

VERMONT DUE DILIGENCE: Product Quality and
Quality Control

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This Report Contains: Executive Summary
Summary by Location
Appendix of all Data and Analyses

Executive Summary

A detailed analysis of the quality of crude ore and finished products processed by The Vermont Talc Company revealed one potential quality issue which may have a significant future economic impact on the Chester/Hamm operation.

The mineral actinolite was detected in two products manufactured at Chester on March 29, 1988. Multiple XRD scans detected from 0.03%-0.4% actinolite in products V-8 and V-15. The average of 3 scans for each product was 0.05% in V-8 and 0.17% in V-15. Both samples were random process samples, not production composites.

A two week composite sample of product V-10 milled November 1-15, 1987, also exhibited trace levels of actinolite. The average of 3 scans was 0.02%.

The macro-crystallinity of the actinolite from Hamm produces very well defined XRD peaks; thereby allowing detection by the CTFA step-scanning XRD procedure at 0.03% by weight.

Actinolite bearing chlorite schist fragments were visibly evident in the crushed ore stockpile at Chester.

In order for Cyprus to produce finished product from Chester/Hamm that conforms to our quality standards as well as those required by the labeling section of the OSHA Asbestos Standard, a combination of selective mining and on-site product monitoring may be required. The major uncertainties that confound this potential problem and our response are:

1. The classification of Hamm actinolite. If it is naturally non-asbestiform, the problem can be managed relatively easily.
2. The extent of actinolite occurrence in the Hamm mine.
3. The future regulatory policies of OSHA concerning asbestiform and non-asbestiform tremolite, actinolite, and anthophyllite.

The "asbestos" testing conducted for Vermont Talc by Shelborne Laboratories has not reported the presence of actinolite in Chester/Hamm products. We attribute this condition to the following:

1. The actinolite contamination is at trace levels and is most probably sporadic.
2. Shelborne analyzes a monthly composite sample (dilution effect).
3. Shelborne runs long scan XRD's on these samples which reduces the detection sensitivity to approx. 1-1.5% for amphiboles.
4. By not detecting actinolite by XRD, SEM analysis would not specifically be utilized as a confirmation tool.

Aside from this potential problem, no other significant quality related problems were uncovered which might warrant the delay or termination of our intended purchase agreement with Vermont Talc.

Water quality testing of the LaMoille River in Johnson did not reveal any indirect seepage of tailings pond effluent that is resulting in detectable changes in river water quality. This result must be qualified in that it only represents the conditions present on March 30, 1988. Variable year-round factors such as river flow, soil conditions, precipitation, and plant effluent will all impact this result. Only systematic, year-round monitoring will define the scope and magnitude of this suspected problem area.

Summary by Location

Johnson Plant

- Floated finished products manufactured with Troy ore (Nov '87-Apr '88) appear to be lower in brightness and higher in acid solubles than previous production with Hamm ore. This condition may be a result of the inclusion of surface stained ore stockpiled in the initial mining effort as well as improper flotation practices.
- Typical mineralogy of floated products manufactured with Troy ore shows: 95-98% talc; 1-2% chlorite; 1-4% magnesite; 0.5% quartz.
- No amphiboles or serpentines were detected in Troy based floated products.
- Total and extractable As & Pb do not appear to be at problematic levels.
- Heavy metals may cause some rejections of cosmetic and USP grades due to high nickel content. Vermont Talc has not monitored this parameter.
- Vermont Talc's in-house microbial testing of their cosmetic grades shows virtually 100% functional sterility. These results contrast field reports from our own sales people that customers have been experiencing micro problems with Vermont Talc. Their use of a common product packer may be the cause of the problem.

- Water quality analysis of mill effluent sampled on 3-30-88 showed 22 p.p.b. Arsenic (0.2 ppm).
- The town well water as well as the Johnson plant well water sampled on 3-30-88 showed that arsenic was not detectable (<10 ppb).
- The Johnson plant discharges their cooling water directly into the LaMoille River. Arsenic levels in this discharge were 14 p.p.b. on 3-30-88. No downstream alteration of river water quality was detected.

Troy Mine

Our analyses of Troy drill holes samples result in the following conclusions:

- No amphibole or serpentine minerals were detected in either the raw ore or floated concentrates.
- Arsenic and lead concentrations in floated, finished product should not pose significant future problems.
- Total heavy metals in floated, finished products may be a potential problem area due to relatively high levels of extractable nickel.
- Finished product brightness values, GEB and/or green filter brightness, may very well be several points lower than those products historically manufactured from Hamm ore.
- Product brightness cannot be increased with traditional acidification/bleaching processes.

Chester Plant

- The low-grade, dry ground products processed from Hamm ore exhibit the following typical mineralogy: 55-65% talc; 20-35% magnesite; 2-8% dolomite; 3-4% chlorite.
- Actinolite was detected in V-8 and V-12 finished product manufactured 3-29-88 at concentrations of 0.1-0.4%.
- Actinolite rock fragments were visible in the Chester crushed ore stockpile.
- Serpentine (antigorite) was detected in V-8 and V-12 finished product manufactured 3-29-88 at concentrations of ~1%.
- Finished product testing on Chester products is limited to screen and viscosity in resin testing.

Hamm Mine

- 4 composite chip samples taken across several faces at the Hamm mine exhibited the following typical mineralogy: 55-66% talc;

20-35% magnesite; 2-8% dolomite; 3-4% chlorite; tr-1% serpentine; N.D.-amphiboles.

- Due to the macro-crystallinity of the actinolite contained in the Hamm pit, XRD detection level is rated at approx. 0.03% by weight (step scanning method).
- Serpentine found in the Hamm pit appears to be antigorite, the non-asbestiform variety of chrysotile.
- The actinolite in the Hamm pit is highly associated with chlorite schist.

Overview Summary

- Quality control testing of all production is minimal and infrequent. Process control testing is virtually non-existent.
- The Material Safety Data Sheets utilized by Vermont Talc are lacking information required by OSHA. They are not in full compliance.
- The bag labeling utilized by Vermont Talc lacks information required by the Hazard Communication Standard. They are not in full compliance.
- Vermont Talc "certifies" that their products meet certain quality criteria (i.e. USP) but they neither test for all the required parameters nor do they have sufficient historical data to substantiate their certification without testing.

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