 Low	3 Low	4 Moderate	5 Moderate

3.1.1 Risk Level Observations: Risk Levels are observed for a period of 5 days in which the levels are decreasing day-by-day. Here is a table showing the observations during various 5 days.

Table 2: Risk Level Observations during various 5 days

Days	Risk Level Before Implementing IS standards	Risk Level After Implementing IS standards
1	20	9
2	16	6
3	15	5
4	12	4
5	10	3

3.2 Graphical representation

The figure shows the comparison of the risk assessment before and after the implementation of IS standards. It also shows that on implementing those IS standards, the risk level is decreased.

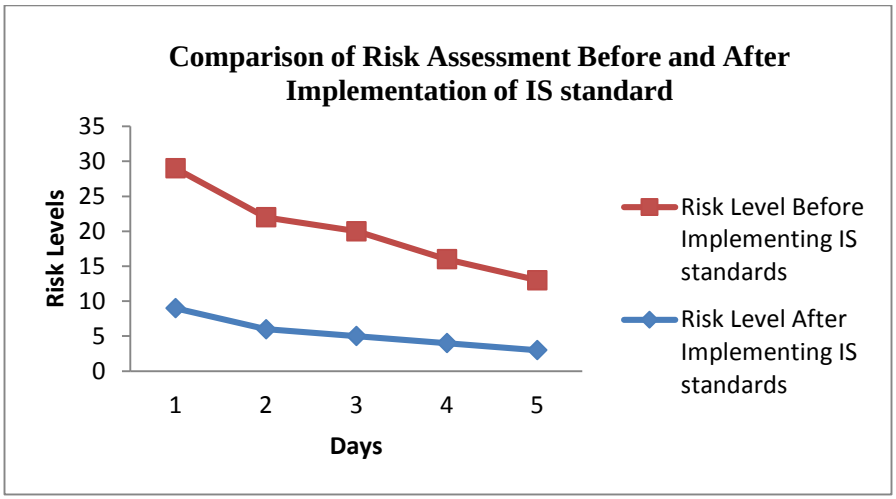

Fig. 1: Comparison of Risk assessment before and after the implementation of IS standards.

4. CONCLUSION

Eventually, the truths regarding asbestos exposure and its true hazards will be recognized and acted upon, but only after economic forces are overcome. The diseases that are mentioned above due to the asbestos usage have long latency periods, in the order of 10-50 years. When we follow the above-mentioned procedures in the IS standards, we can control and prevent the minimum level of the diseases given above due to the usage of asbestos. Above all these procedures will also help to find the symptoms and its preventive actions and medical appliances given to those diseases. In addition to these, this method will be very helpful in decreasing the risks associated with the works relating to asbestos and the products containing asbestos. Current asbestos-related regulations are irrational. Asbestos production and trade is prohibited in some countries, while others have maintained or increased production and use in recent years. Substitution of asbestos by artificial fibers would not necessarily lower or eliminate health risks. The increased incidence of malignant Mt in developed nations, despite the prohibition of asbestos, is probably at least in part due to improved diagnostics, increasing awareness of Mt, a screening effect in asbestos-exposed populations, and some over-diagnosis in conditions with an unclear demarcation of malignant Mt as an entity. This screening effect has probably contributed to an increased registered incidence of all asbestos-related diseases in exposed populations, and a resultant over-estimation of dose-response relationships, particularly after low-dose exposures. On the basis of independent scientific data, the bans and restrictions on asbestos in some countries should, therefore, be re-examined and potentially revised.

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