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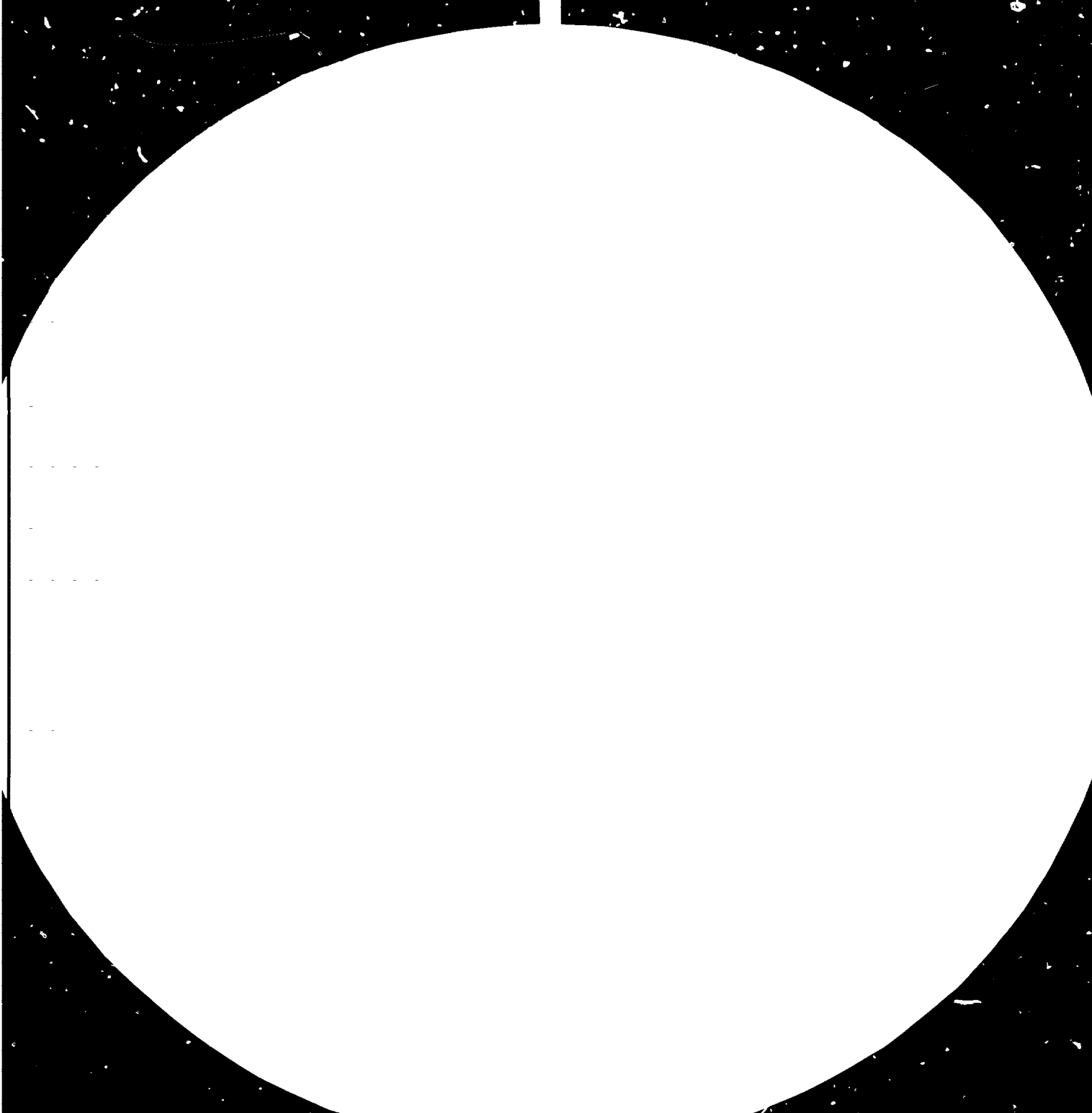
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EXPLOITATION AND APPLICATION OF ASBESTOS IN CHINA**

by

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Summary

In China's non-metallic industry, the asbestos is of considerable importance. The central people's government has paid great attention to its development.

This paper gives a brief account of the asbestos mining, milling, asbestos products, new trends of comprehensive utilization of tailings and of the way forward for developing asbestos industry in China.

China is a large country rich in mineral resources and is the third largest country next to the Soviet Union and Canada in asbestos reserves. Among non-metallic industries, asbestos is of considerable importance. The people's government has paid great attention to its development since liberation. The production of asbestos fibre has been increased steadily in recent years but it still does not meet the daily-increasing demand of industrial and construction activities.

In China, chrysotile asbestos deposits being discovered in both serpentine rocks and dolomite rocks. Generally speaking, the former is of larger size with the fibre concentration of 2.5 - 8%, and the latter is of medium or small size with concentration 1.5 - 4%, but is much better in fibre quality than that of serpentine rock type.

Chrysotile occurs with basic rock either cross fibre or slip fibre, making up more than 99% of China's production of asbestos. The former occurrence covers most deposits of economic significance. However, Sichuan Asbestos Mine, one of the main producers in China, supplies famous slip fibre for its length. The longest one is 218cm, which is believed to be the longest of the world. (see specimens exhibiting in the Geological Museum, Beijing, China).

In China, asbestos ore is exploited either in open pits or underground mines, but open pits hold about 70% in respect of the number of mines as well as the national annual output. Production in main mines and mills is fully mechanized or semi-mechanized. In open pits the traditional drilling and blasting method is still used. Bench drilling is generally accomplished with YQ-150 percussion drill (with diameter 150mm), while electric shovels with 1 - 2 cu.m. buckets are used for loading of ore. Rear-dump trucks with a capacity of 8 - 15 tons are available for mining haulage. Stripping ratio in open pits ranges from 0.7 to 1.5.

The mining method used in the underground mines are mainly filling and shrinkage stopping in case of beds with medium thickness, while sublevel caving with fanning deep holes or spontaneous block caving in massive ore bodies. The chief links in the production chain are also mechanized. Track haulage is the main means of ore transportation. A systematic study of mining methods and equipment used in massive orebodies is being undertaken.

A mechanical dry process comprising crushing, screening, aspiration, cleaning, fiberization and grading has been widely used in the mills except manual sorting of the longer "crudy" fibre. The milling flow sheet consisting of progressively reducing the size of rocks and gradually separating the fibre is accepted in most of the mills, which ensures recovering asbestos fibre as soon as released from the host rocks in order to minimize fibre length degradation. At the sametime, the aspirated product from each of the primary fibre separation stages is treated in a separate fibre cleaning section. Undoubtedly, the milling in the large or middle-sized plants is gradually getting perfected.

The equipment used for crushing and fiberizing are: jaw, gyratory crushers, impact crushers, ring-roll crushers, vertical pulverizers, high-speed mills and edge runners. For drying, vertical-tower type dryers and horizontal-rotary type dryers have been favoured in the mills. Various types of screens such as vibration screens, gyratory screens and light square screens etc. are used by the industry to screen, separate and clean fibre. The mechanization of fibre packaging remains a weak link in mill procession. Only a simple and imperfect screw bagging machine of domestic design is being used in a few plants. The test of fibre length distribution is made with a China made MS -2-4 asbestos testing screen. The processed fibre can be classified into six major groups according to fibre length distribution.

Since late 1970s, some innovations of aspiration equipment have been made, resulting in higher fibre recovery. In some mills, the gyratory screens with higher efficiency have replaced the vibration screens. It has been proved that an additional rotary aspirator equipped at the end of screen is favourable for fibre separating. By using centrifugal air separators and specific gravity separators, some plants have obtained satisfactory results for separating or cleaning.

Researches and studies on new technique, new equipment and automation of milling have been carried out in recent years.

Nevertheless, some problems remain in the milling process. For instance, most of the processing equipment is out-of-date, which needs a lot of maintenance; some advanced pulverizers which release shorter fibre from fine rocks and separator which would reject barren rocks at the earlier stage are urgently needed; the breakage of longer fibre in process lowered its value; It is a fact that the existing standard of fibre is imperfect. Moreover, some plants, especially small and medium-sized mills, do not observe the unified specifications issued by the Ministry, therefore, considerable disadvantages for the consumers are created; high concentration of dust in the workshop endangers operator's health.

It must be pointed out that the poor quality of management and low efficiency in production is still one of the chief problems in our asbestos mines and mills.

Millions of tons of overburden and tailings from asbestos mines have caused environmental problems which require urgent attention. According to our experience, comprehensive utilization of the residues has been the only right way to solve the problem. Research has shown that useful components in the asbestos tailings can be recycled. "Carbonated bricks" made of tailings and lime are good construction materials. The tailings can also be utilized as a burden in production of phosphate, calcium and magnesium fertilizers.

New experiments in extracting some heavy metals such as nickel and platinum from ultrabasic rocks — the barren host rocks of asbestos ores are being undertaken by the Chinese scientists.

Numerous applications of asbestos are the consequence of its excellent physical and chemical properties, combined with a low production cost. It has been widely used in machine building, chemical, petroleum, electrical and construction industries as well as in military industry and certain fields of sophisticated technology.

In China, more than thirty enterprises are making asbestos products. They belong to two main categories: asbestos-cement products factories and asbestos products factories. The former being the largest consumers of asbestos fibres (account for more than one half of all asbestos applications) and producing mainly varieties of asbestos-cement pipes and roofing sheets and corrugated tiles. These products are usually manufactured from chrysotile fibres of group 4-5. The latter are asbestos textiles (yarn, cloth and packings), friction materials (brake and clutch linings), fibre rubber products (sheets, joint materials and gaskets) and thermal insulation materials etc.

In short, asbestos fibre is used in manufacturing more than ten kinds of products with over a hundred specifications to meet the domestic demand of industries, while a small amount of fibre and asbestos products is exported.

Recently, the longer and medium-length asbestos fibre can not match the demands of our domestic market. Many enterprises are now working in research of short fibre utilization to replace the long and medium ones under the principle of maintaining the same quality of products. They have succeeded in trial producing good quality asbestos-cement boards by a new dry rolling process with some simple equipment. As a result, short fibre can be used in

quantities. Asbestos cloth without spinning has been successfully made by experiment. This is an important technical innovation in asbestos textile industry and has opened a new prospect in application of short fibres.

Some other progress, such as new methods and equipment of shaping or pipe-making in improving quality of products has been made. The successful research and manufacture of semi-corrugated asbestos cement panels by vacuum shaping method has introduced a new member to external walling material family.

Even though China is the third largest country in asbestos reserves and her production has also been increased steadily, the quantity and quality of fibre produced and labour productivity are still much lower than that of those industrially developed countries. In order to catch up with them, we still have a long way to go. It is a must to develop China's asbestos industry rapidly so as to meet the demands of development of our national economy. The tasks ahead are mainly as follows:

1. Strengthen geological exploration, develop an effective means of prebody evaluation and get a clear knowledge about industrial asbestos reserves.
2. Study new technique and equipment of milling for more efficient fibre separation and fibre recovery, fit up the mines with advanced facilities in order to increase productive capacity, develop mechanical bagging machines and bring fibre dust under control.
3. Rationalize the present fibre standard for both mills and asbestos products factories.
4. Increase production and varieties of products, develop new technique and equipment and find out more ways for short fibre utilization.

During the current period of readjustment of national economy, we must bring the potentialities of the existing enterprises into full play, carry out rational technical reforms, reduce consumption of raw materials and raise quality of products and production efficiency in order to expand production.