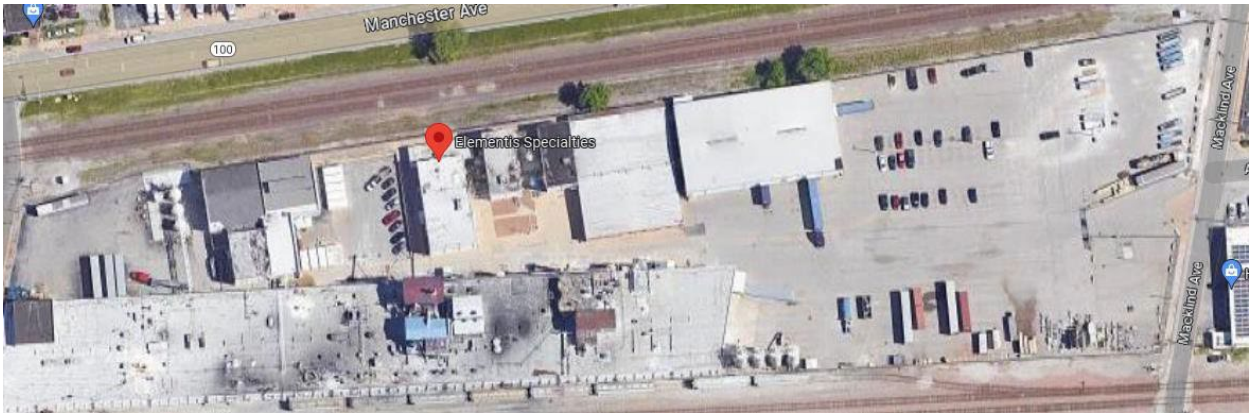
Inspection Report: Elementis Specialties, Inc., Clean Air Act Stationary Source

Facility Name:	Elementis Specialties, Inc.
Inspection Date:	July 11, 2023
Facility Address:	5548 Manchester Avenue, St. Louis, MO, 63110
ICIS-Air #:	MO00000002951000066
Federal Facility:	No
NCI:	Creating Clean Air for Communities
Facility size:	Major Source
Activity:	Partial Compliance Evaluation
State Referral:	No
EJ:	Yes
NAICS code:	325510 Paint and Coating Manufacturing
Lead Inspector:	Steve Rapp, Eastern Research Group, Inc. ("ERG") Inspector, 339-364-4264
Asst. Inspector:	Elizabeth Hubbard, ERG Inspector Trainee, 919-468-7894
State Inspectors:	Kat Hertling and Robert Barnacle, Missouri Department of Natural Resources ("MoDNR")
Facility Contact:	James Moore, Environmental Health and Safety ("EHS") Manager

1. **Plant Description:**

According to the 2018 operating permit, OP2018-094, the Elementis Specialties, Inc., St. Louis Plant specializes in the production of rheological agents. Rheological agents change the flow characteristics of liquids. Elementis Specialties, Inc. uses several varieties of clay, polyethylene waxes, oils, amines and solvents in different combinations and processes to produce its line of agents. The processes are the Wet Process Bentone Manufacturing, Dry Process Bentone Manufacturing, Bentone Paste and Gel Manufacturing, and formerly, Nalzin Manufacturing (recently discontinued).

Figure 1: Satellite image of the Elementis facility in St. Louis, MO.



2. **Facility Entry:**

The representatives of the United States Environmental Protection Agency ("EPA"), Steve Rapp and Elizabeth Hubbard from Eastern Research Group, Inc. ("ERG"), arrived at the Elementis Specialties, Inc., facility at 5548 Manchester Avenue, in St. Louis, MO ("Elementis", or "the facility") at approximately 8:45 am. Shortly after, the representatives from MoDNR, Robert Barnacle and Kat Hertling, arrived. The ERG and state representatives ("the inspectors") were directed to the administration building where they were greeted by James Moore, EHS Manager for the facility. At approximately 9:00 am, the inspectors and Mr. Moore met in a conference room for the opening conference with Claire Backer, process engineer, Olivia Hoing, operations manager, and Jeremy Hall, manufacturing director ("the facility representatives"). The inspectors presented their identification credentials and provided an overview and scope of the inspection. The inspectors explained that ERG worked as contractors to conduct facility inspections for the EPA. They provided a copy of EPA's "Small Business Resources Information Sheet." The facility representatives explained that the former EHS manager, Bryan Fuhr, had recently left the company and Elementis was filling in with people from other departments until they could find a full-time replacement.

3. **Opening Conference/Technical Discussion:**

The inspectors explained that they were at the facility to conduct a routine Clean Air Act ("CAA") inspection, including a focus on volatile organic compounds ("VOCs") and hazardous air pollutants ("HAPs"). The inspectors explained that during the facility walkthrough, they would take digital images of the facility's processes and emission points using a digital point and shoot camera, as well as an optical

gas imaging, forward looking infrared ("FLIR") video camera, model GF320, that were not intrinsically safe. They requested that the facility representatives inform them of any areas where there could be a potentially explosive atmosphere where they would not use the cameras. The facility representatives agreed to inform the inspectors of any such areas during the facility tour.

The inspectors asked for background information about Elementis and the facility. The facility representatives explained that the facility currently had approximately 60 employees and was operating 24 hours a day, seven days per week. They said that the facility was originally built in 1890 as the National Lead Company. It was purchased by Rheox (now Elementis) around 1950 to manufacture organoclay products. They described the general operation as follows: The company's main products were organoclays used in the energy sector, as well as in paint and cosmetics manufacturing. The process started with a wet slurry of clay reacted with amines and alcohol resulting in a material containing approximately 3% solids. They then use belt press filters to increase the solids content to approximately 15%. The material is then sent through dryers that bring the solids content to approximately 50%. The final product is further milled before being packed and shipped to customers.

The inspectors explained that they had questions related to the facility's 2018 operating permit, the associated Statement of Basis ("SOB"), Emission Inventory Questionnaire ("EIQ"), and related compliance reports. The facility representatives explained that there were several changes at the facility since the 2018 operating permit was issued and MoDNR had issued an addendum in 2021. For example, the facility no longer included the Nalzin process equipment. Additionally, the new permit includes conditions for the horizontal belt filter ("HBF") process which are similar to Condition 006 in the 2018 permit for the Bentone flash dryer system. The following is a summary of the discussion.

The inspectors noted that Permit Condition 002 of the 2018 operating permit requires a two minute daily visible emission ("VE") observations of the baghouses using EPA's reference method 22 ("RM22"). The inspectors noted that the permit requires Elementis to operate the baghouses in accordance with the manufacturer's specifications and asked what pressure drop was specified. The facility representatives said that the baghouses have a specified pressure drop of six inches of water column ("w.c.") but explained that Permit Condition 002 of the 2018 permit applied to the Nalzin manufacturing process, which was removed, and therefore those permit conditions had been removed in the new permit and no longer apply.

The inspectors noted that Permit Condition 006 of the 2018 operating permit included a weekly VE observation requirement (for the first 8 weeks), then bi-weekly (for the next 8 weeks), and then monthly (if no violation of the opacity limits during the initial periods) using RM22 or reference method 9 ("RM9") if any VE detected by RM22 from the Bentone flash dryer process. The facility representatives explained that they had conducted the initial 16 weeks of VE checks as required by Condition 006 and now checked for VE around the facility daily and, if any VE detected, used RM9 to check for 360 seconds (i.e., six minutes) to determine if there is a violation of the emission limits in Permit Condition 006. They showed the inspectors a spreadsheet of recorded VE observation results, including the results for September 13 and 15, 2022. The inspectors noted that for September 13, 2022, the spreadsheet indicated no VE observed. However, for September 15, 2022, the spreadsheet indicated that the pressure drop of the baghouse was recorded as 10 inches of w.c. and so, the milling and shaker packer

baghouses were shut down and repaired. The spreadsheet noted that after the repairs, the pressure drop reading was 5.5 inches of w.c. The inspectors asked that during the facility walkthrough, the representatives show where they typically make the VE observations.

The inspectors noted that Permit Condition 004 of the 2018 operating permit set a minimum temperature for the thermal oxidizer ("TO") controlling emissions from the Bentone reaction tanks and horizontal belt filters at 1,500 degrees Fahrenheit and a destruction efficiency ("DE") of at least 95% as tested every five years. The facility representatives explained that the last performance test of that thermal oxidizer was 2020 and that it had met the 95% DE requirement. The inspectors explained that the control efficiency of a pollution control system was the product of the DE multiplied by the capture efficiency ("CE") of the system. They noted that Enclosure A of the SOB for the 2018 operating permit included a "federally enforceable control device efficiency" for particulate matter ("PM") of 99.0% for most of the Bentone and Nalzin processes but 49.5% for some of the Nalzin processes. They asked if the CE for those processes were ever measured by testing. The facility representatives said that the stack test consulting firm may have performed testing for CE when they tested for DE but noted the Nalzin process equipment discussed in that section of the 2018 SOB was no longer at the facility.

The inspectors noted that the SOB for the 2001 operating permit included a reasonably available control technology ("RACT") determination for VOCs, made under Missouri's air pollution regulation 10 CSR 10-5.520, which appeared to require a CE of 95% and a DE of 95% for the Bentone reaction tank, the vacuum filters #1 and #2, and flash dryers #1 and #2, but 60% CE and 95% DE for the belt press filter. They asked if CE for those processes was ever tested. The facility representatives were not sure if the CE was ever measured but assumed VOC capture was high because the emissions ducting system operated under negative pressure to the thermal oxidizer. The inspectors asked if the 60% CE assumption associated with the belt press was due to it being only partially enclosed, such as with a hood rather than in a permanent total enclosure. The representatives were not sure how the 60% was determined. They also noted that near the paddle mixers, there were hoses under negative pressure that vented to the TO.

The inspectors noted that the 2013 construction permit, 122013–006, stated that, "HAP emissions are expected from this project, but only in amounts less than their respective Screening Model Action Levels ("SMAL"). The HAPs of concern are methyl chloride and benzyl chloride." They noted that the permit also states that, "VOC and HAPs emissions are expected from the use of the liquid amines. Emissions were calculated assuming 100% of the VOC and HAPs are emitted. The percent VOC and HAPs were obtained from the MSDS for the amines." They noted that SMAL is a permitting threshold, not a threshold for the National Emission Standards for Hazardous Air Pollutants ("NESHAPs"). They noted that the SOB to the 2018 permit states that 40 C.F.R. Part 63, Subparts VVVVVV, the NESHAP for chemical manufacturing at area sources, and BBBBBBB, the NESHAP for the chemical preparations industry, do not apply because the facility does not use any of the HAPs targeted by the regulations, such as (but not limited to): 1,3-butadiene; 1,3-dichloropropene; Acetaldehyde; Chloroform; Ethylene dichloride; Hexachlorobenzene; Methylene chloride; Quinoline; Arsenic compounds; Cadmium compounds; Chromium compounds; Lead compounds; Manganese compounds; Nickel compounds; or Hydrazine, at amounts greater than the

regulatory thresholds[1]. They asked if any of those HAPs were used in any of the facility's products and considered in its review of NESHAPs, such as those for paint or associated product manufacturing. The facility representatives said that there could be small amounts of benzene in some raw materials like toluene and xylene as a contaminant, but they did not use benzene as a raw material. The facility representatives said that methyl and benzyl chloride were considered in the facility's annual emission calculations but did not believe that any of the raw materials used at the facility contained methylene chloride or heavy metals. They noted that for quality control purposes, the suppliers of the raw materials provided Elementis with tested values of constituents in the supplied materials. They asked if the facility used any raw materials that might contain methylene chloride which is a pollutant that can trigger applicability of several NESHAPs, even for minor sources of HAPs. The inspectors reviewed the raw material specifications, certificates of analysis, receipts, and Safety Data Sheets for the amines used at the facility. They did not see any indication that methylene chloride or other target HAPs were present in the amines used at the facility. They made copies of those documents for the inspectors. See Appendix E.

The inspectors noted that the 2018 construction permit, 082018 009, states, "There are no emission factors published for the VOC emission from process operations in Bentone manufacturing. Emission factors for these operations were developed from stack testing that was performed on each of the process operations while manufacturing one specific formulation, Bentone 34." They asked if Bentone 34 is representative of other formulations or represented a "worst case" for potential emissions. The facility representatives said that Bentone 34 is not the worst case but is rather a standard product with 37 to 40% lost on ignition. They explained that other products had higher losses on ignition but were run less frequently (e.g., one time per quarter or one time per year), including one product that had a range of 48 to 51% loss on ignition and was run approximately 25% of the time. The inspectors noted that a product running 25% of the year would typically be considered "representative" and should be considered in future testing.

The inspectors noted that the 2018 construction permit, 082018-009, states, "AP-42 Section 7.1 "Organic Liquid Storage Tanks" (November 2006) was used to calculate the emissions of the Amine Storage Tanks since they are heated." They asked for the temperature to which the tanks were heated and to see the emissions estimates for the amine tanks. The facility representatives said the tanks were heated to approximately 140 degrees Fahrenheit but were not familiar with the emissions calculation methods used to prepare the facility's EIQ and compliance reports which are prepared by a consultant, BHMG Engineers. The inspectors reviewed several EIQ pages related to amine tanks #4 and #7 which stated the "Tanks" model was used in the estimations for those tanks, i.e., 0.44 tons per year ("TPY") VOC and 0.89 TPY VOC, respectively. They explained that if the calculations were based on the Tanks model, the emissions would likely be understated because the model is not able to calculate emissions correctly from tanks heated above 100 degrees Fahrenheit.

The inspectors noted that the National Emissions Inventory ("NEI") indicated that the facility's 2020 combine facility-wide HAPs were 0.31 TPY and VOCs were 38 TPY and asked how Elementis was calculating its emissions of those pollutants. They asked why no HAPs seemed to be estimated from amine storage tanks. The facility representatives did not readily know the basis of the estimations but

[1] See § 63.11494 and § 63.11588.

believed that emission factors, Safety Data Sheets, and data related to the raw materials and processes were used by the outside contractor.

The inspectors asked if the facility representatives knew the current or manufacturer's recommended pressure settings for the conservation vents on the heated amine tanks. They noted that the NEI appeared to include an estimate of VOC emissions from working losses from the tanks (i.e., during filling) but not from breathing losses (i.e., day-to-day storage), which could be significant from heated tanks. Further, they noted that the NEI did not appear to include a HAP estimate from those tanks for either breathing or working losses. The facility representatives said that the tanks included conservation vents consisting of a gasket with a weight on top. They explained that the tanks were located indoors but vented outdoors. They were not sure of the settings or if the emissions were considered in the Tanks modeling done by the consultant.

4. Facility Tour/Walkthrough:

At approximately 10:20 am, the facility representative led the inspectors on a walk through the facility. The group followed the basic production process, including: the raw materials receiving and storage areas, including the outdoor vertical clay storage tanks; the indoor equipment for processing, including the reactors, belt presses, dryers, and milling equipment; outdoor solvent storage; and product packaging and storage. They observed several outdoor fixed roof tanks containing solvents, as well as the amine tanks which are located indoors. They also observed several air pollution control devices, such as baghouses and thermal oxidizers, as well as numerous emission points on the roofs of the production buildings.

During the facility walkthrough, the inspectors took photographs with a digital camera and videos using the FLIR camera. See the digital image log in Appendix A. Using the FLIR camera, they detected indications of VOC emissions at several locations, including:

- The inlet and outlet of the horizontal belt filter presses associated with the fluid bed reactor process (see videos MOV_2699.mp4, MOV_2700.mp4 and MOV_2701.mp4 and photos DSCN9611.JPG, DSCN9612.JPG, DSCN9613.JPG, DSCN9614.JPG, DSCN9615.JPG, and DSCN9616.JPG),
- The inlet and outlet of the horizontal belt filter presses associated with the Bentone process (see videos MOV_2711.mp4 and MOV_2712.mp4, and photos DSCN9651.JPG, DSCN9652.JPG, DSCN9653.JPG, DSCN9654.JPG, and DSCN9655.JPG),
- The exhaust stacks from the fluid bed dryers (see MOV_2702.mp4 and MOV_2703.mp4 and photos DSCN9626.JPG and DSCN9627.JPG), and
- The exhaust vents from the flash dryers (see MOV_2704.mp4 and photos DSCN9630.JPG and DSCN9631.JPG).

Regarding the horizontal belt filters, the inspectors observed that the emissions capture hoods were positioned approximately four feet above the belts and open on all sides. They noted that the hoods only extended for approximately six feet over the outlet end of the presses where the higher solids content material was conveyed to the next stage in the process. They observed that there was no emissions capture device at the inlet where the clay mixture entered the press as a liquid mixture which poured down from approximately one foot above the belt. The inspectors noted visible emissions at the inlet of

the horizontal bed filters associated with the Bentone process. The facility representatives explained that the belt portion of the presses were under negative pressure which pulled liquid and emissions down from the press to ductwork below and routed to the thermal oxidizers. The inspectors noted that, as described by the facility representatives, the material entering the belt presses was approximately 97% liquid (3% solids), consisting of a mixture of ethanol and clay that had been reacted with amines, and the material exiting the presses contained approximately 85% liquid (15% solids). They noted that given the VOC emissions observed with the FLIR, it appeared that the emissions capture system may not be achieving capture efficiencies at the rate assumed in the facility's permits and emission calculations.

Regarding the exhausts from the dryers, the inspectors noted that the dryer processes were routed to baghouses to control particulate matter emissions but not to thermal oxidizers to control VOCs and HAPs. They noted that the VOC emissions detected by the FLIR camera from the dryer vents were likely VOCs and HAPs driven off as the material was dried from 85% liquid (15% solids) to approximately 50% liquid (50% solids).

The inspectors also detected possible VOC emissions from the thermal oxidizer stack (see video MOV_2705.mp4 and photo DSCN9632.JPG). They observed what appeared to be VOC emissions in an extended plume beyond where the typical range of water vapor would be expected.

The facility representatives showed the inspectors where VE observations were typically made, including the pneumatic system for conveying the clay and the various emission points on the roof of the production buildings. The inspectors did not note any VE at the usual observation points. However, at the Fluid Bed Stage 2 dryer vent, they observed visible emissions with the naked eye, as well as VOCs using the FLIR camera. Due to the position of the vent and the sun, and the location of other equipment on the roof, they were unable to conduct a RM22 observation at that time.

The inspectors and facility representatives went into the room where the heated amine storage tanks were located but, due to safety concerns, the inspectors were not allowed to bring the digital or FLIR cameras inside to record images. The inspectors noted the tanks were vented to the roof but detected a chemical odor inside the room.

The group returned to the conference room at approximately 1:00 pm. After a short discussion, the group took a lunch break.

5. Closing Conference:

At approximately 2:30 pm, the inspectors returned to the facility. They joined the facility representatives in the conference room. They thanked the facility representatives for their time and cooperation during the inspection. They explained that EPA would provide Elementis with an inspection report in approximately 60 days. They explained that the report would be available to the public through the Freedom of Information Act, and therefore, if the company wanted to claim any notes or digital images as confidential business information ("CBI"), they could do so today or within 10 days following the inspection. They provided Mr. Moore with the EPA's confidentiality notice form. Mr. Moore signed the form. See Appendix B.

The inspectors provided a receipt for the copies of documents they received, including raw materials receipts, product specifications, and Safety Data Sheets for three amine products (see Appendix D and Appendix E):

- Lonza Carsoquat ST-83,
- Evonik Adogen 442 83 EI, and
- Evonik Variquat B 343E.

The inspectors summarized the following areas of concern:

- The inspectors made observations with the FLIR camera that indicated emissions of VOCs from several processes at the facility, including the belt presses and product dryers. Such observations raised questions about the assumptions Elementis uses regarding the degree of capture of VOC and HAP emissions and the accuracy of emissions calculations reported to MoDNR and EPA.
- The inspectors observed visible emissions from the fluid bed dryer and horizontal bed belt filter presses which also raised questions regarding the level of capture of emissions from the belt presses.
- The inspectors noted Elementis' use of the Tanks model to estimate VOC and HAPs emissions from the amine tanks may underestimate emissions of those pollutants because the model typically cannot estimate emissions accurately for storage tanks at temperatures higher than 100 degrees Fahrenheit.

The inspectors provided the facility representatives with a copy of a Notice of Preliminary Findings. See Appendix C.

At approximately 3:00 pm, the inspectors departed from the facility.

6. Appendices

A. Digital Image Log
B. Confidentiality Notice Form
C. Notice of Preliminary Findings Form
D. Document Receipt Form
E. Copy of Documents Obtained During Inspection

Inspection Report Sign-Off

Lead Inspector's Name: Steven Rapp, ERG

X Steve Rapp

Digitally signed by Steve Rapp
Date: 2023.08.28 14:02:27 -04'00'

Lead Inspector

Assisting Inspector's Name: Elizabeth Hubbard, ERG

X Elizabeth Hubbard

Digitally signed by Elizabeth Hubbard
Date: 2023.08.28 14:14:17 -04'00'

Assisting Inspector

Supervisor's Name: Tracey Casburn, Air Branch Chief, ECAD

X TRACEY CASBURN

Digitally signed by TRACEY CASBURN
Date: 2023.09.04 06:57:12 -05'00'

Supervisor