

Current Status in the Use of Asbestos and Health Effects in China

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Abstract

China is one of the leading countries in the world in the production and use of asbestos. Based on rough statistics, the total reserves of asbestos are about 10 million tons of chrysotile and 45,000 tons of crocidolite, located mostly in Qinghai, Sichuan, Xinjiang and Shanxi provinces; output was about 450,000 tons of chrysotile and about 390,000 tons of products containing asbestos in 1996. There are about 100,000 workers exposed to asbestos. An epidemiological study showed that the number of cases of asbestosis at the end of 2003 was 6984 with about 800 deaths. The prevalence of pleural plaques is about 51% in patients with asbestosis and 15% in exposed workers in general. The number of cases registered as lung cancer related to asbestos exposure was 119, but autopsy studies on 78 asbestosis patients showed that 21 were complicated by lung cancer. The incidence of mesothelioma was relatively low. Anyway, we have taken measures to reduce the use of asbestos. Asbestos has been completely banned for use in friction materials in the auto industry from October, 2003.

1. Current status of the asbestos industry in China

China is one of the main countries in the world producing and using asbestos. The development of its asbestos industry has been very complicated (see Table 1).

Table 1. Development of the asbestos industry in China

| Years | Development levels | Increase |
|-------------|--|----------|
| Early 1950s | High speed development | 43% |
| 1960s-70s | Slow speed /reduction in development | -0.9% |
| 1980s | Steady development | 3.8% |
| Early 1990s | Requirements raised, continued development | |
| After 1996 | Market shrinks, falls to low level | |

Based on rough statistics, the total asbestos reserves are about 10 million tons of chrysotile and 45,000 tons of crocidolite.

Asbestos mining in China is distributed in 15 provinces and mainly concentrated in

Qinghai, Sichuan, Xinjiang and Shanxi provinces. The asbestos reserves of the above four provinces accounted for approximately 96.4% of the total asbestos reserves. Not only is chrysotile the most common type, accounting for 90~95% of all asbestos reserves in China, but it also comprises about 95% of the whole asbestos output. In addition, the asbestos fibers encountered are mainly of the shorter type, with far fewer longer fibers.

In 1996, the total output of asbestos in China was about 450,000 tons of chrysotile with about 390,000 tons of products containing asbestos. The latter included friction, sealing, heat-resistant and other products containing asbestos, which amounted to about 40,000, 66,000, 260,000 and 16,000 tons, respectively.

In China, asbestos is mostly used as a raw material to produce products containing asbestos, and the average consumption of asbestos is more than 300,000 tons a year. There are about 3,000 different types of asbestos products in China, including cement, friction, heat-resistant, sealing and other products containing asbestos. Among them, cement, friction and heat-resistant products comprise about 50%, 20% and 10% of total asbestos consumption, respectively (See Table 2).

Table 2. The output of different types of asbestos products in China

| Type of products | % of asbestos | Output in 1995 | Asbestos used in 1995 | Output in 1996 | Asbestos used in 1996 |
|-------------------------|---------------|----------------|------------------------|----------------|------------------------|
| Friction products | 50--55 | 6.37 | 3.185--3.5035 | 4.69 | 2.345--2.5795 |
| Sealing products | 60--70 | 14.26 | 8.556--9.982 | 6.63 | 3.978--4.641 |
| Heat-resistant products | 90--100 | 53.48 | 48.132--53.48 | 26.27 | 23.643--26.27 |
| Special products | 90--100 | 2.16 | 1.944--2.16 | 1.55 | 1.395--1.655 |
| Total | | 76.27 | 61.817--69.1255 | 39.14 | 31.361--35.0405 |

Note: in units of 10 thousand tons

There are more than 120 enterprises involved in asbestos mining in China; of these, 31 are quite large scale operations.

China exports few asbestos-containing products. In the past few years, exports of such products amounted to around 3000~4000 tons per annum. In order to make up for a domestic shortage, a large amount of asbestos is imported (mostly the longer fiber type): 78,000 tons of raw asbestos in 1996 and 3698 tons of asbestos-containing products in the first half year of 2001 (See Fig.1).

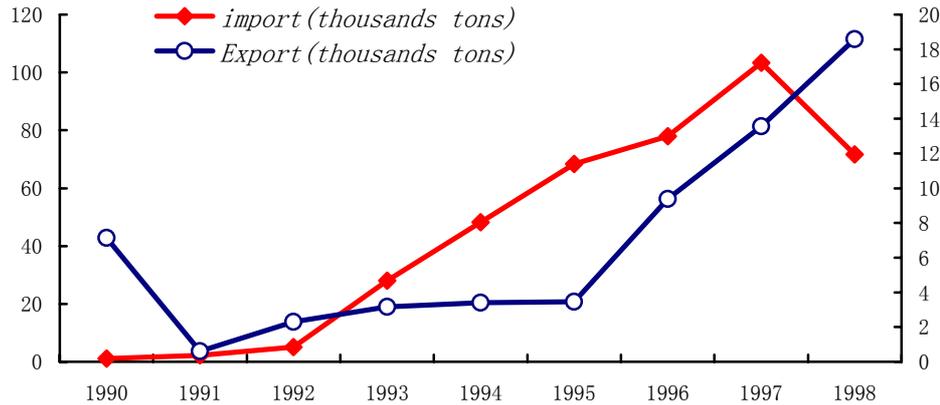


Fig.1 Export and import of asbestos in China

2. Review of research on health effects of asbestos in China

There are about 100,000 workers exposed to asbestos in China, which include about 24,000 working in asbestos mining, and about 46,000 in asbestos product plants.

2.1 Health standards for asbestos in workplaces and working conditions in China

The National occupational exposure limit values for asbestos dust in workplaces are 2 mg/m^3 or 2 f/cm^3 . A large amount of asbestos dust may be released during the production of asbestos-containing products; for example, in handling raw asbestos, asbestos textiles and rope production and manufacture of brakes, etc.

There is serious contamination by asbestos dust in asbestos mining. Generally, the concentrations in the oldest mines, in common with some self employed and family workplaces, frequently exceed $10\text{-}15 \text{ mg/m}^3$, even up to $50\text{-}150 \text{ mg/m}^3$. But the new building enterprises are much better and the concentration of asbestos dust in these workplaces is $2.5\text{-}3 \text{ mg/m}^3$. In general, the working conditions in asbestos mining are much worse than those in asbestos production plants. On the other hand, the incidence of asbestosis in asbestos production plants is higher than in asbestos mining. The reason may be due to the dispersion of asbestos dust.

2.2 Current status of asbestosis and other asbestos-related diseases

Based on nationwide statistics of occupational diseases, there were 7907 cumulative asbestosis patients by the end of 2003, accounting for 1% of the total pneumoconiosis cases. Around 923 of these had died, the death rate being 11.67% for all causes of death (See Fig.2).

Complications of respiratory diseases, cardiovascular disease, tumor, and other diseases were ranked as the main causes of death.

Some epidemiological studies showed that the prevalence of pleural plaques was about 51% in the patients with asbestosis and 15% in exposed workers, generally.

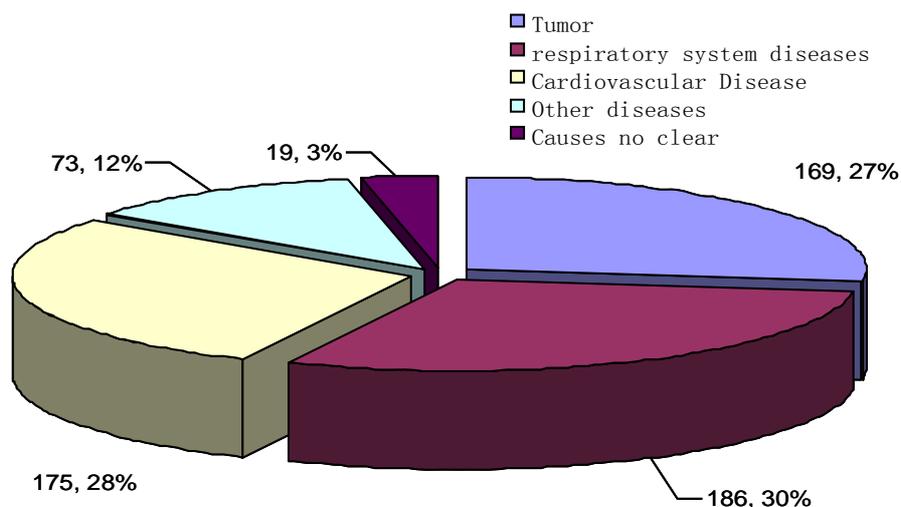


Fig. 2 Causes of death in patients with asbestosis

3. Industry policies on the production and use of asbestos in China

A number of laws and regulations related to occupational safety and health have been issued and came into effect in recent years, such as the National Law on the Prevention and Control of Occupational Diseases (2002), the Law of Safe Production (2002) and the Law of Promoting Clean Work (2002).

The Chinese government encourages any activities involving research, development, popularization and utilization of new techniques, processes and materials, in terms of the prevention and control of occupational diseases and protection of workers' health. It seeks to strengthen basic research on pathogenesis and etiology of occupational diseases, raise scientific and technological levels in this field, actively adopt techniques, processes and materials which could effectively prevent and control occupational diseases and reduce and eliminate the use of asbestos. Industrial Technique Policies, such as "the Decision of State Council on Some Questions of Environment Protection", "State Industrial Technology and Credit policies", "The List of Backward Production Capacity, Technologies and Products (third revision)" and "the Automobile Brake System Structure, Function and Methods of Test(GB12676-1999)", have also been established. These limit or ban backward productive techniques, technologies, equipment and products. The State drafts and publishes lists of such production techniques, technologies, equipment and products and deadlines for their elimination. The government requires that enterprises must use no toxic or harmful materials, or substitute less toxic or less harmful materials, in technological innovation.

The State Council has decided to abolish or close some enterprises with indigenous production according to "The Decision on Some Questions of Environmental Protection." These enterprises include arsenic-smelting, mercury-smelting, lead and

zinc-smelting, oil-refining, gold-selection enterprises, etc. At the same time, enterprises are required to close some plants involving indigenous pesticide production, electroplating, drift-dyeing, products containing asbestos and radioactive products.

For guiding social investment orientation, the State Commission of Development and Reformation and the People's Bank of China have drafted National Industrial Technology and Credit Policies. Production technologies, products and construction projects listed in the prohibited categories should be discontinued. Even current, partially completed, projects must be resolutely controlled or closed down,

The Former State Commission of Economy and Trade issued "The List of Backward Production Capacity, Technologies and Products (third revision)" on July 2002. In this list, products containing crocidilite were classified as No.28 for banning in building materials industries.

In 1999, "Automobile Brake System Structure, Function and Methods of Test" (GB12676-1999) became effective, prohibiting the presence of asbestos in automobile brake linings. Furthermore, asbestos has been completely banned for use in friction materials in relevant regulations.

4. The controversy on safe use of chrysotile

There is still a lot of argument in China concerning the use of chrysotile. The China Friction and Sealing Material Association is promoting the use of non-asbestos materials in friction and sealing products in China, striving to carry out interim policies and measures involving non-asbestos processes, compliant with the current situation in China, and establishing an industrial or national standard for non-asbestos products in the fiber reinforced board.

In contrast, the Chinese Non-metallic Material Industrial Association point out that the toxicity of chrysotile is much less than that of crocidolite and that there exist successful measures to prevent and control the hazards of chrysotile at workplaces. They stress that the key consideration is not the banning of chrysotile, but prevention and control.

Since the 1980s, research into substitutes for asbestos has been carried out in China, including research on non-asbestos friction materials, non-asbestos sealing materials and non-asbestos fiber cements and, in recent years, heat-resistant firefighters' outfits.

Asbestos substitute fibers are classified into two kinds: metal fibers (such as steel fiber, copper fiber, aluminum fiber, etc.) and nonmetal fibers. The latter includes natural fibers (mineral and plant fibers such as cotton and flax, etc.) and synthetic fibers (both inorganic, such as glass fiber, rock fiber and ceramic fiber, etc., and organic, such as Kevlar fiber, carbon fiber, etc.).

The output of friction materials was 137,000 tons in 2003, which was an increase of 32.6% on 2002; of this total 87.5% was for brake production. The output of sealing materials was 41,000 tons, an increase of 20.0% on 2002. As for brakes, disk brakes

contain hardly any asbestos now; the proportion of non-asbestos in drum and clutch linings, and in some sealing materials has gradually increased.

Conclusion

China is a responsible country. Although China is one of the main countries producing and using asbestos, it has advanced policies for limiting and banning the use of asbestos in accordance with its economic development level. In this it has made considerable progress as shown by the following achievements:

- Techniques, processes and materials that probably cause severe occupational hazards have been limited or even eliminated. On the other hand, those techniques, processes and materials for effective prevention and control of occupational hazards are encouraged.
- Since October 2002, products containing crocidolite have been withdrawn from use.
- Asbestos has been banned for use in friction materials in the automobile industry since October, 2003.
- Asbestos substitutes have been widely studied and used.