Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section Number: 11.26

Reference Number: 9

Title: Written communication from R. Virta, US Department of the Interior, to R. Myers, US EPA

Virta, R.

US Department of the Interior

February 1995

AP-42 Section 11.26
Reference 9
Report Sect. 2
Reference 17

Reference: Ron Myers

Date: 2-13-95

In response to your request the following is enclosed:

Just a couple of minor comments on your talc chapter of the AP-42. Looks good. Thanks for letting me review the document

If additional information is desired, feel free to contact the undersigned.

Bob Virta

Bureau of Mines
U.S. Department of the Interior

202-501-9384

Enclosure 1

DRAFT

This is preliminary material, in draft form, for purposes of review. This material must not be quoted, cited, or in any other way considered or used as final work.

11.26 TALC PROCESSING

11.26.1 Process Description[1-7]

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. There is no Source Classification Code (SCC) for the source category.

Most domestic talc is mined from open-pit operations; over 95 percent of the talc ore produced in the United States comes from open-pit mines. 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 11.26-1 is a process flow diagram for a typical domestic talc plant. Talc ore generally is hauled to the plant by truck from a nearby mine. The ore is crushed, typically in a jaw crusher, and screened. The coarse (oversize) material then is returned to the crusher. Rotary dryers may be used to dry the material. 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. Some roller mills are designed to use heated air to dry the material as it is being ground. Hammer mills or jet air mills may be used to produce additional final products. 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. The classified material also may be pelletized prior to packaging for specific applications. In the pelletizing step, processed talc is mixed with water to form a paste and then extruded as pellets.

Talc deposits mined in the southwestern 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.

11.26.2 Emissions and Controls[1-2,4-5,7-11]

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, materials handling and transfer operations, packaging, and storage. Although pelletizing is a wet process, PM may emitted from the transfer and feeding of processed talc to the pelletizer. Particulate matter emissions may include trace amounts of several inorganic compounds that are listed hazardous air pollutants (HAP), including arsenic, cadmium, chromium, cobalt, manganese, nickel, and phosphorus.

Enclosure 2 1st page

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Date: February 14, 1994
(Revised November 28, 1994)

Subject: Background Information for Proposed AP-42 Section 11.26, Talc Processing
Review and Update of Mineral Products Industry and Metallurgical Industries Sections of Chapters 11 and 12 of AP-42
EPA Contract 68-D2-0159, Work Assignment 2-01
MRI Project 4602-01

From: Richard Marinshaw

To: Ron Myers
EPA/EMAD/EFIG (MD-14)
U. S. Environmental Protection Agency
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I. Introduction

This memorandum presents the background information that was used to develop the proposed AP-42 Section 11.26 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. A review of the available test data on talc processing is then described. Finally, the reference list is provided. The draft AP-42 section is provided as the attachment.

II. Industry Description[1-4]

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 is a massive, impure, talcose rock that has a variable talc content that can exceed 50 percent. 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~~ rocks (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. Talcose rocks may contain mineral impurities that are composed of one or more of

Enclose 2

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. Tremolite, anthophylite, and actinolite~~, which are associated with asbestos~~, may be found in talc deposits, but are rarely fibrous in such deposits. Chrysotile also can be found in some talc deposits, but is extremely rare.

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 997,000 megagrams (Mg) (1,099,000 tons). Talc mines in Montana, New York, Texas, and Vermont accounted for about 98 percent of total domestic production in 1992.

The largest use of talc-group minerals is for manufacturing of ceramics (31 percent of total 1992 U.S. production), which includes 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 largest user of talc minerals is the paper industry (20 percent). The third major use of talc is as a filler or a pigment for paints (18 percent), followed by roofing applications (9 percent), plastics (5 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[1-2,4-7]

Most domestic talc is mined from open-pit operations; over 95 percent of the talc ore produced in the United States comes from open-pit mines. 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 domestic talc plant. Talc ore generally is hauled to the plant by truck from a nearby mine. The ore is crushed, typically in a jaw crusher, and screened. The coarse (oversize) material then is returned to the crusher. Rotary dryers may be used to dry the material. 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. Some roller mills are designed to use heated air to dry the material as it is being ground. Hammer mills or air jet mills may be used to produce additional fine products. 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. The classified material may also be pelletized prior to packaging for specific applications. In the pelletizing step, processed talc is mixed with water to form a paste and then extruded as pellets.