Background Report Reference

AP-42 Section Number: 11.26

Background Chapter: 2

Reference Number: 5

Title: Written communication from J. Kelse, R.T. Vanderbilt Company, Inc. to R. Myers, US EPA, March 21, 1994

J. Kelse

R.T. Vanderbilt Company, Inc

March 1994

AP-42 Section 11.26
Reference
Report Sect. 2
Reference 5

R.T. Vanderbilt Company, Inc.
INDUSTRIAL MINERALS AND CHEMICALS

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March 21, 1994

Mr. Ronald E. Myers
Emission Factors and Methodologies Section
Emission Inventory Branch
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, NC 27711

Subject: Draft AP-42 Section 8.30, Talc Processing and Background Memorandum

Dear Mr. Myers:

Thank you for the opportunity to comment on the captioned draft and background memorandum. Information presented in the draft appears accurate. However, several key statements in the background memorandum regarding asbestos and New York State talc mining are not accurate.

This "asbestos" in talc matter has been the subject of considerable controversy which in recent years has enjoyed both scientific and regulatory clarification. We have highlighted the problematic statements in the memorandum, suggested appropriate correction and explained why these corrections are important. While by no means complete, we have also enclosed assorted support material and a list of experts as a possible secondary source of confirmation.

Despite overwhelming evidence to the contrary, there remain individuals and at least one government entity (NIOSH) which still cling to the beliefs reflected in the memorandum. Recognizing that there is honest confusion on some of these points, we encourage the Emission Factors and Methodologies Section to carefully review the supporting material and to contact some of the experts listed. Most on this list are mineral scientists, epidemiologists and pulmonary specialists.

If you have any questions regarding our comments or any of the enclosed reference material, please feel free to call. We would be happy to assist in any way we can.

Very truly yours,

R. T. VANDERBILT COMPANY, INC.

John W. Kelse
Corporate Industrial Hygienist
Manager, Occupational Health & Safety

C. S. Thompson, Ph.D., Mineralogist
D. R. Pattee, Corp. Environmental Manager

JWK/CST/DRP:sk
enclosures

As indicated in the cover letter, our primary concern involves incorrect usage of the terms, asbestos, asbestiform, fiber or fibrous and to health risks associated with New York State tremolitic talc.

RECOMMENDED CHANGES AND COMMENT:

Statement 1 - (highlighted in text)

"Asbestiform minerals, including tremolite, anthophyllite and actinolite, are found in talc deposits, but generally not in fibrous form. Chrysotile asbestiform minerals can also be found in talc deposits, but they are found infrequently and at low levels."

Suggested Change:

> Serpentine and amphibole minerals, including lizardite, antigorite, tremolite, anthophyllite and actinolite have been reported in talc deposits but rarely seen in their asbestiform habit. These minerals (unlike asbestos) are common rock and soil forming minerals found in many mining and aggregate producing environments (iron ore, copper, gold, crushed stone, etc.). In fact, one or more of these minerals are found in the vast majority of igneous and metamorphic rock. When processed these nonasbestiform minerals can produce some elongated or acicular particles of respirable size. Such particles do not, however, resemble the crystal growth structure or "fiber" dimensions of asbestos. Though elongated, respirable and of the same chemical composition as asbestos, these cleavage fragments have not been shown in animal and human health studies to pose the same type of magnitude or risk shown by their asbestiform counterparts. Beyond the dimensional differences, these particles vary in physiochemical properties as well. These differences likely account for the differences in biologic effect observed.
>
> Nonspecific asbestos definitions with nonspecific fiber counting criteria has promoted confusion as to whether these common minerals should be called "asbestos" or regulated in the same way as asbestos. This basic question was the subject of a major OSHA rulemaking in 1990 which concluded that elongated amphibole cleavage fragments were not asbestos and did not pose the same health risk as asbestos. These particles (elongated or not) are currently regulated by OSHA as a nuisance dust (particles not otherwise regulated). The presence of chrysotile (the asbestiform variety of lizardite and antigorite) in talc deposits is extremely rare. As a retrograde mineral, talc might possibly be found in association with chrysotile in serpentines and other hydrous minerals. However, the conditions under which talc forms are dissimilar to the geologic conditions under which asbestos forms.
>
> The psychological association between talc and asbestos is an extremely unfortunate one which, as indicated above, evolved in large measure from

imprecise, nonspecific, definitions and overly broad "fiber" counting criteria. Some trace fibrous components have been observed in talcs but these are now generally recognized as the rare fibrous form of the mineral talc.

We believe the attached reference materials support the recommended change. There is good reason for confusion in this area but key distinctions between asbestos and non-asbestos is now - thankfully - better recognized. Further confusion of these matters should be avoidable. Essentially, the term "asbestiform" stands for a very unique mineral growth habit (single dimension crystal growth versus random crystal growth, extremely long and narrow fibrils weakly joined in "bundles", generally showing curvature, etc.). All asbestos is asbestiform but all elongated particles should not be considered "asbestiform" or even "fibrous". There is an obvious difference in the morphology of asbestos versus common cleavage fragments and clear differences in biologic effect as well. These distinctions are very important as they impact the viability of America's mining and aggregates industry (it is not just a talc issue).

Statement 2 - (highlighted in text)

"Asbestos emissions from talc mining and processing have been the subject of concern, particularly for the talc deposits located in upper New York State. However, no emission data were located that provided an indication of asbestiform fiber emissions rates from talc processing. Some studies of talc mining and processing plant worker exposure to asbestiform fibers have been conducted. A National Institute for Occupational Safety and Health (NIOSH) study of worker exposure to asbestiform fibers at a talc mining and processing plant in upper New York State found fibrous tremolite and anthophyllite to be major contaminants in the talc processed by the plant. The study also found that worker exposure to these fibers far exceeded Occupational Safety and Health Administration (OSHA) standards. A later study sponsored by the talc processing plant that was the subject of the NIOSH study disputed the NIOSH report results. Other than worker exposure studies, the only information located that relates to asbestiform fiber emissions to talc processing is from a study by the New York State Department of Health. In that study, asbestiform fibers in low concentrations (0.064 to 0.116 fibers per cubic centimeter) were detected in ambient air samples taken in the vicinity of talc mining area."

Before our recommended text change, it should be noted that this entry is an excellent example of why the mineralogic and biologic errors described earlier need correction. It would be unfortunate if EPA further promoted confusion in this area after the many years it has taken to finally correct. NIOSH, as most who are familiar with this issue now know, was incorrect mineralogically and biologically. Our New York State tremolitic talc product and ore body does not contain tremolite or anthophyllite asbestos but rather a considerable amount of nonasbestiform tremolite and a much smaller amount of nonasbestiform anthophyllite. A small amount of talc fiber (truly fibrous) can be found and this has been mistaken by a few labs (not by most) as chrysotile (i.e. sees fiber microscopically and then assumes antigorite or lizardite reflected on the XRD is chrysotile). Common sense would dictate that if the tremolitic NIOSH reported really was "asbestiform" (and therefore tremolitic asbestos) the mine and mill would have long ago been shutdown by MSHA (who regulates this mine and mill - not OSHA). Common sense would also suggest that if the tremolite was asbestos and occurred at the

exposure levels NIOSH reported, a very clear association with lung cancer would be seen (tremolite asbestos is very rare in the world but when tested in animals has proven to be an extremely potent tumor producer). The reporting of asbestos in this talc deposit and alleged excess lung cancer as a result of exposure to it has been a source of controversy for many years. However, in recent years we believe this controversy has been resolved. Since the NIOSH study (which reported only overall death statistics with no meaningful cause/effect analysis) three other published, peer reviewed studies (three different investigations) have reported the absence of a dose/response relationship. The most recently published paper (Gamble), was not funded by the company. A fourth, as yet published study through the University of Alabama (most recent update) also sees no causal connection between the moderate lung cancer observed and exposure to this dust. These studies, unlike the NIOSH work, compared cases against controls, obtained smoking histories and matched cases to exposure by tenure and actual dust levels. When properly evaluated in this way, no cause - effect relationship is seen (lung cancers observed were among those least exposed by both time and dust level and a smoking etiology does appear to be the more plausible explanation). It might further be noted that this very same talc was tested in several animal experiments against real asbestos (including tremolite asbestos). In every case, under the same test conditions, asbestos produced prolific tumors while this talc produced none. We realize statements of this nature from the company "in question" will be viewed with suspicion so please carefully review the enclosed materials and speak with health professionals familiar with these studies.

Suggested Change:

> In the mid to late 1970's talc deposits located in upper New York State became the focus of a major controversy. The National Institute for Occupational Safety and Health (NIOSH) reported that the talc from this region contained significant levels of tremolite and anthophyllite asbestos. Moreover, the prevalence of lung cancer among those exposed to this talc for any period of time was close to three times that expected. NIOSH concluded the asbestos it reported (many times in excess of established standards for workplace exposure to asbestos) caused the excess lung cancer. The mining company questioned the validity of the NIOSH work on two counts. First, that the asbestos reported was in fact not asbestos but rather amphibole cleavage fragments (some elongated - aspect ratio 3 to 1, etc.). Second, the excess cancer observed did not appear related to the dust exposure. Rigorous mineralogical analysis of this talc, several animal studies and three published follow-up epidemiologic studies of these same talc workers appear to support the company's position. Although the follow-up mortality studies were (with one exemption) funded by the mining company, these studies did more thoroughly investigate the causal issue. Unlike the NIOSH work, smoking histories were obtained, a case control analysis was undertaken and exposure/response was analyzed by both tenure and dust level exposure. In all three updates, a dose/response - causal connection was not demonstrated (the excess lung cancers appeared among those least exposed and smoking appeared just as likely - if not more likely - to be responsible for the cancers observed). Animal studies which tested the tumor induction capacity of this talc against

asbestos showed no tumor promotion with this talc contrasted with prolific tumor promotion from asbestos under the same test conditions. Extensive mineralogic analysis by mineral scientists do not report asbestos in this talc.

The mineralogic and health issue noted here has been addressed to one degree or another by several other federal agencies (OSHA, MSHA, EPA, The Bureau of Mines, the Consumer Product Safety Commission) and by assorted health and mineralogic associations and experts. While some disagreement remains, the preponderance of evidence does argue against the presence of asbestos in this talc and against an asbestos health risk. It appears exposure to this talc presents no greater health risk than exposure to any other talc. Indeed when the lung cancer rate of New York State talc miners with more than 1 year of exposure is compared to the lung cancer rate of cosmetic talc miners in Vermont with more than 1 year of exposure (Vermont talc contains no amphibole component), the lung cancer rate is no different.

Some ambient air samples taken in the vicinity of the New York talc mines are available from the New York State Department of Health and from the mining company. The meaning or significance of "fiber" concentrations reflected in these data is unknown in light of the mineralogic issue described above and the health findings. Relative to mining exposures (total dust levels) the ambient data show extremely low concentration of total particulate. Analysis for asbestos for the company sponsored ambient monitoring reports no asbestos observed. As reflected in the occupational health literature, the significance of elongated cleavage fragment dusts does not appear any greater than that of a nuisance dust or talc itself.

CONCLUSION

Fortunately, the mineralogic and health issues addressed above and in the enclosed documents have received considerable attention and regulatory decisions (i.e. OSHA) have been made in this area. Accordingly, we do not believe it is correct to characterize this as an "issue" any longer even though there remain some who still insist broken up rock should be called and/or treated as asbestos and that the rules of good epidemiology can be ignored in the name of "prudence". There remains in the country an unfounded fear of "fibers" thanks to the hysteria we have allowed to develop around asbestos. We don't seem to mind what we call "fibers" or whether by using that word it is interpreted to mean "asbestos risk". Instead, we rush toward more and more "generic" broader definitions. The risk of this is the suggestion of risk where there is none. If we want to know why substances and materials act as they do we need to be more discriminating - more careful about identification, not less.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

MAR 3 1994

Mr. D. Putnan
Vice President
Gouverneur Talc Company, Inc.
Post Office Box 89
Gouverneur, New York 13642

Dear Mr. Putnan:

As you may know, the Emission Inventory Branch of the U. S. Environmental Protection Agency (EPA) is in the process of updating the document *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources* (known more commonly as AP-42). As part of this process, we are now seeking comments on the draft sections that are to be included in this update of AP-42.

Chapter eight of AP-42 addresses the mineral products industry and is one of the chapters being updated. Enclosed is a copy of the draft Section 8.30, Talc Processing, and the corresponding background memorandum for the section. We would appreciate it if you or one of your associates would review the enclosed draft AP-42 section and background memorandum and would send us your comments. Unfortunately, we are on a very tight schedule, and it is important that we have all comments by March 30, 1994.

The emission factors presented in AP-42 generally are based upon results from validated tests or other emission evaluations that are similar to EPA reference test methods. As a result, the emission factors presented in AP-42 sections must be supported by equivalent documentation. We have been unable to locate test data from which we can develop emission factors for talc processing. If you are aware of emission data that we could use to develop emission factors for talc processing, we would appreciate your assistance in obtaining copies of the data.

We appreciate your cooperation and look forward to receiving your comments. If you have any questions, I can be reached by telephone at (919) 541-5407 or by fax at (919) 541-0684.

Sincerely,

Ronald E. Myers

Ronald E. Myers
Emission Factors and Methodologies Section
Emission Inventory Branch

2 Enclosures

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Date: February 14, 1994

Subject: Background Information for Proposed AP-42 Section 8.30, Talc Processing
Review and Update Remaining Sections of Chapter 8 (Mineral Products Industry) of AP-42
EPA Contract 68-D2-0159, Work Assignment 012
MRI Project 3612

From: Richard Marinshaw

To: Ron Myers
EPA/EIB/EFMS (MD-14)
U. S. Environmental Protection Agency
Research Triangle Park, NC 27711

I. Introduction

This memorandum presents the background information that was used to develop the proposed AP-42 Section 8.30 on talc processing. A description of the industry is presented first. A process description followed by a discussion of emissions and controls is then presented. Finally, the reference list is provided. The draft AP-42 section is provided as the attachment.

II. Industry Description[1-3]

Talc, which is a soft, hydrous magnesium silicate ($3MgO \cdot 4SiO_2 \cdot H_2O$), is used in a wide range of industries including the manufacture of ceramics, paints, paper, and asphalt roofing. The end uses for talc are determined by variables such as chemical and mineralogical composition, particle size and shape, specific gravity, hardness, and color. The Standard Industrial Classification (SIC) code for talc mining is 1499 (miscellaneous nonmetallic minerals, except fuels), and the SIC code for talc processing is 3295 (minerals and earths, ground or otherwise treated). There is no Source Classification Code (SCC) for the source category.

The word talc refers to a wide variety of rocks and rock products. Soapstone reportedly contains up to 50 percent talc. It has a slippery feeling and can be carved by hand. Steatite contains a high-purity talc suitable for making electrical insulators. These talc-containing minerals (soapstone and steatite) will be treated as talc in this section. The color of talc varies from snow-white to greenish-gray and various shades of green. The specific gravity of talc ranges from 2.6 to 2.8.

In theory, talc is composed of 63.4 percent silicon dioxide (SiO_2), 31.9 percent magnesium oxide (MgO), and 4.7 percent water (H_2O). The actual composition of commercial talc may vary widely from these levels. Talc may also contain one or more of the following oxides, ranging in concentration from a trace to several percent: iron, titanium, aluminum, calcium, chromium, cobalt, manganese, nickel, phosphorus, potassium, or sodium. For most end-uses, these impurities are undesirable and are removed to the extent feasible. Asbestiform minerals, including tremolite, anthophylite, and actinolite, are found in talc deposits, but generally not in fibrous form. Chrysotile asbestiform minerals can also be found in talc deposits, but they are found infrequently and at low levels.

Talc deposits can be found in many parts of the world. In 1992, talc minerals were mined and processed at 19 mines in 8 States, and domestic production amounted to 1,071,000 megagrams (Mg) (1,178,000 tons). Talc mines in Montana, New York, Texas, and Vermont accounted for about 96 percent of total domestic production in 1992.

The largest use of talc-group minerals is for manufacturing of ceramics (31 percent), which includes kiln furniture, sanitary ware, floor and wall tile, dinnerware glazes, and electrical porcelains. For these end-products, adding talc to the usual clay-silica-feldspar body mixtures facilitates the firing of the ware and improves the quality. The second major use of talc minerals is as a filler or a pigment for paints (17 percent of total 1992 U.S. production). The paper industry is the third major user (16 percent) of talc, followed by roofing applications (11 percent), plastics (6 percent), and cosmetics (5 percent). Talc also is used in the production of synthetic rubber, insecticides, and pharmaceuticals.

Grades of talc are most frequently identified with the end use. Some of the important desirable properties are softness and smoothness, color, luster, high slip tendency, moisture content, oil and grease absorption, chemical inertness, fusion point, heat and electrical conductivity, and high dielectrical strength.

III. Process Description[1,2,4]

Most domestic talc is mined from open-pit operations; in 1985, 93 percent of the talc ore produced in the United States came from open-pit mines. Underground mines continue to be important sources of this mineral, however. Mining operations usually consist of conventional drilling and blasting methods. The softness of talc makes it easier to mine and process than most other minerals.

Figure 1 is a process flow diagram for a typical U.S. talc plant. Talc ore generally is hauled to the plant by truck from a nearby mine. The ore is crushed and screened, and coarse

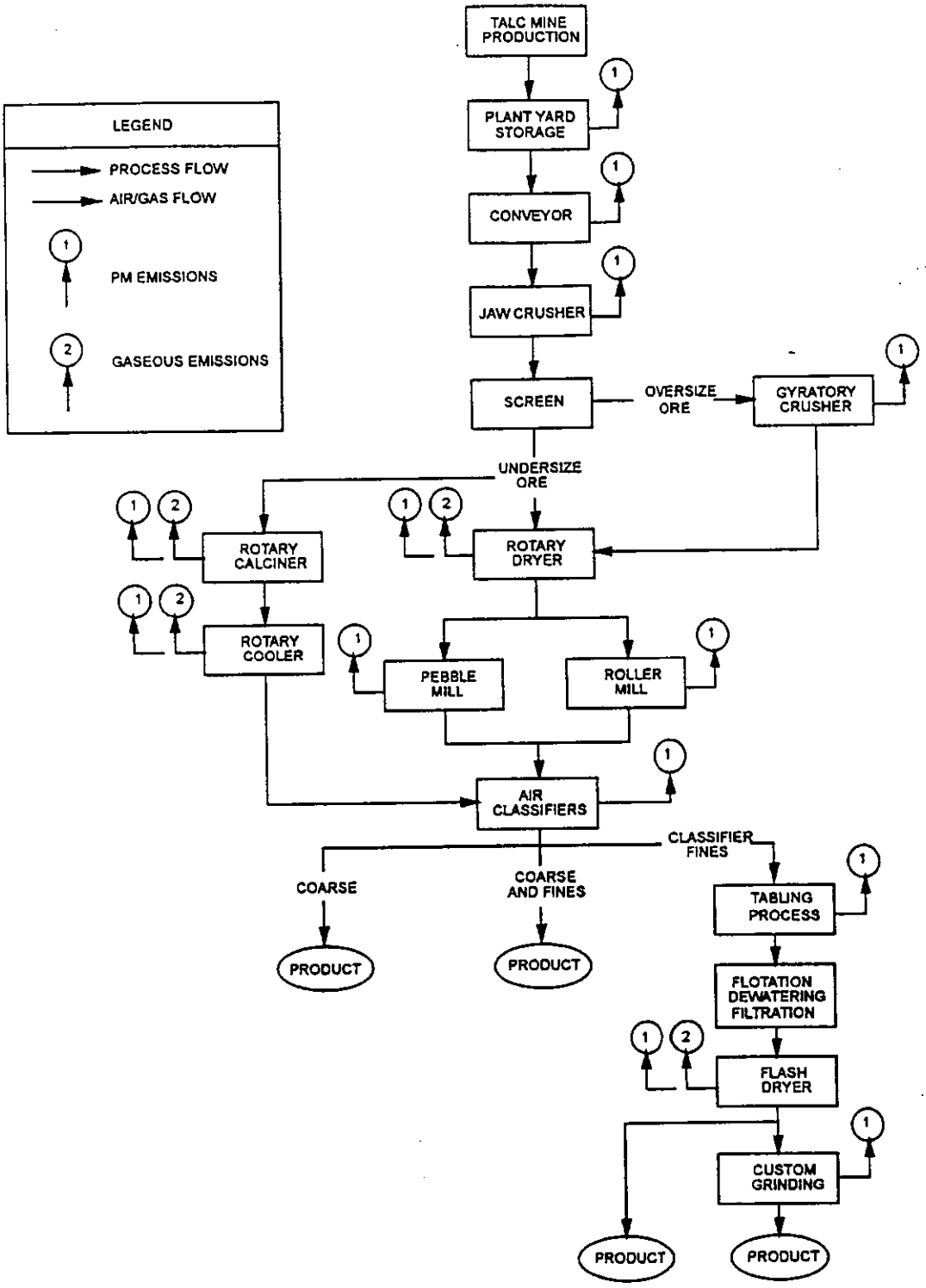

Figure 1. Process flow diagram for talc processing.[1]

(oversize) material is sent through a gyratory crusher. Rotary dryers are used to dry the two separate fractions. Secondary grinding is achieved with pebble mills or roller mills, producing a product that is 44 to 149 micrometers (μm) (325 to 100 mesh) in size. Air classifiers (separators), generally in closed-circuit with the mills, separate the material into coarse, coarse-plus-fine, and fine fractions. The coarse and coarse-plus-fine fractions then are stored as products. The fines may be concentrated using a shaking table (tabling process) to separate product containing small quantities of nickel, iron, cobalt, or other minerals, and then undergo a one-step flotation process. The resultant talc slurry is dewatered and filtered prior to passing through a flash dryer. The flash-dried product is then stored for shipment, or it may be further ground to meet customer specifications.

Talc deposits mined in the western United States contain organic impurities and must be calcined prior to additional processing to yield a product with uniform chemical and physical properties. Prior to calcining, the mined ore passes through a crusher and is ground to a specified screen size. After calcining in a rotary kiln, the material passes through a rotary cooler. The cooled calcine (0 percent free water) is then stored for shipment, or it may be further processed. Calcined talc may be mixed with dried talc from other product lines and passed through a roller mill prior to bulk shipping.

IV. Emissions and Controls[1,2,5-8]

The primary pollutant of concern in talc processing is particulate matter (PM) and PM less than 10 μm (PM-10). Particulate matter is emitted from drilling, blasting, crushing, screening, grinding, drying, calcining, classifying, and materials handling and transfer operations. Particulate matter emissions may include trace amounts of several inorganic compounds that are listed hazardous air pollutants (HAP's), including chromium, cobalt, manganese, nickel, and phosphorus.

The emissions from dryers and calciners include products of combustion, such as carbon monoxide, carbon dioxide, nitrogen oxides, and sulfur oxides, in addition to filterable and condensible PM. Volatile organic compounds (VOC's) also are emitted from the drying and calcining of western United States talc deposits, which generally contain organic impurities.

Asbestos emissions from talc mining and processing have been the subject of concern, particularly for the talc deposits located in upper New York State. However, no emission data were located that provided an indication of asbestiform fiber emission rates from talc processing. Some studies of talc mining and processing plant worker exposure to asbestiform fibers have been conducted. A National Institute for Occupational Safety and Health (NIOSH) study of worker exposure to asbestiform fibers at

a talc mining and processing plant in upper New York State found fibrous tremolite and anthophylite to be major contaminants in the talc processed by the plant. The study also found that worker exposure to these fibers far exceeded Occupational Safety and Health Administration (OSHA) standards. A later study sponsored by the talc processing plant that was the subject of the NIOSH study disputed the NIOSH report results. Other than worker exposure studies, the only information located that relates asbestiform fiber emissions to talc processing is from a study by the New York State Department of Health. In that study, asbestiform fibers in low concentrations (0.064 to 0.116 fibers per cubic centimeter) were detected in ambient air samples taken in the vicinity of a talc mining area.

Emissions from talc dryers and calciners are typically controlled with fabric filters. Fabric filters also are used at some facilities to control emissions from mechanical processes such as crushing and grinding.

The only test data found on talc processing are from an emission test conducted in 1976. Uncontrolled and controlled filterable and condensible inorganic PM emissions and particle size distribution were measured. The PM emissions were measured using a modified Method 17. The particle size distribution was measured using an alundum thimble connected to the nozzle by a 12-in. steel probe, followed by a 47-millimeter-type SGA filter. The particle size distribution of the portion of the sample found to be less than 45 μm was determined using electronic particle counter methods. Table 1 summarizes the measured emission concentrations and rates, and Table 2 summarizes the particle size distribution. Because the test report did not include process operating rates, emission factors could not be developed from the emission data.

TABLE 1. SUMMARY OF PM EMISSION DATA FROM A TALC CRUSHING AND GRINDING TEST[5]

Sampling location[a]	Processes	Average concentration		Average emission rate	
		mg/dscm	gr/dscf	kg/hr	lb/hr
Fabric filter inlet No. 1	Primary/secondary crushing	20,100	8.8	387	852
Fabric filter inlet No. 2	Vertical mill	2,880	1.26	14.4	31.7
Fabric filter inlet No. 3	Storage, bagging, air classification	7,050	3.08	40.9	90.1
Fabric filter inlet No. 1A	Storage	148,000	64.6	98.7	218
Fabric filter Inlet No. 1B	Storage	20,700	9.06	21.2	46.8
Fabric filter outlet	All of the above	139	0.061	4.72	10.4

[a]Inlets 1, 2, 3, 1A, and 1B are deducted to a common fabric filter.

TABLE 2. SUMMARY OF PARTICLE SIZE DISTRIBUTION DATA FROM A TALC CRUSHING AND GRINDING FACILITY[5]

Process	Diameter, μm[a]	Cumulative weight, g	Cumulative percent less than diameter
Primary/secondary crushing	55.4	1.564	91.3
	34.9	3.932	78.2
	22.0	7.822	56.7
	17.4	9.546	47.2
	11.0	11.063	38.8
	6.9	14.197	21.4
	3.0	17.521	3.0
	2.0	17.898	0.94
	1.0	18.049	0.11
Vertical mill	29.0	0.002	100.0
	18.8	0.017	99.7
	14.9	0.031	99.4
	11.9	0.144	97.1
	9.4	0.943	80.8
	7.5	2.792	43.3
	4.7	4.554	7.5
	3.0	4.821	2.1
	1.9	4.908	0.28
	1.0	4.920	0.04
Storage, bagging, air classification	43.9	0.014	99.9
	27.7	0.339	97.9
	17.4	2.141	86.6
	13.8	4.289	73.2
	11.0	6.922	56.8
	6.9	12.108	24.5
	4.4	14.847	7.4
	3.0	15.534	3.1
	2.0	15.885	0.92
	1	16.016	0.10

[a]Optical procedures rather than inertial separators used to determine particle size distribution; data may be suspect.

IV. REFERENCES

1. Calciners and Dryers in Mineral Industries--Background Information for Proposed Standards, EPA-450/3-025a, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 1985.

2. L. A. Roe and R. H. Olson, "Talc", Industrial Rocks and Minerals, Volume I, Society of Mining Engineers, New York, NY, 1983.

3. R. L. Virta, "Talc in 1992", Mineral Industry Surveys, Annual, Preliminary, Bureau of Mines, U.S. Department of the Interior, Washington, DC, January 1993.

4. R. L. Virta, The Talc Industry--An Overview, Information Circular 9220, Bureau of Mines, U.S. Department of the Interior, Washington, DC, 1989.

5. Emission Study at a Talc Crushing and Grinding Facility, Eastern Magnesia Talc Company, Johnson, Vermont, October 19-21, 1976, Report No. 76-NMM-4, U. S. Environmental Protection Agency, Research Triangle Park, NC, 1977.

6. Occupational Exposure to Talc Containing Asbestos, DHEW (NIOSH) Publication No. 80-115, National Institute for Occupational Safety and Health, U.S. Department Of Health, Education, and Welfare, Washington, DC, February 1980.

7. An Evaluation of Mineral Particles at Governeur Talc Company, 1975 and 1982: A Comparison of Mineralogical Results Between NIOSH and DGC, Dunn Geoscience Corporation, Latham, NY, January 4, 1985.

8. Investigation of Environmental Occurrence of Asbestiform Fibers in St. Lawrence County, New York State Department of Health, Bureau of Toxic Substance Assessment, February 1987.

ATTACHMENT

DRAFT AP-42 SECTION 8.30

8.30 TALC PROCESSING

8.30.1 Process Description[1-3]

Talc, which is a soft, hydrous magnesium silicate ($3MgO{\cdot}4SiO_2{\cdot}H_2O$), is used in a wide range of industries including the manufacture of ceramics, paints, paper, and asphalt roofing. The end-uses for talc are determined by variables such as chemical and mineralogical composition, particle size and shape, specific gravity, hardness, and color. The Standard Industrial Classification (SIC) code for talc mining is 1499 (miscellaneous nonmetallic minerals, except fuels), and the SIC code for talc processing is 3295 (minerals and earths, ground or otherwise treated). There is no Source Classification Code (SCC) for the source category.

Most domestic talc is mined from open-pit operations; in 1985, 93 percent of the talc ore produced in the United States came from open-pit mines. Underground mines continue to be important sources of this mineral, however. Mining operations usually consist of conventional drilling and blasting methods. The softness of talc makes it easier to mine and process than most other minerals.

Figure 8.30-1 is a process flow diagram for a typical U.S. talc plant. Talc ore generally is hauled to the plant by truck from a nearby mine. The ore is crushed and screened, and coarse (oversize) material is sent through a gyratory crusher. Rotary dryers are used to dry the two separate fractions. Secondary grinding is achieved with pebble mills or roller mills, producing a product that is 44 to 149 micrometers (μm) (325 to 100 mesh) in size. Air classifiers (separators), generally in closed-circuit with the mills, separate the material into coarse, coarse-plus-fine, and fine fractions. The coarse and coarse-plus-fine fractions then are stored as products. The fines may be concentrated using a shaking table (tabling process) to separate product containing small quantities of nickel, iron, cobalt, or other minerals and then undergo a one-step flotation process. The resultant talc slurry is dewatered and filtered prior to passing through a flash dryer. The flash-dried product is then stored for shipment, or it may be further ground to meet customer specifications.

Talc deposits mined in the western United States contain organic impurities and must be calcined prior to additional processing to yield a product with uniform chemical and physical properties. Generally, a separate product will be used to produce the calcined talc. Prior to calcining, the mined ore passes through a crusher and is ground to a specified screen size. After calcining in a rotary kiln, the material passes through a rotary cooler. The cooled calcine (0 percent free water) is then stored for shipment, or it may be further processed. Calcined talc may be mixed with dried talc from other product lines and passed through a roller mill prior to bulk shipping.

8.30.2 Emissions and Controls[1,2,4,5]

The primary pollutant of concern in talc processing is particulate matter (PM) and PM less than 10 μm (PM-10). Particulate matter is emitted from drilling, blasting, crushing, screening, grinding, drying, calcining, classifying, and materials handling and transfer operations. Particulate matter emissions may include trace amounts of several inorganic compounds that are listed hazardous air pollutants (HAP's), including chromium, cobalt, manganese, nickel, and phosphorus.

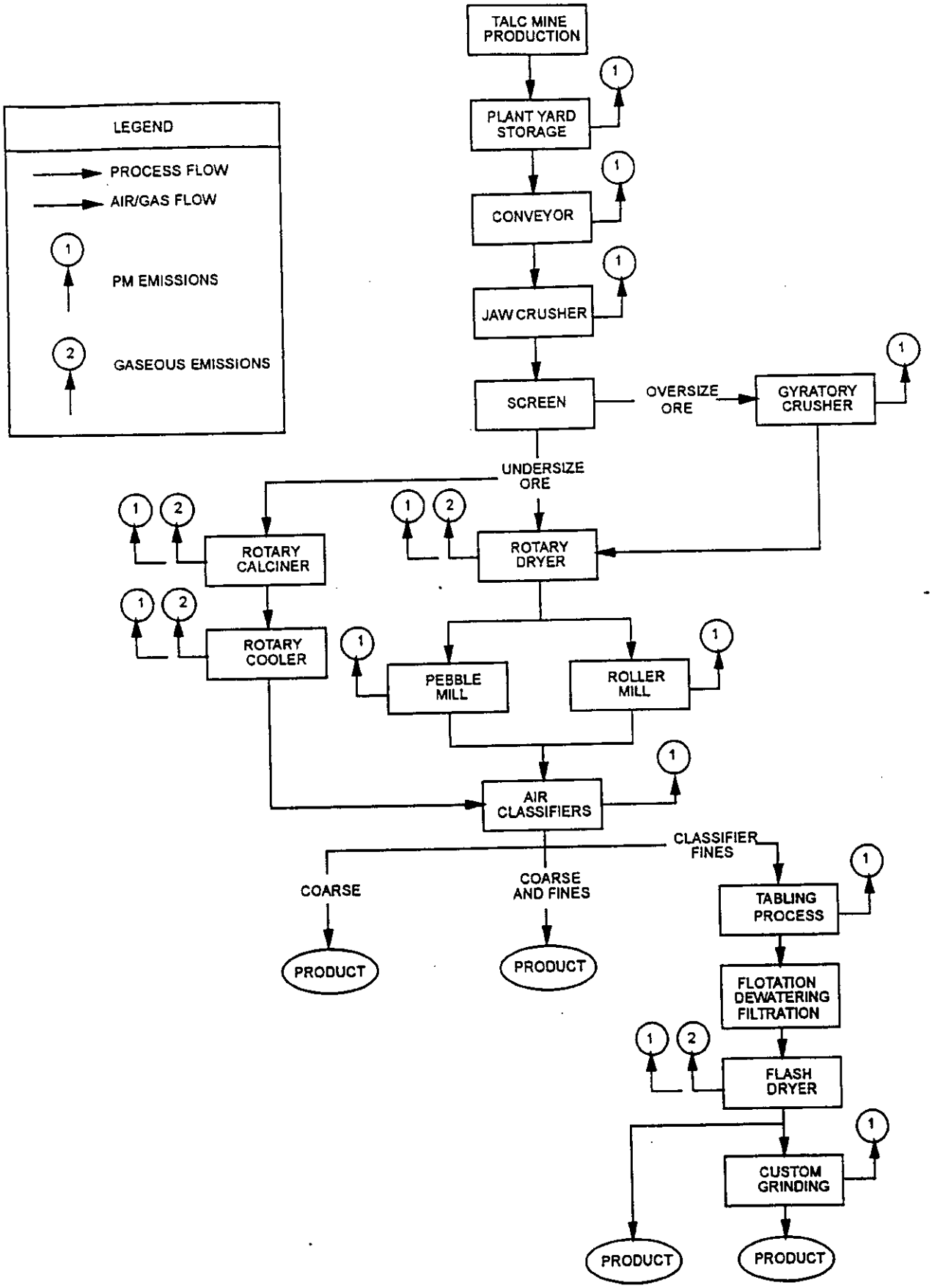

Figure 8.30-1. Process flow diagram for talc processing.[1]

The emissions from dryers and calciners include products of combustion, such as carbon monoxide, carbon dioxide, nitrogen oxides, and sulfur oxides, in addition to filterable and condensible PM. Volatile organic compounds also are emitted from the drying and calcining of western United States talc deposits, which generally contain organic impurities.

Emissions from talc dryers and calciners are typically controlled with fabric filters. Fabric filters also are used at some facilities to control emissions from mechanical processes such as crushing and grinding.

Due to a lack of availability, no emission factors for talc processing are presented.

REFERENCES FOR SECTION 8.30

1. Calciners and Dryers in Mineral Industries--Background Information for Proposed Standards, EPA-450/3-025a, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 1985.

2. L. A. Roe and R. H. Olson, "Talc", Industrial Rocks and Minerals, Volume I, Society of Mining Engineers, NY, 1983.

3. R. L. Virta, The Talc Industry-An Overview, Information Circular 9220, Bureau of Mines, U.S. - Department of the Interior, Washington, DC, 1989.

4. Emission Study at a Talc Crushing and Grinding Facility, Eastern Magnesia Talc Company, Johnson, Vermont, October 19-21, 1976, Report No. 76-NMM-4, U. S. Environmental Protection Agency, Research Triangle Park, NC, 1977.

5. Investigation of Environmental Occurrence of Asbestiform Fibers in St. Lawrence County, New York State Department of Health, Bureau of Toxic Substance Assessment, February 1987.