Asbestos Fibres: Production and Usage

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DURING the past five years, production of asbestos fibres has increased in all countries that list asbestos as one of their mineral resources. Despite the many small mines that have been opened in Canada, United States, Mexico, South America, Italy, South Africa, Australia, Yugoslavia, and Rhodesia, the supply still does not meet the demand. It is estimated that total 1952 world production of asbestos fibres of all varieties approximated 1,600,000 tons, with Canada supplying 966,382 tons (1), or 60 per cent of all fibre mined.

Asbestos fibre brokers continually are offering odd-lot samples of chrysotile, amosite, crocidolite, tremolite, and anthophyllite fibres to manufacturers, quoting fantastic prices for tonnages varying from just a few to 50 or more in a month. In many cases, the samples are not properly graded and contain quantities of rock impurities and finely ground dust.

When vendors submit samples of asbestos fibres, the manufacturer should consider them in terms of price, quality, quantity, and as possible substitutes for fibres currently used in his products.

Grading of these odd-lot fibres in most cases has been poorly done, with resultant non-uniform fibre lengths. In some instances, a number of miscellaneous lots of fibres have been blended for sale. This blending produces a fibre that is difficult for the manufacturer to accept as a substitute for the well-standardized Canadian fibres.

All fibres offered to the purchasing departments of most manufacturers usually are forwarded to their research units, where they are carefully examined for length, grade, and quantities of rock, dust, and such foreign materials as wood and wire. Comparisons are made with standard Canadian grades, or, if the fibre is of some other variety, comparison is made with shipments of that grade received during the past five years. If the sample is only a small quantity, such as a few grams, it is placed between two glass plates and reflected against a white wall, where the lengths may be measured and the impurities counted. When large samples are available they are given special tests to evaluate the fibres for use in regular products. These special tests include air separation and screening in a pilot plant to determine impurities ranging from large +4 mesh fragments of rock to —35 mesh granular material. Then the clean fibres as well as the original fibres are combined separately with the necessary ingredients to produce a commercial product. Physical tests on the product furnish further factors for evaluating the fibre.

Should a sample of fibre pass laboratory tests, it is customary to request three to ten tons for a plant test before final approval is given. When the large shipment of fibre arrives it is thoroughly sampled and re-tested, and the data compared with those of the original sample. If both sets of data are comparable and the plant tests are satisfactory, fibre specifications are drawn up for future purchases of this grade and variety of asbestos.

In some cases, the quality of the fibre is so poor that anyone accustomed to fibre examinations will realize that it is worthless before tests are made.

The three varieties of asbestos used in large quantities industrially are chrysotile, amosite, and crocidolite. Although actinolite occasionally appears on the market, no published records show how much is used, and we may consider it of minor importance.

Chrysotile

Chrysotile asbestos is the most popular variety for industrial purposes and probably accounts for 90 per cent of all asbestos fibres used in industrial products.

The quantity of chrysotile imported by United States industry in 1952 was approximately 734,500 tons (2), 668,800 tons of which came from Canada. When available, some Rhodesian and Arizona chrysotile fibres are used in textiles, special papers, and asbestos-cement products. Last year the textile industry in the United States imported 26,445 tons (2) of chrysotile fibres, including No. 1 and No. 2 crudes and Group 3 fibres. This amount includes 24,631 tons of spinning fibre from Canada, and 1,824 tons of C.&G. No. 1 and No. 2 from Rhodesia. These fibres usually are re-processed by the consumer and then carded and formed into blankets, rovings, threads, cords, ropes, and yarns of various classifications depending on demand. Asbestos cloths, tapes, wicks, and braided tubing all are made to meet particular specifications.

Fibres prepared in the textile plant (3) are used in such products as awnings, brake linings, blankets, conveyors, curtains, clothing, gloves, bag filters, draperies, coverings for electrical and power plant equipment, flexible metal tubings, packings, chemical filters, thermal insulating materials, friction materials, clutch facings, gaskets, electric blankets, ironing board covers, joint fillers, turbine jackets and blankets, and plastics.

The shortage of spinning fibre has resulted in off-grade so-called

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(1) Preliminary estimate by Industry and Merchandising Division, Dominion Bureau of Statistics, Ottawa.

(2) BOWLES, Oliver, U.S. Dept. of Interior, Washington, D.C., private communication.

(3) *A Primer on Asbestos Textiles*, prepared by the Asbestos Textile Institute, 1946.

"textile" fibres being offered to customers. Most of these fibres come from sources other than Canada and often are poorly graded. They sometimes are brittle and contain high percentages of non-fibrous materials.

On several occasions, small samples of textile fibres from foreign countries have been submitted and found to be satisfactory in length, strength, and in quantity of such impurities as magnetite, limestone, rock, and dust. An order of a ton of the fibre, however, proved entirely different and resulted in large card drops because of brittleness and non-uniformity of fibre length. Brokers submitting samples of textile fibres should get a guarantee from the miners that shipments of fibres will be equal to samples submitted to prospective customers.

For papers and millboards, most manufacturers use fibres of Groups 3 to 6, depending upon the kind of products being made. The longer fibres are used in special papers or diaphragms requiring sufficient length to give reinforcement. The types of paper products manufactured by a paper mill are numerous and may be mentioned briefly as electrolytic cell or diaphragm, wick, pipe covering, millboards, roofing papers, laminated roll-board, roofing felts, pipe line felts, welding paper, and similar materials.

Fibres for asbestos-cement products vary from Groups 4 to 7, inclusive, depending upon the methods of manufacture. This group of products includes shingles, pipes, jackets, flat sheets, corrugated sheets, wall boards, and electrical panels.

Asbestos asphalt roof coatings usually contain fibres of Groups 6 and 7, and floats, depending upon the particular coating being manufactured. The use of floats was discussed in *Asbestos Floats* (4) presented at the Ottawa General Meeting of the Institute in January, 1952. In this presentation, many of the physical properties and uses of floats were discussed.

The popularity of floor tiles made from organic resins and asbestos fibres has resulted in exceedingly large sales. Group 7 fibres used in floor tiles by all leading United States manufacturers amounted to approximately 170,000 tons in 1952.

Asbestos-cements contain fibres of Groups 6 and 7, as well as floats, the fibre used being governed by the cement. The quantity of fibres used in these products in the United States in 1952 was approximately 30,000 tons.

Amosite

United States industry imported 18,319 tons of amosite fibres (5) from South Africa last year. This was approximately 30 per cent of the total African production.

Samples of amosites are being offered by many vendors and brokers. In some cases, the same samples appear under different identification numbers. These envelope samples actually are too small for evaluation and many times appear to be of good quality, although larger samples of the same fibre contain high percentages of rock and are rejected. In many cases, the fibre length is so short that it falls into the filler classification. When properly processed, this variety of asbestos is bulky and light in density, and frequently is suitable for insulations.

Amosite imported into the United States gradually is becoming shorter in length and dirtier, and contains considerable rock. It is necessary, therefore, for the consumer to reprocess the fibre to remove the non-fibrous material which should have been removed in Africa. This additional processing cost plus loss of the non-fibrous material has raised the cost of this fibre to a point where substitutes will be given consideration.

It is not known what kind of control tests are maintained on the production of amosite fibres in Africa, but it is suggested that, whatever they are, they should be reviewed in terms of consumer needs.

Amosite is not as strong as chrysotile or crocidolite, nor does it have the good flexing properties of these fibres for use in textiles. Occasional samples of amosite, however, possess sufficiently high strength and good flexing properties to be used in textiles, if they were available in quantity. Products requiring light weight and not needing high strength can be greatly improved by the use of this variety of asbestos. Amosite fibres, with or without other varieties of fibres, will exhibit low densities, fairly good strength, and good insulation properties, and, when properly processed, can be formed into magnesia blocks and pipe coverings of low density and good insulating properties.

Amosite, combined with other fibres and fillers, is used to produce lightweight asbestos-cement wallboards that are attractive, easy to install, and possess good insulation properties. A most recent installation of this construction is found in the fireproof walls of the new American ship, *United States*.

Crocidolite

Crocidolite asbestos is found in commercial quantities in South Africa and also in Austria. Smaller mines in other countries do not produce much fibre of this variety. Africa produced 44,734 tons of crocidolite last year. United States industry imported about 7,100 tons, including 274 tons of Australian Blue fibre (6).

That the quality of crocidolite fibre has decreased during the past five years is evidenced by a decrease in length and an increase in rock and extreme fines in the form of finely ground ironstone. Many vendors and brokers are offering samples of crocidolite as odd lots. Some fibres are so short that they fall into the filler class. If the quality of this variety of fibre continues to decrease, it will be natural for customers to investigate substitutes.

Because of its physical properties, crocidolite lends itself to some special applications that are not practical for chrysotile. For example, this type of fibre has very high tensile strength, has good acid-resisting properties, will give good porosity when formed into a filler mat, and will filter out small particles of dusts, smokes, and suspended particles in gases.

Crocidolite can be converted into textiles with some difficulty but it does not lend itself to carding and weaving as easily as does chrysotile.

Probably its greatest application is in asbestos-cement products where its properties of strength and increased porosity improve manufacturing processes and boost production rates. Crocidolite is extremely effective in acid-resisting gaskets and the so-called service

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(4) Badollet, M.S., C.I.M., Trans., Vol. LV, 1952, pp. 185-189.

(5) Bowles, Oliver, U.S. Dept. of Interior, Washington, D.C., private communication.

(6) Bowles, Oliver, U.S. Dept. of Interior, Washington, D.C., private communication.