TECHNICAL AND SCIENTIFIC DEVELOPMENTS RELATED TO THE ASBESTOS INDUSTRY IN GERMANY

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BY

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A B S T R A C T

This report reveals some processes and methods applied by the German asbestos industry which were considered sufficiently valuable to be reported. A detailed plan is given on preparing and automatic batching and mixing of asbestos spinning stock. Cards for producing yarn from short asbestos fibers are described as are some auxiliary machines and installations. A report is given on the subject of elimination of dust for the prevention of silicosis (asbestosis) and findings by research workers in the medical field are submitted.

The results of the attempted synthesis of asbestos are presented, based on already published and hitherto unpublished papers and on personal interviews with people concerned.

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I N T R O D U C T I O N

Objective:

The object of this report is to submit data and a description of machinery and installations found to be used by the German asbestos industry and considered to be of interest to the American industry. It also gives details on dust prevention and about the work on the development of synthetic asbestos.

Evaluation:

This report should be considered a supplement of previous reports about the German asbestos industry. In this connection it is especially referred to FIAT FINAL REPORT 460, and BIOS FINAL REPORT 404, Item 22. To go into detail about the general condition prevailing in the German asbestos industry would merely be a repetition of the contents of previous reports. However, it can be stated that since the previous investigations were made, the production facilities at the plants visited have been restored to an appreciable extent. Buildings have been re-erected and machines repaired or restored and put into working condition.

The main problem for the German asbestos industry at the present moment is the lack of raw material. The small stocks of raw asbestos on hand at the end of the war are practically exhausted and essential goods needed by other industries for starting or continuing production can neither be produced in sufficient quantities nor of the required qualities.

To some extent better conditions were found in the British Zone. Shortly before this investigator's visit 600 tons of raw asbestos were made available to the industry. This material had been stored away in a mine in the northern part of the American Zone for safekeeping against Allied bomb raids. The ownership was claimed by a Hamburg import company and on the strength of the evidence submitted, the raw asbestos was handed to them and transferred to the British Zone.

A further shipment of 1000 tons, mainly blue asbestos spinning fiber, was expected to arrive within a short time via England.

Though some machinery and installations mentioned may not be unknown in America, their use in connection with the production of asbestos goods was considered to be of sufficient interest to be included in this report.

PREPARING AND BATCHING OF SPINNING STOCK

The importance of preparing spinning stock is well known to all processors of asbestos and manufacturers of asbestos goods. Numerous ways have been tried and many methods have been applied. In most cases, however, the treatment of the asbestos fiber was too harsh and resulted in an excessive loss due to shortening of the fiber staple, or, the process was too slow to make it economical and to obtain the requested amount of production. In general, very little has been done to eliminate, at the start, those short fibers which will be lost or eliminated from the original stock in the course of production. These short fibers not only tend to decrease the quality and appearance of the finished product, but also cause an increased wear and tear of the cards which have to be stripped more frequently. They also render more difficult the elimination and prevention of dust (see page 8).

While the present condition of German asbestos plants can offer only an overall picture, the set-up for obtaining a clean and well opened asbestos spinning stock as formerly used by Frankfurter Asbestwerke was found unique and most efficient by this investigator. German personnel who had access to most of the asbestos factories on the continent during the war also confirmed this fact. Due to the war damage caused to the textile plant of Frankfurter Asbestwerke the machines are not now available for investigation. The investigator had, therefore, to compile the details of this report from his own memory and in cooperation with personnel, formerly in charge of that plant. The following process was applied:

1. The raw asbestos, particularly of the grades Crude 1 and Crude 2 is loosened up in a crushing roller mill (Kollergang) which, however, deviates from the conventional chaser mill with cylindrical rollers by having wide conical rollers. Thus undesirable friction between the rollers and the trough is eliminated by rollers having the same speed at the hub as at the periphery. The rollers, running on an inclined surface can thus be built larger and heavier resulting in larger amounts to be treated at a time, faster production and smoother handling of the fiber.

2. The raw asbestos is sent through a vertical opener. (Crighton Opener) which is operated with opened or closed grid in accordance with the quality of raw material processed.

3. The opened fiber then enters a screening drum, where impurities are eliminated. This screening was found especially important in preparing high grade and pure (100% asbestos) spinning stock. The machine consists of a large inclined drum with a bottom of exchangeable sheet metal sieves having openings varying from 1/8 to 1/3 of an inch. Spiral beater arms treat the material thoroughly while transporting it across the sieves to the end of the drum.

The screening of the asbestos provides the mill with grades of fiber which comply with the needs of production and quality required. For once a long fiber, clean and of highest grade is obtained. Secondly, from the screened out waste fiber mixed with other waste from the mill and screened on a smaller sieve, a shorter spinning fiber is obtained, and the producer is able to determine how high a percentage of this shorter fiber he can allow in the various mixes, and use the remainder in other products. Thus, he is fairly sure to have a uniform stock, notwithstanding unavoidable variation of the raw material as it comes from the mines. Thirdly, most of the undesirable impurities and dust are eliminated.

Here are some typical results of asbestos fiber passed through the screening drum:

	long fiber	short fiber and dust
Johnson 3 R	77%	23%
Bells B	76%	24%
" II F	94%	6%
C & Q I	99%	1%

4. The various grades of raw asbestos are now ready to be blended into spinning stock - as the formula warrants - and to be mixed with reclaimed waste fiber and/or organic textile fiber (cotton, Zellwolle etc.), which previously has been processed and built to a lap on a cotton lap machine (Batteur).

In describing the further process of mixing, reference is made to Table 1, Appendix 5, showing a schematic presentation of the lay-out. A box of about 33 feet length serves as the hopper, the bottom of which consists of a steel blade conveyor (1). On this conveyor the various grades of asbestos fiber and the cotton lap are placed layer by layer in accordance with the formula. The hopper holds about 1 ton of material, but its size can be adjusted to the space available. After the hopper is filled, it is closed with a dustproof lid.

From now on the further processing and proportioning of the material is fully automatic until it leaves the cards as

sliver. The steel band conveyor (1) brings the material to a chopping wheel (2) which chops it off vertically from the horizontal layers, thus obtaining a fairly uniform amount from the various materials to be introduced in the product. Over a chute (3) the material drops on to the buckets or into the pit of a bucket conveyor (4) which brings it to the mixing drum (5). There the material is well blended and short fibers are eliminated through a screen (6). A spiral conveyor (7) brings this short fiber material to the outlet (8), where it is automatically bagged. The beater arms of the mixing drum (5) are shaped to support the air suction of a vertical opener (10) for transporting the stock towards the suction pipe (9). The vertical opener (10) has a completely closed grid and serves only for final blending and opening of the previously cleaned and screened spinning stock. From the vertical opener (10) the spinning stock goes directly to the various cards, or, if need be, to storage bins.

For the opening of spinning and other waste the Frankfurter Asbestwerke have been recently using a new type of attrition mill. Previously disintegrators (hammer mills) were used, especially for hard waste and similar material. Since the crusher rolling mill is not available now for loosening raw asbestos fiber, the attrition mill is used for this purpose, too. As to this type attrition mill, manufactured by Karl Behrens & Co., Grossauheim bei Hanau, reference is made to the documents microfilmed on reel No. 215 AA, on November 15, 1946. The documents describe a machine, called Condux Muehle for pulverizing, fiberizing, breaking up and reducing to small pieces of all kinds of material. It is claimed that the machine can be used for both dry and wet material. Its use is suggested for the rubber, paper and millboard, leather, rayon, chemical, asbestos and other industries. The plates are exchangeable for different materials and for various degrees of breaking up. The Frankfurter Asbestwerke use the machine mainly for breaking up waste material from the manufacture of gaskets from high pressure sheetings and asbestos millboard. A number of samples processed with this machine has been forwarded to TIID, U.S. Department of Commerce, Washington 25, D.C.

CARDS FOR PROCESSING SHORT ASBESTOS FIBER

By investigating the subject of carding, this investigator's attention was given to the method of using short asbestos fiber in asbestos yarn. While the system was applied originally in the plant of Kuechenmeister, Freiberg, Saxony, it was recognized as sufficiently important and efficient to be introduced in a modified form by Ernst Gessner, Aue/Erzgebirge, as a part of their program of producing special textile machinery for the asbestos industry.

In two previous reports - FIAT FINAL REPORT NO. 460, on page 5, and BIOS FINAL REPORT NO. 404, on page 5, this machine has been mentioned. Supplementing these reports a drawing (Table 2, Appendix 5) is herewith submitted. In this process the well loosened short fiber of the groups 3, 4, and 5 is introduced into a previously carded web of cotton or Zellwolle fiber. Two systems have been applied successfully:

1. The feed box (2) is placed at point A behind the breaker card of a two-card-set delivering the short fiber on the web passing the feed lattice of the finisher card. The finisher card runs only with three pairs of workers and clearers, to avoid too rough treatment of the fiber and to keep down the loss of short asbestos fiber.

2. The feed box is placed at point B (as shown in the drawing) and the short fiber is scattered on top of the lower web (3) of a double-doffer card without passing the card. Before entering the tape condenser the upper web (1) is placed on top of the asbestos fiber layer.

It was generally found that system No.2 proved to be more reliable as to the required asbestos content, and the blending of asbestos and organic fiber is rather satisfactory. It is claimed that by careful handling and controlling the equipment, an asbestos content of 70% can be assured.

It has been contemplated also to apply system No. 2, for slag wool in place of asbestos fiber. However, there was no evidence of successful test runs in this respect.

The card clothing used is comparatively coarse. For yarn numbers 0.5 to 1.4 metr. the breast roller has 10/12, the main cylinder 12/14, the doffer 14/16, the two fly rollers 16/18. The licker-in has Garnett clothing (saw tooth wire filleting). For yarn numbers ranging from No. 1.4 to 3.5 metr. the card clothing is somewhat finer, starting with 14/16.

Pages 38 - 40, Appendix 5, show three photos of this card with the feed box (2) and the upper web organic fiber (1) as described under No.2 above.

SPINNING

As a general rule, before the restrictions on account of the raw asbestos shortage were introduced, the German asbestos industry brought out two qualities of asbestos textile products with regard to the cotton content.

1. Technical pure (handelsrein)

2. Guaranteed pure (garantiert rein = 100% asbestos)

The first quality was kept within a variation of a few percent with 75 - 80% asbestos, while quality No. 2, had to be without any organic fiber. Except for special requirements and for yarns finer than No. 6 metr. (6000 meters per kilogram about No. 30 cut) the yarn is produced without cotton core.

Table 6, Appendix 5, shows the drawing of a ring spinning machine devised for continuous spinning from individual sliver cheeses. It is stated that to introduce wire to the sliver on the spinning machine instead of introducing it at the twisters has the advantage that the wire will be better centered in the finished yarn.

With respect to sliver made of low grade fiber for the production of coarse yarn and also for spinning carded glass fiber (see FIAT FINAL REPORT NO. 460), pot spinning machines as shown in Table 7, Appendix 5, have been employed successfully.

In this connection attention has to be called to a slight mistake in BIOS FINAL REPORT NO. 404. On page 11 it is stated: "The finest yarns of all had been made in Berlin (Deutsche Asbestwerke) where they had produced 200's (200,000 meters per kilogram)", and on page 58: "Their finest yarn is 80's (80,000 meters per kilogram)".

The finest yarn ever spun in the asbestos industry is No. 20 metr. which has 20,000 meters per kilogram or about 10,000 yards per pound. It would be equivalent to a yarn No. 100 cut. This yarn has been produced in former years by three companies in Germany. Under present conditions the finest number produced is generally No. 2.5 metr. (2,500 meters per kilogram = No. 12 cut).

HIGH SPEED BRAIDERS

Reference is made to microfilm 229 - CC of 14 January 1947 with which documents are submitted about High Speed Braiders manufactured by Guido Horn, Berlin.

These machines have been widely used in Germany in various industries for the processing of silk, cotton, wool, hemp, jute, ramie yarns and also wire. In recent years they were introduced in the asbestos industry for the production of packings and of laggings for heat insulation.

To the knowledge of this investigator and with respect to asbestos factories, only three of these machines survived the

war. They belong to Asbest & Gummi-Werke, Martin Merkel, Harburg-Hamburg. The Guido Horn company is located in the Russian Sector of Berlin, and, therefore, not accessible for further investigation.

The careful treatment of the yarn combined with the high speed of production makes these machines highly efficient. Compared with the amount of production on the conventional type braiding machine the machine by Horn achieves a 2.5 to 3.5 times higher production.

RECOVERY OF VOLATILE SOLVENTS

While investigating Frankfurter Asbestwerke a new installation for the recovery of volatile solvents was noticed, which was about ready to be put into operation.

The information obtained about this equipment seems to be interesting enough to acquaint the American industry with it. The documents and drawings compiled in the course of investigation have been processed as microfilm Reel No. 190 BB on November 7, 1946.

It refers to equipment designed and built by Silica Gel Gesellschaft, Dr. v. Luede & Co., Berlin, present address: Hof/Saale, which is recommended for the recovery of volatile solvents used in the manufacture of coated fabrics in the rubber, dry cleaning industry and in other industries.

In FIAT FINAL REPORT 464 : "SURVEY OF GERMAN COATED FABRICS INDUSTRY", the investigator refers to the solvent recovery systems used as follows: "Most plants had a solvent recovery system, though in most cases the capacity was not large. The recovery system varied from the use of all carbon, carbon and silica gel, and straight silica gel. All admitted of obtaining overall efficiency of only around 60 - 65%, although the management of one plant equipped with Silica Gel insisted he obtained an efficiency of 75 - 80%."

The efficiency of the system developed by Dr. v. Luede & Co. is claimed to be at least 95% of the vapor entering the containers. In this respect reference is made especially to the calculation of efficiency shown in the microfilm, although it has to be converted into American cost data and market conditions.

A feature of this process is claimed to be that continuous operation is possible, since two adsorption chambers are used, with automatic change from one to the other when the one is saturated.