

ASBESTOS PLANT,

BEACONSFIELD DISTRICT

Preliminary Remarks

Asbestos is generally marketed in two well defined classes, viz. "Crude" - obtained by "napping" the rock from the fibre, and the other produced by milling. In the former, two grades are represented:- No. 1 consisting of fibre 1" or more in length and No. 2 three quarters to one inch. In the latter class, i.e. milling, several grades are produced.

Comparatively high prices are paid in England for the "crude" class if the fibre is over $\frac{3}{8}$ " long and is suitable for spinning. For the latter purpose it must be free of breaks.

From information available, there appears to be very little fibre of this length in the Beaconsfield district, and it is doubtful whether it would pay to save it by "napping".

The Wunderlich Ltd. who operated a mill in this district discarded the material of short fibre and produced one grade only of asbestos.

In the proposed mill under consideration it is intended to produce two grades.

It is absolutely essential that special machines be used in the treatment of asbestos bearing rock. Machines which have been successful in other types of milling processes, and which might appear suitable for milling asbestos always give poor results.

In designing a treatment plant for separating asbestos fibre from the rock and its preparation in marketable condition various factors have to be considered in addition to the four main processes, viz. Crushing, drying, screening and the suction of the fibres from the sieve.

Site

The site on which the proposed mill is to be erected has not yet been decided upon.

The transportation of the ore to the mill, the contour of the land and its suitability for a tailing dump are the chief factors to be considered in selecting the site. If the mill is to be supplied with ore from numerous claims, the location and value of the largest deposits must govern its general position. The actual selection of the site will depend upon whether it is more advantageous to build on sloping or flat ground. In the former the ore is conveyed by gravity and with few elevators, but the cost of erection is often appreciably higher. The latter is the more common practice notwithstanding the unavoidable delays caused by the breaking of elevators.

Capacity

It is estimated by the miners and others interested in the mining of asbestos in the Beaconsfield district that an output of approximately 15 tons of selected ore could be maintained daily by 30 men, and that the average grade of the material mined would contain 2 per cent. of recoverable asbestos using a plant capable of separating one grade.

This figure is not borne out by the operations of the Wunderlich Ltd., who, no doubt, commenced work on the most promising outcrops and removed 48,000 tons of rock for 441 tons of chrysotile fibre, or a little under 1 per cent.

Taking into consideration the present undeveloped state of the field and the average grade of the ore which has been mined I do not consider that small working parties could produce 15 tons of selected ore daily to keep a small mill running regularly one shift and it is not desirable on the score of economy to operate it intermittently.

By working the known surface outcrops and operating the faces which have already been opened up by the Wunderlich Ltd., the above output could probably be maintained but for a few months only.

Owing to the erratic occurrence of chrysotile a vigorous systematic policy of development is necessary to determine the quantities of payable ore available. If the deposits open up so satisfactorily as to warrant the erection of a plant, I consider it essential that the capacity of the proposed mill be such that it will be capable of treating from 40 to 50 tons of fibre bearing rock per day of eight hours.

Motive Power

The prospects of generating electric power in the district on a fairly large scale at a reasonable cost are not good although this would be the most convenient form of power to use, not only for operating the mill, but for haulage, transport and other purposes.

Unless there are other prospective users in the Beaconsfield district to warrant the erection of a transmission line by the Hydro-Electric Department this form of power cannot be considered.

Under these circumstances I consider it advisable that the plant be driven by a suction producer gas engine 120 H.P.

If it is found necessary to run two shifts a small engine of this type can be installed to provide motive power to a dynamo which can be used to provide light for the mill.

Housing of Plant

The buildings to be constructed of wood on solid concrete foundations and to be covered with wood and corrugated iron.

Milling Process

The mill under consideration comprises a crushing and a drying section; and a crushing, screening and suction unit.

Crushing and Drying Section

A jaw crusher of the Blake type to be used with size of receiving capacity about 8" by 14". Primary crushers of this type are less injurious to the contained fibre than the gyratory crushers and the former are more economical to operate than the latter unless large tonnages are dealt with.

The ore coming from the Blake crusher to be dried in a single tube horizontal rotary drier 30 feet long by two feet in diameter with a fire box at one end and a chimney at the other. The drier to be fitted with longitudinal blades, to have an inclination of 7° and to turn on friction rollers. With the exception of the latter the whole to be bricked in. The space between the arch and the cylinder to be 6 inches. The drier to be gear or chain driven and the feeding to be done automatically. The main advantages of this type are continuity of operation and the ease with which large quantities can be treated in a short space of time. Revolutions of drier 6-8 per minute. The ore from the drier is conveyed by an elevator to an ore bin with a discharge through an automatic feeder to a secondary crusher of the gyratory type instead of rolls, as although the twisting motion of the former tends to a slight extent to lower the grade of the fibre, yet the action of the rolls so compresses it that the subsequent separation by screening is rendered much more difficult than if the ore had been broken in a gyratory crusher. Rock fed into the latter has a marked tendency to slide upward and jump, an action likely to break the fibre. This jumping tendency can be overcome by choke feeding.

A bucket conveyor delivers the ore to a Torrey cyclone which is capable of reducing the dry ore from 2 inches to ¼" without injuring the fibre. This operation is considered the greatest problem in asbestos milling. The Torrey cyclone has been designed solely for asbestos bearing rock. It is a vertical type crusher. Ore is fed through the opening and falls on a wearing plate of manganese steel. From there it is caught by horizontal impellers, which revolve at 1100 to 2000 R.P.M. The ore is hurled from these vanes into manganese-steel jaws. The impact is sufficient to break the rock and liberate the fibre without cutting it. This machine has a tendency to fluff the liberated fibre, which helps in the succeeding screening processes. After treatment in the cyclone the material falls on to a flat shaking screen 4' wide and 10 feet long and with 1/16" holes. The screen separates the sand from the fibre. The horizontal motion which causes the sand and fibre to slide back and forth is not conducive to an exceptionally clean separation because the asbestos fibres have a tendency to clog the holes. Although the use of flat shaking screens has become universal, a new type, the Mitchell, recently tested in one of the mills of the Amalgamated Asbestos Corporation, has proved very successful and is now being installed. It has a swift vertical motion and keeps the fibre in suspension above the screen cloth and allows the sand to pass through quickly. This results in a cleaner grade of fibre. If the Mitchell screens can be purchased at a figure approximating the flat screens

I would recommend their use in preference to the latter.

The fibre in the material that comes from the top of either type of screen is taken up by a fan and deposited in Collector No. 1. The undersize is taken by a conveyor to sand dump. The residue from the screen is delivered to Torrey Cyclone No. 2. This machine is fitted with an additional set of vanes which revolves below the first and the hurling and breaking action is repeated.

Any tramp iron entering the machine does not hit the vanes as they revolve, but slides with them.

The discharge of the cyclone goes to shaking screen 1/16" holes. The fibre is drawn by a fan to collector No. 1. The residue and undersize is conveyed to sand dump. From here the fibre falls to a grader which is a revolving octagonal screen having arms within which move in a direction opposite to that of the screen. In this 5/16" screen two grades are made, the comparatively long fibre thrown on one shaking 10 mesh screen, and the undersize on a 12 mesh. These screens effect a partial separation. The oversize from the 10 mesh is drawn by a fan to collector No. 2. From here it falls to a revolving grading screen 10 mesh. The oversize constitutes No. 1 Fibre ready for market. The tailing is taken by a conveyor to store dump. The undersize from the 5/16" revolving screen is thrown on to a 12 mesh shaking screen. The fibre is drawn by a fan to Collector No. 3.

The tailings from the last screen and No. 10 mesh are thrown on to a 12 mesh shaking screen and the fibre is drawn by a fan to collector No. 3. The latter now contains No. 2 grade asbestos fibre ready for market. The fine asbestos powder is conveyed to the store dump already referred to.

If the demand for asbestos powder for plastering warrants the erection of an emery mill for fine grinding this equipment can be added subsequently, but is not included in the present estimate.

Cost of Mill

This will depend upon the general design, capacity, and type of mill; design of building, site, foundations necessary, details of construction, material and machinery.

Owing to the fluctuation in the cost of building materials and machinery, the estimate is an approximate one. Another important factor bearing on the cost of construction is the mill site. The latter has not yet been selected.

The following factors have been taken into consideration in arriving at the approximate cost:- Excavations, concrete foundations for buildings and machinery, timber and iron used in construction of buildings and plant, building supplies hardware, etc., bricks, crushers, drier, elevators, Torrey cyclones, shaking screens, conveyors, revolving grading screens, fans, suction gas plant, belting, collectors, shafting pulleys, journals, hangers, bolts, etc.; installation of plant and general superintendence.

The estimate does not include the cost of transporting building materials and machinery to the proposed mill site, erection of huts, laying of tramways, providing explosives and tools for the miners.

The cost of plant is estimated at Five thousand nine hundred pounds (£5900).

The cost of tools and explosives for 15 parties of two each for the first month would be approximately £150.

(Sgd.) W.D. Reid
GOVERNMENT ASSAYER.

GEOLOGICAL SURVEY, LAUNCESTON.

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