

FILE NAME: Trade Publications (TR)

DATE: 1947 Aug

DOC#: TR048

DOCUMENT DESCRIPTION: Trade Journal Article - Recovering Asbestos Floats with Dust Collectors



AUGUST, 1947

ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY

VOL. 50, No. 8

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ROCK PRODUCTS is published monthly by MACLEAN-HUNTER Publishing Corporation, 309 West Jackson Blvd., Chicago 6, Illinois; Horace T. Hunter, President; John R. Thompson, Vice President; J. L. Frazier, Secretary. Copyright, 1947. Entered as second-class matter, Jan. 30, 1934, at the Chicago, Ill. post office under the act of Mar. 3, 1879. Additional entry at Milwaukee, Wis.

SUBSCRIPTION INFORMATION

Subscription Price: United States and Possessions, Canada, one year, \$2.00; two years, \$3.00; three years, \$4.00. Pan American, one year, \$4.00; two years, \$7.00; three years, \$10.00. All other foreign, one year, \$6.00; two years, \$12.00; three years, \$15.00. Twenty-five cents for single copies. Indexed in the Industrial Arts Index. Canadian subscriptions and remittances may be sent in Canadian funds to ROCK PRODUCTS, P. O. Box 100, Terminal "A" Toronto, Canada.

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Recovering ASBESTOS Floats with Dust Collectors

By L. J. WIESCHHAUS*

DUST clouds created in the milling of asbestos have long defied efficient and economical collection and it is only recently that this problem has been successfully solved. Because of the vast quantities of asbestos lost in the form of dust and because of the high market value of these "floats" at the present time, it may be well to consider some of the factors involved in the collection of asbestos.

The physical properties of asbestos, while not unique individually, present a combination of problems which are a tax on the ingenuity of the dust collector engineer. A few of these properties are:

1. **Fibrous nature.** The characteristic of a fibre is that it has a tendency to interlace and form a mat which makes pneumatic handling difficult.

2. **Friability.** Asbestos has the ability of breaking down successively into smaller and smaller fibres, thus ultimately creating a dust of such minute particle size that it becomes suspect of being hazardous. This means that a successful collector must have an extremely high degree of efficiency for particles of a size smaller than 10 microns.

3. **Effect of Moisture.** As the particle size decreases it becomes increasingly affected by moisture which, when present in excessive amounts, causes

the dust to "cake" in a solid, impermeable layer on any filter medium.

4. **Low apparent specific gravity.** Although its real specific gravity is 2.54 to 2.59, finely divided asbestos has an apparent specific gravity of only about 1/4 or 1/5 of that figure. The fibrous, fluffy nature of the material is a serious handicap in any settling operations.

These are the principal physical characteristics which are important for considering the problem of dust recovery in this industry.

Types of Collectors

In the milling of asbestos the principal sources of dust are in the crushing, sizing and grading operations. All of these are controlled by preliminary cyclone type collectors and the success with which the dust is removed from the source depends primarily upon the design of the hood arrangement. Unfortunately, the low velocity cyclone type collectors generally used are often inefficient with respect to settling out the finer sized particles, and it is in the collection of dust from the discharge of these cyclones that the real problem of dust control arises in the asbestos industry.

One secondary form of collector which has been used in practically all

asbestos mills is the dust shed. The dust shed serves two main purposes: (1) it serves as a settling chamber so that a large portion of the effluent from the cyclones can settle out by gravity before it is discharged into the open air and (2) by removing the discharge point to a remote point from the mill proper, it seeks to assure that most of the dust will be carried away by the wind rather than being returned to the working area. One obvious disadvantage of this method is that it permits vast quantities of dust of low particle size to float over the surrounding area.

Another method of dust prevention which has been tried is "wet" processing. This method does serve to eliminate a great deal of the dust normally attendant on asbestos preparation, however, it resulted in almost insurmountable production difficulties. The time required and the handling problems encountered in drying the material at the proper temperature made the process impractical. Also, a certain amount of handling was required after the material had been dried and it was still necessary to provide some sort of dust collection methods for the dust created in this operation.

Another type of collector which has been used in this industry and which has met with considerable success is the electrostatic type of collector. Electrostatic collectors, however, have two serious drawbacks: First, the cost of the original installation varies with the degree of efficiency desired, and the relationship between cost and efficiency is that of an acutely rising curve, rather than a straight line. Second, for maximum efficiency, an electrostatic collector must be designed for operation at a fairly definite dust concentration and its efficiency drops off when it is used at any other concentration. In adapting a collector of this type to the asbestos industries it must be designed for median operation and hence cannot be expected to operate at its maximum efficiency at all times. The reason for this is the great variation in dust load which results from variations in rock, rock temperature, mill temperature, moisture conditions, etc.

Even under the most ideal conditions, and especially so under the operating conditions which prevail in the asbestos industry, there is a certain amount of effluent from electrostatic collectors. Even though the collector may be 98 or 99 per cent overall efficient, the effluent is visible, which

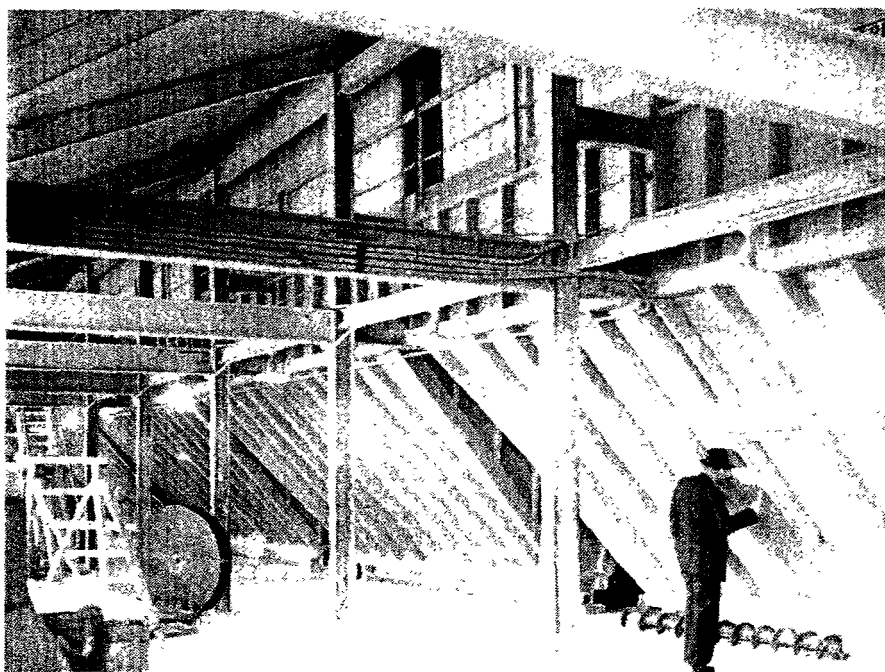


Fig. 1: Partial view of the collector installed at the Johnson's Co. mill in Thetford Mines, Quebec. Four of the six collectors are visible. Inspection window may be seen to the right

is a sociological disadvantage, and it is of very small particle size. This type of collector does have two distinct advantages over most other collectors in that it has very low power requirements and very low back pressure.

Another type of collector which has been tried in the asbestos industry, and which has met with considerable success, is the filter type. Filter type collectors, when using ordinary cloths, are at a disadvantage in certain operations where extremely high temperatures or high moisture contents are encountered or in collecting material of a viscous nature, however, when properly applied, they are ideally suited for a material such as asbestos floats.

From a consideration of the physical characteristics of asbestos, as described above, it will be seen that considerable care must be exercised in designing any type of filter to handle this material.

Because of the fibrous nature of the particles, the filter material must be of such a material and weave as to offer the least possible encouragement to the fibres to interlace and interlock with the fabric. This is very important if the shaking mechanism is to do an efficient job of cleaning the bags.

Because of the friability of asbestos with its resultant small particle size, it is important that the cleaning cycle and cleaning mechanism be designed so that they leave a certain amount of "filter cake" in the bags at all times. The "filter cake" is the actual filtering medium and is absolutely necessary if the fine particles are to be stopped. This, incidentally, prohibits the use of reverse air flow during the cleaning cycle since this practice gets the filter cloth too clean.

Care must be exercised to keep the asbestos reasonably dry to prevent caking in the collector.

Bag proportions must be given careful consideration because of the very low apparent specific gravity of asbestos. If the bag length is too great in proportion to the diameter, the bag will form a trapping structure when it is shaken, greatly hampering the cleaning operation. A useful rule of thumb developed during the years that metallurgic bag houses have been in operation is that the length of a bag shall not be greater than 30 times the diameter.

Filter Type Operates Successfully

An example of the successful use of a filter type collector in the asbestos industry is presented by Johnson's Co., Ltd., Thetford Mines, Quebec, which has had such an installation in operation now for more than six months.

The first step in this installation was the purchase by Johnson's Co. of a small 5000 c.f.m. collector to be used

(Continued on page 176)

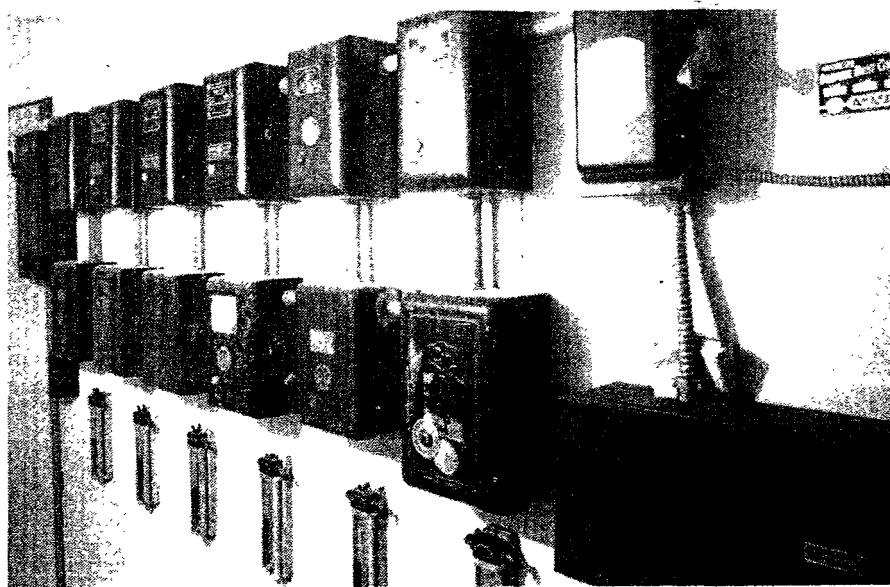


Fig. 2: Electrical control panel. Individual manometers are supplied for each collector unit to provide check on completeness with which collectors are shut off during shaking operation. To the extreme right is electrical timer controlling shaking cycle

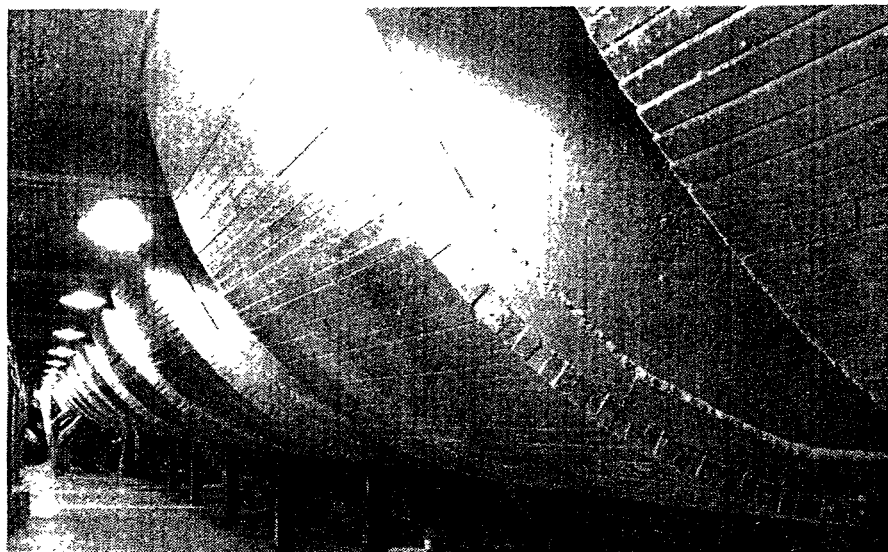


Fig. 3: Inlet duct which carries dust laden air into collector hoppers

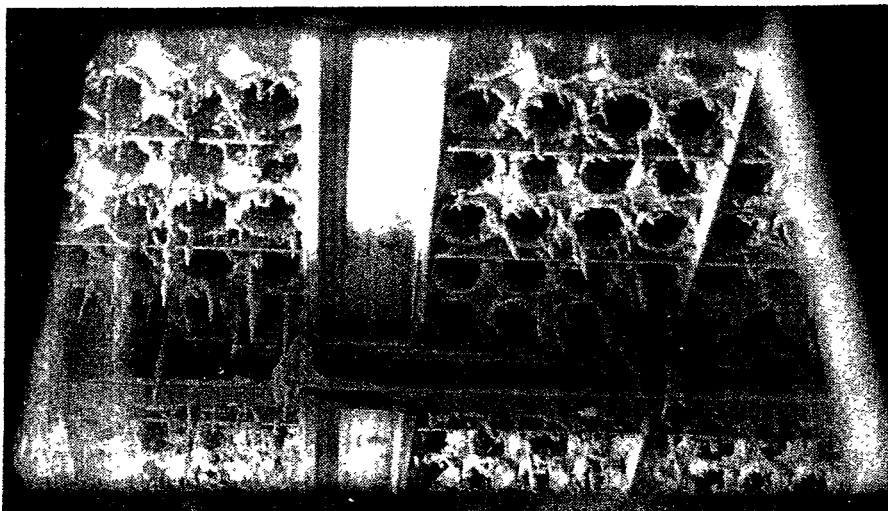


Fig. 4: Underside of cell plate. Note that none of the tubes are bridged over in spite of the "clinging" nature of the asbestos fibers

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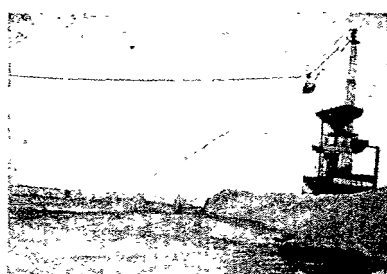
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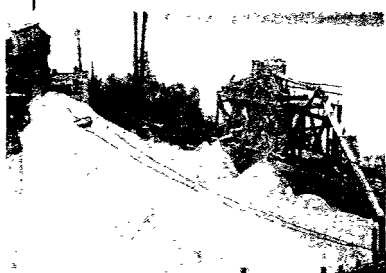
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Asbestos Dust

(Continued from page 105)

as an experimental unit. This collector was tapped into the dust system and subjected to a series of rigid tests by the company's engineers. The purpose of the tests was to determine: 1—the optimum air-cloth ratio; 2—the cleanliness of the discharge air; 3—the back pressures resulting from various operating procedures; and 4—the effectiveness of the shaking mechanism. The fourth point was the one about which the greatest doubt existed and it received the most rigid tests. On several occasions asbestos floats were actually shoveled into the collector until the bags were stuffed and the collector then shut off and shaken. The back pressure returned to normal almost immediately.

These tests showed that the filter would handle an air flow of $4\frac{1}{2}$ c.f.m. per square foot of cloth and, with an operating and cleaning cycle of 40 minutes, the back pressure varied between $\frac{1}{2}$ and $1\frac{1}{2}$ in. of water. The discharged air was well within the standard health requirements of less than 10 million particles smaller than 10 microns in one cubic foot of air.

On the basis of these tests a 400,000 c.f.m. unit was purchased and installed to handle the complete dust load from this mill.

The entire installation was made with practically no interruption in the regular operation of the mill. It is estimated that approximately two hours of operating time were lost when the dust collector was being switched into the system.

Figs. 1 through 4 show the construction and operating features of the collector as it is installed. This is a bag type collector with bags of sateen weave cotton fabric, 8 in. in diameter and 17 ft. 6 in. long. Spring steel bands hold the bottom of the bags in aluminum cell plates while the tops of the bags are suspended from the shaking mechanism. The shaking mechanism consists of a motor driven eccentric which transmits a horizontal shaking action to the bags. The resulting bag motion is similar to that obtained when a small rug is shaken by hand. The spring steel clamping arrangement at the cell plate permits easy bag replacement. One man can remove and replace a bag of this type in less than one minute.

There are six collecting units arranged in such a way that five are always in operation while the sixth is being cleaned. The cleaning cycle is controlled automatically by an electric timing mechanism shown in Fig. 2, and it operates on a predetermined time cycle. At the proper time the electrical control mechanism causes an electro-pneumatic valve to close the

dust is dropped down into the hopper below. From there it is carried by means of a screw conveyor to one end of the hopper where it drops through a chute to a conveyor box in the floor below. A drag chain in this conveyor duct carries the floats from all six collectors to a central point of discharge where it is graded and bagged for shipment.

Only once has any difficulty been encountered in the maintenance of proper back pressure. This occurred when an exceptionally wet batch of rock was being processed and the moisture content of the dust was sufficient to cause an almost impermeable cake to build up in the bags. This was corrected by the simple expedient of shutting off the wet rock and circulating dry dust through the collector until the pressure returned to normal.

This is an "all pressure" system with the necessary pressure being supplied through the cyclone separators used in the grading process. No supplementary fans were required when the dust collector was added to the system. The additional power required to overcome the resistance of the system was provided by using an improved type of fan wheel which increased the fan performance and efficiency to such a degree that not a single horsepower was added to the total fan load.

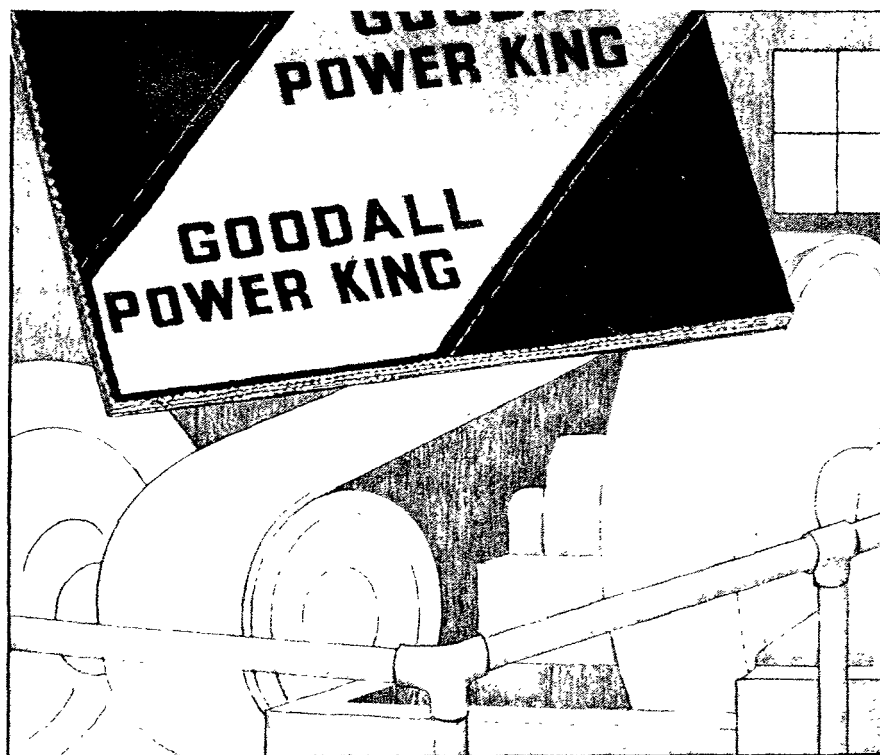
No serious trouble has been encountered since the installation went into operation although it is currently being operated at a 10 per cent overload. Approximately 22 tons per day of marketable asbestos is being collected. This material is all regraded and bagged according to its market classification.

Cement Production

BUREAU OF MINES reports that production of finished portland cement during April, 1947, totaled 14,566,000 bbl. or 15 per cent greater than that reported for April, 1946. Mill shipments reached 15,414,000 bbl., a figure essentially the same as that reported for April of the previous year. Stocks of finished portland cement on April 30, 1947, were 21,330,000 bbl., an increase of 34 per cent over that reported for April, 1946. Demand for cement was higher in 10 districts and lower in nine, than that in April of last year. The long-term trend in production of finished portland cement continues upward, increasing during the first four months of 1947 at an average rate of 2,989,000 bbl. per month.

The following statement gives the relation of production to capacity, and compared with the estimated capacity at the close of April, 1947 and April, 1946.

	RATIO (PER CENT) OF PRODUCTION TO CAPACITY				
	Apr. 1947	Apr. 1946	Mar. 1947	Feb. 1947	Jan. 1947
One month	74.0	64.0	69.0	68.0	66.0
Four months	73.0	50.0	72.0	71.0	70.0



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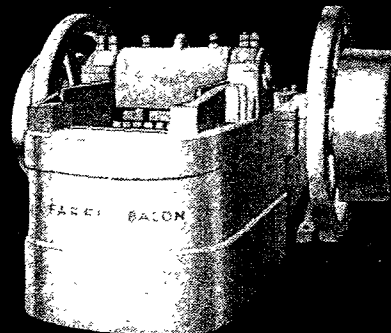
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