AP-42 Section 11.28
Reference 6
Report Sect. BR
Reference 7

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

JUL 12 1983

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.

Mr. Robert L. Sansom
President
Louisa Properties
General Partner of Virginia Vermiculite, Limited
1111 North 19th Street, Suite 505
Arlington, Virginia 22209

Dear Mr. Sansom:

The plant visit report on the Virginia Vermiculite, Limited, plant in Trevilians, Virginia, has been rewritten as requested in your July 6, 1983, transmittal and is considered a final report. As requested in your transmittal, the information contained in the draft trip report which is considered confidential by your company has been deleted from the final report. The deleted information will remain in the confidential files of the United States Environmental Protection Agency.

If you have any questions or additional comments, please contact me at (919) 541-5595 by July 29, 1983.

Sincerely yours,

William J. Neuffer
Industrial Studies Branch
Emission Standards and
Engineering Division

Enclosure

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4505 Creedmoor Road
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FINAL

Date: June 8, 1983
(Finalized July 11, 1983)

Subject: Site Visit--Virginia Vermiculite Limited, Trevilians, Virginia
Calciners and Dryers in Mineral Industries
EPA Contract No. 68-02-3817; ESED Project No. 81/08
MRI Project No. 7702-L

From: Amy J. Nelson AJN

To: William J. Neuffer
ESED/ISB/SSAS (MD-13)
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711
(919) 541-5595

I. Purpose

The purpose of this site visit was to observe the operation of a rotary vermiculite dryer and the associated air pollution control equipment at Virginia Vermiculite, Ltd.

II. Place and Date

Virginia Vermiculite, Limited
Trevilians, Virginia
(703) 967-2266
May 11, 1983

III. Attendees

Virginia Vermiculite, Limited

Robert Sansom, President, Louisa Properties
General Partner of Virginia Vermiculite
1111 North 19th St., Suite 505
Arlington, Va. 22209
(703) 276-8900 (Energy Ventures Analysis)

John Sansom, Plant Manager, Trevilians, Va.

U.S. Environmental Protection Agency

Gil Wood, EPA/ISB

Midwest Research Institute

William H. Maxwell, MRI/Raleigh
Amy J. Nelson, MRI/Raleigh

IV. Discussion

The major points of discussion during this visit were: (1) vermiculite mining; (2) vermiculite wet processing and drying; (3) air pollution control equipment associated with vermiculite drying; and (4) operation and maintenance of the rotary dryer and associated control equipment. A Section 114 response from Virginia Vermiculite was received by the EPA on January 27, 1983, and the entire response is considered confidential.

A. General

The following information was obtained from an emission test report by RTP Environmental Associates (November 29, 1979). Virginia Vermiculite, Limited, operates a vermiculite mining operation in Trevilians, Virginia. Clay, mica, and silicate deposits are removed from a vermiculite-laden ore by water sliming and flotation procedures. The vermiculite is dried in a rotary dryer prior to screening and shipping. Particulate emissions from the rotary dryer are controlled by a low efficiency cyclone in series with a cylindrical water spray tower. Further, general information about the Virginia Vermiculite plant, including grades of vermiculite produced, hours of operation, and vermiculite mining is given in a confidential addendum to this report.

B. Process Description

1. Ore handling. See Confidential Addendum.

2. Wet Processing. Figure 1 shows the process flow diagram for the beginning of the wet processing section of the plant. Ore from the wobble feeder is mixed with water, and the slurry passes through a rock separator and a screw classifier. Screening separates smaller material from larger material prior to conditioning. This separation improves the efficiency with which other rock is removed from the vermiculite ore (ore regeneration is 60 to 65 percent). Each ore size is processed in its own system. Figure 2 shows the processing steps for each material. Details of the conditioning procedure are considered confidential.

Once the unwanted rock is separated from the vermiculite, the two lines converge, producing a single ore once again. This mixed ore, containing both large and small vermiculite particles, is then dewatered by both a cyclone and a belt filter. The material slurry coming on to the belt filter contains approximately 60 percent solids, while the discharged vermiculite cake contains 15 to 20 percent moisture. This cake is the feed material for the rotary dryer located outside the wet processing building.

3. Dry processing. The rotary dryer utilized by Virginia Vermiculite is 12.2 m (40 ft) long and 1.8 m (6 ft) in diameter. It is of homemade construction and consists of two reclaimed asphalt dryers welded together. Spiralling lifters are used to facilitate product drying. The retention time is 25 minutes, and the temperature is maintained at less than 121°C (250°F). The process rate is 6.4 to 9.1 Mg/h (7 to 10 tph). The North

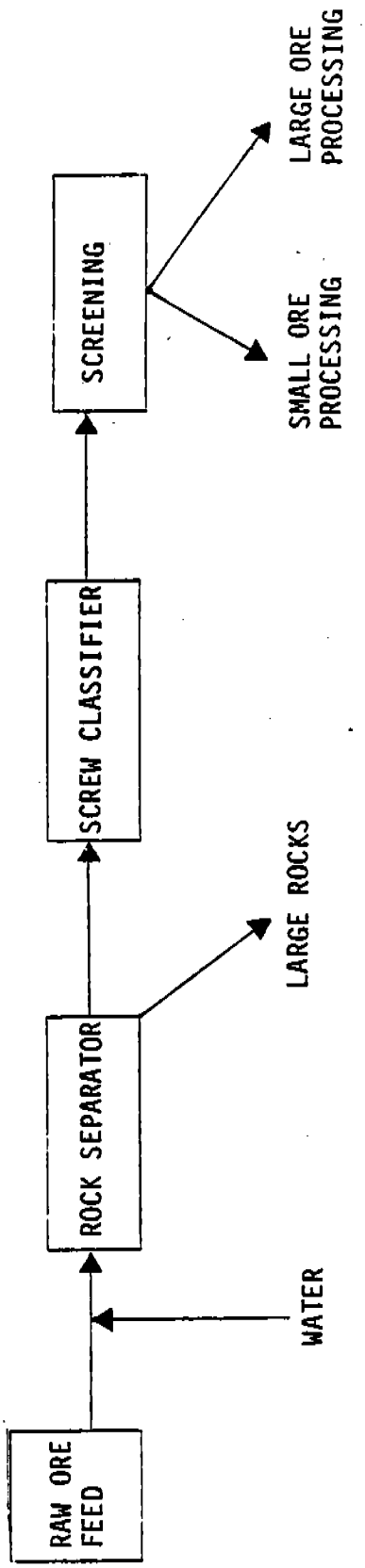

Figure 1. Beginning of wet processing system--Virginia Vermiculite, Boswell's Tavern, Va.

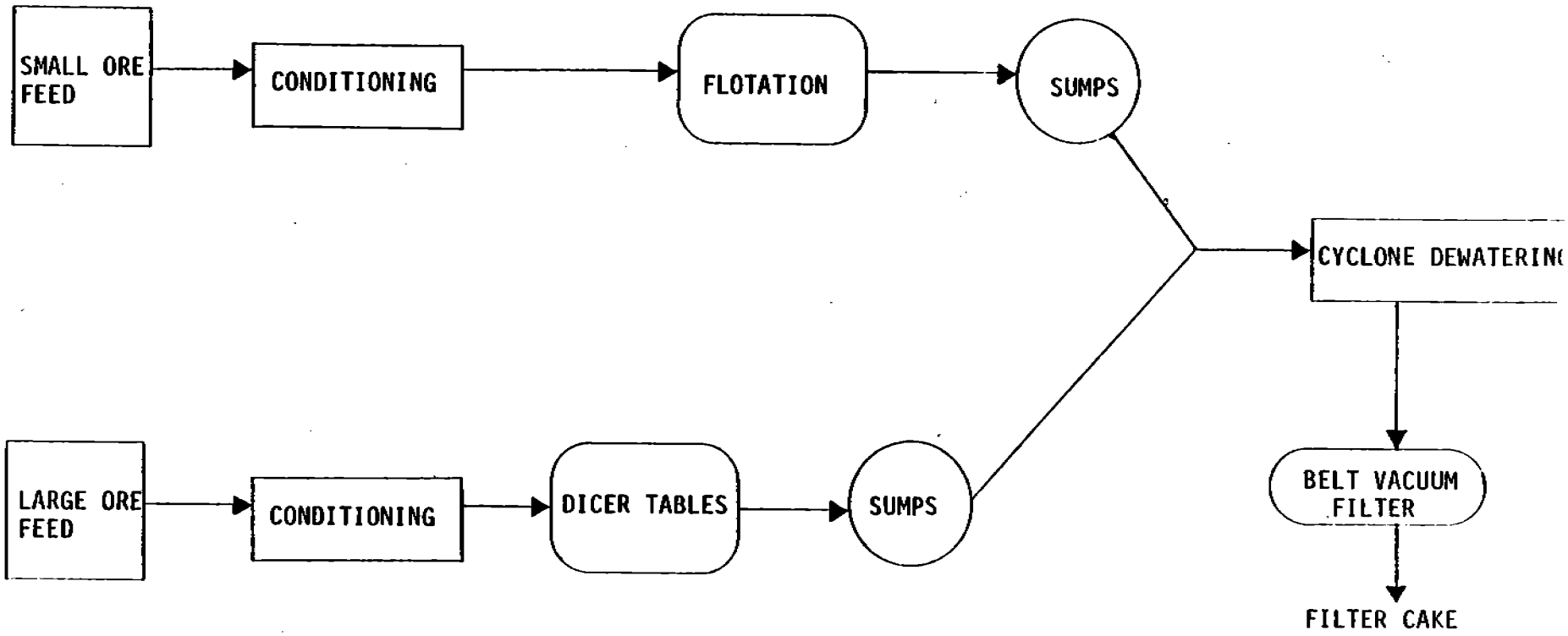

Figure 2. Wet processing systems--Virginia Vermiculite.

American No. 4 fuel oil burner is automated, and the plenum is lined with refractory material. The fuel oil has a heat content of 2.8 x10^6 kJ/kg (1.2 x10^6 Btu/ lb) and contains 1.5 percent sulfur. The vermiculite cake drops into the dryer approximately 3.1 m (10 ft) in front of the burner. The material never touches the flame, thus reducing the chances of removing any bound moisture from the vermiculite particles. Only unbound moisture is removed, leaving a residual moisture content of 6 percent. A duct fan draws the hot gases through the dryer cocurrently to product flow.

As the vermiculite falls out of the dryer it is carried by bucket elevator inside a processing building to a screening room. Here, six screening machines separate the vermiculite ore into grades 3 and 4. (No. 2 is obtained as needed by by-passing the floation steps, and No. 5 is the cyclone waste.) All six machines are vented to the central air duct from the rotary dryer. Plant personnel noted that their major process fugitive dust problems occur in the screening room. Figure 3 is a process flow diagram showing the dryer, screening machines, control equipment, and the associated ductwork. Following screening, the vermiculite ore is belt-conveyed to covered storage sheds prior to shipping. Samples of the raw and dried ore were collected during the visit.

C. Control Equipment

1. Low efficiency cyclone. The exhaust gases from the rotary dryer and the screening operations are drawn by an induced draft fan through a shop-fabricated, low-efficiency cyclone. The cyclone is 4.3 m (14 ft) long and 1.8 to 2.4 m (6 to 8 ft) in diameter. It was installed 4 years ago and completly replaced in October 1982 due to wear. Partial replacement of the tapered section occurred two or three times prior to its replacement. Mr. John Sansom estimated the cyclone would have to be replaced on a regular basis every 2 years. As mentioned earlier, the cyclone waste is sold as grade 5 vermiculite to gypsum companies. Any unsold cyclone waste is formed into a slurry and pumped to a tailings pond.

2. Spray tower. The exhaust gases from the cyclone pass through a cylindrical water spray tower prior to being emitted to the atmosphere. The scrubber was installed in December 1978 and has been rebuilt a couple of times since that time. The original scrubber was constructed of 0.3 cm (1/8 in.) steel and has been completely replaced with 0.6 cm (1/4 in.) steel. The pressure drop across the tower is less than 1.2 kPa (5 in. w.c.). All the 0.3 cm (1/8 in.) steel ductwork associated with the scrubber system has also been replaced with 0.6 cm (1/4 in.) steel to reduce wear. According to Mr. John Sansom, no major corrosion problems exist in the scrubber system. The spray tower is also equipped with a wire mesh demister which is cleaned at least every 2 weeks and is replaced frequently. The amount of water used in the scrubber is not measured. Waste water is treated in settling ponds and eventually overflows into a storage pond of water used for wet processing, creating a closed-cycle water system.

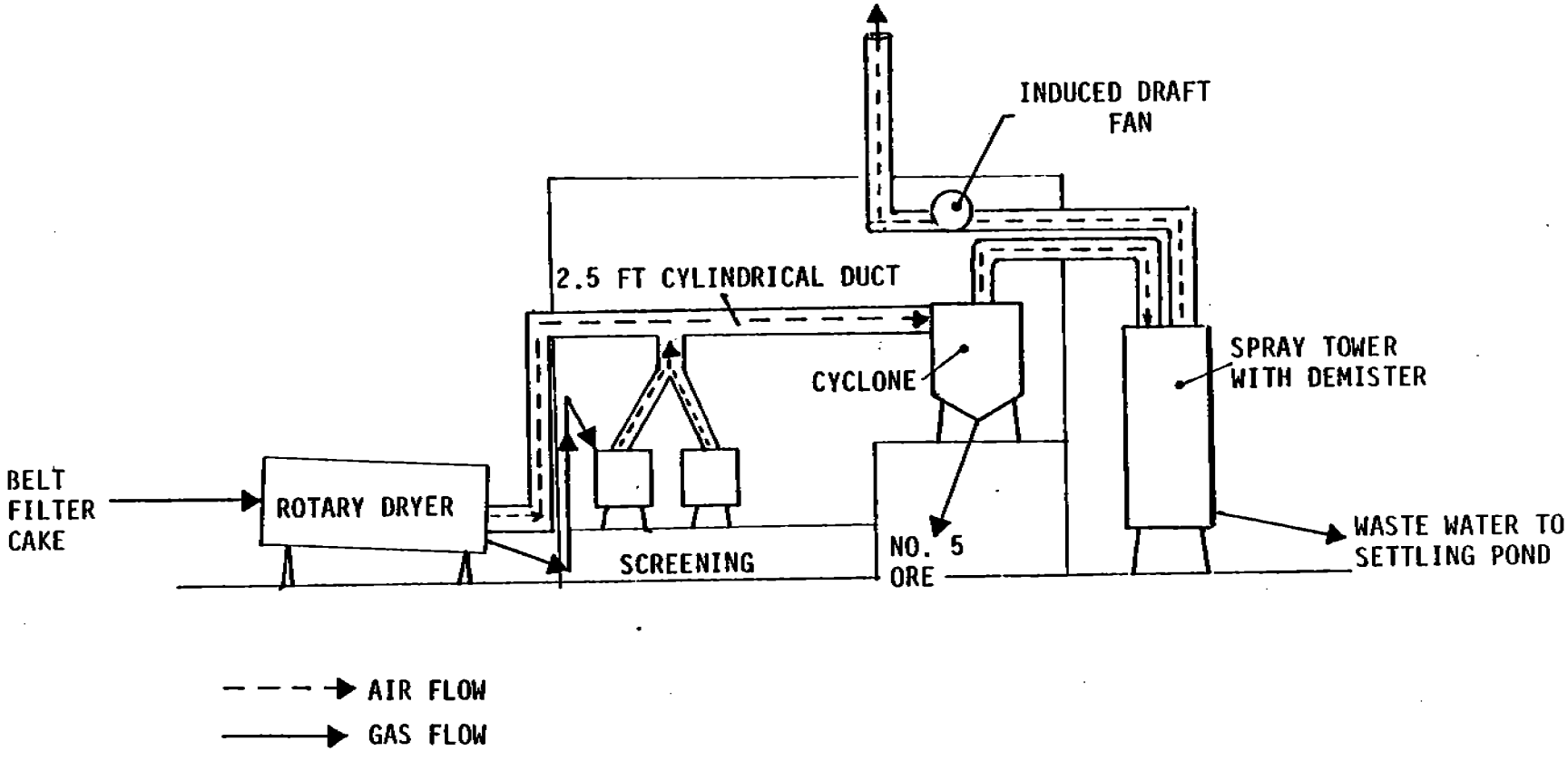

Figure 3. Dry processing and control equipment--Virginia Vermiculite.

Treated gases exit a 12.1-m (40-ft)-high stack at 54°C (130°F) and at a rate of 70.8 m^3/min (2,500 acfm). The inside diameter of the stack is 76 cm (2.5 ft).

D. Emission Test Data

A complete emission test report for Virginia Vermiculite was obtained from the Virginia State Air Pollution Control Board and has been reviewed by EMB. A summary of this report is included as Attachment 1 of this report. The results indicate an average particulate emission rate of 690 g/h (1.52 lb/h). By calculation, this is equivalent to approximately 0.039 g/DNm^3 (0.017 gr/dscf) for the rotary dryer and screening emissions. Three consecutive 6-minute averages of visible emissions (VE) observations taken the afternoon of the visit indicate an opacity range of 0 to 5 percent (see Attachment 2). A partial 6-minute reading taken in the morning indicated an opacity of 0 to 10 percent. (John Sansom commented that the State observers normally get higher readings in the morning than in the afternoon due to different weather conditions.)

E. Maintenance

The plant is shut down for one-half day every week for general maintenance. Some of the lifters in the rotary dryer are replaced every summer during the low-production periods. As mentioned in Section C above, the cyclone requires patching periodically and total replacement every 2 years. Scrubber maintenance includes cleaning fines out of the wire mist eliminator every 2 weeks.

F. Miscellaneous Information about Vermiculite Production

See Confidential Addendum.

G. Conclusions and Recommendations

VE observations and emission test data support that the Virginia Vermiculite plant in Trevilians, Virginia, is a well-controlled facility. Test ports are available for outlet stack testing. Inlet testing prior to the scrubber would be feasible if the proper testing modifications were employed. Both Robert and John Sansom were very helpful and informative during our visit, and they provided important information to this project.

2 Attachments