

**Inspection Report: PQ Corporation, Clean Air Act Stationary Source**

**Facility Name:** PQ Corporation

**Inspection Date(s):** September 27, 2023

**Facility Address:** 4238 Geraldine Avenue, St. Louis, MO 63115

**FRS ID #:** 110001452703

**Federal Facility:** No

**NCI:** Creating Cleaner Air for Communities

**Facility size:** Major Source

**Activity:** PCE

**State Referral:** No

**NAICS code:** 325188 – All Other Basic Inorganic Chemical Manufacturing

**Lead Inspector:** Elizabeth Hubbard, ERG Inspector Trainee, (919) 468-7894

**Asst. Inspector:** Bryan Lange, ERG Inspector, (919) 622-2374

**State Inspector:** Patrick Glass, Missouri Department of Natural Resources (MoDNR)

**Facility Contact:** Rich Heisse, Site Manager, (314) 679-8502, rich.heisse@pqcorp.com

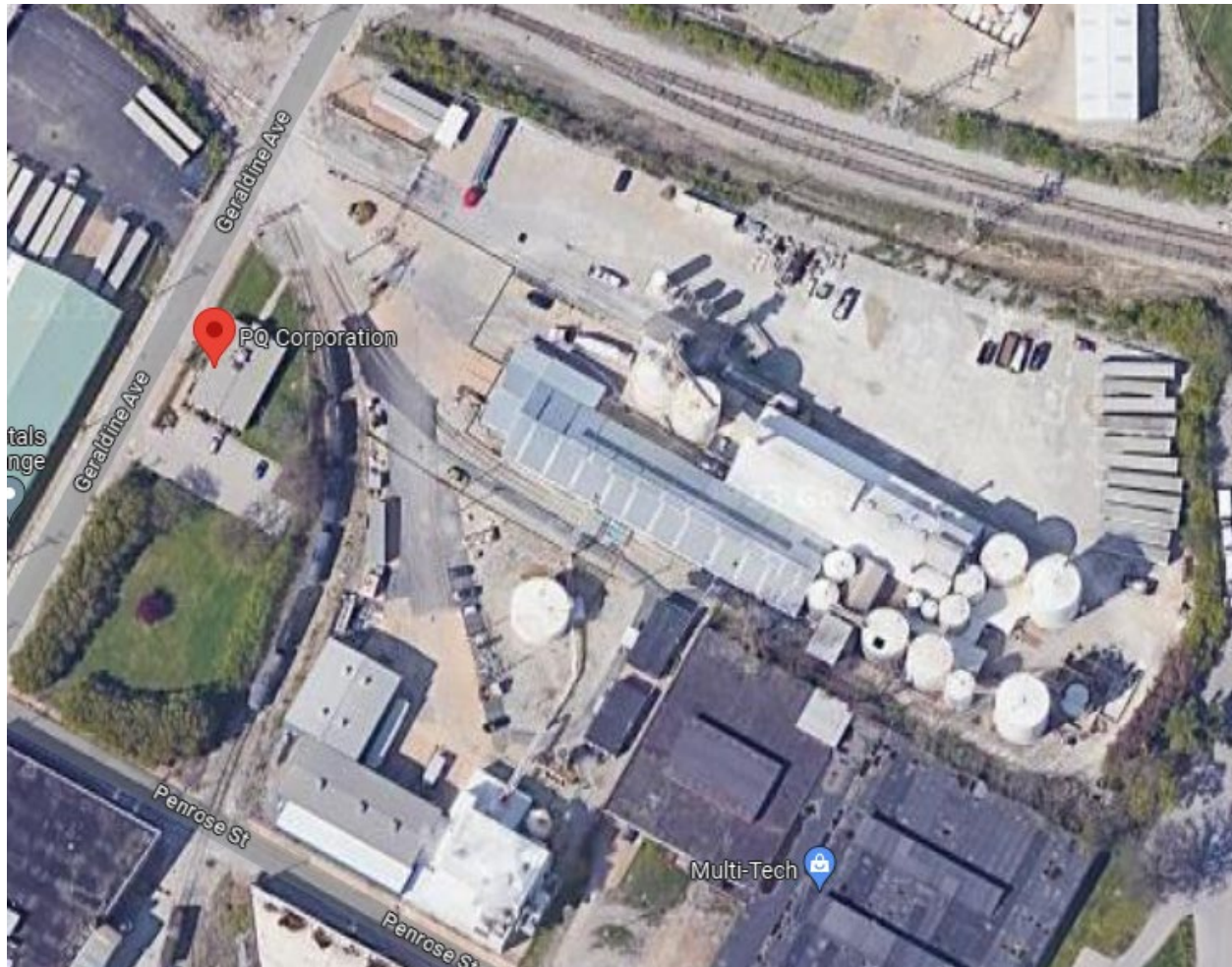
## 1. Plant Description:

According to the facility's 2018 operating permit, "PQ Corporation, located within the City of St. Louis, produces sodium silicate (water glass) and silica gel. Sodium silicate and silica gel are used in a variety of products including clarifying agent for alcoholic beverages." The installation is a major source for particulate matter ("PM") and nitrogen oxides.

The operating permit describes the production of sodium silicate as follows: "The production of sodium silicate begins by unloading railcars of soda ash and sand into storage silos. From the storage silos, a carefully controlled amount of soda ash and sand are fused and reacted to produce sodium silicate. The sodium silicate is then solidified and conveyed to the storage silos."

The operating permit describes the production of silica gel as follows: "Silica gel is produced by reacting sodium silicate with sulfuric acid. Once the silica gel has been produced, it is washed, dried and ground to the size specified by the customer. The drying and grinding are accomplished in the Mill Heater. From the Mill Heater, the silica gel is transported by air to the packaging operation."

**Figure 1:** Satellite image of the PQ Corporation facility in St. Louis, MO.



## **2. Facility Entry:**

The representatives of the United States Environmental Protection Agency (“EPA”), Elizabeth Hubbard and Bryan Lange from Eastern Research Group (ERG), and a representative from MoDNR, Patrick Glass, arrived at the PQ Corporation facility at 4238 Geraldine Avenue, St. Louis, MO (“PQ Corporation” or “the facility”) at approximately 9:15 am. The MoDNR and ERG representatives (“the inspectors”) were met at the administration building by Rich Heisse, Site Manager; Tom Ferrall, Environment, Health, and Safety (“EHS”) Partner; James Kelsey, Gels Plant Unit Manager; and Jeff Zurbriggen, ICD Plant Unit Manager (“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 EPA. They provided a copy of EPA’s “Small Business Resources Information Sheet.”

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

The inspectors explained that they were at the facility to conduct a routine Clean Air Act (“CAA”) inspection that was part of a national initiative to look at facilities close to residential neighborhoods, including a focus on volatile organic compounds (“VOCs”) and hazardous air pollutants (“HAPs”). The inspectors explained that during the facility walkthrough, they would capture 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. Therefore, they requested that the facility representatives inform them of any areas where there could be a potentially explosive atmosphere. The facility representatives expressed that there were no areas of the facility where flammability would be a concern.

The inspectors asked for background information about PQ Corporation and the facility. The facility representatives provided an overview of the facility’s history, as well as the general operations that took place at the facility. The facility representatives explained that the facility operated 24 hours per day, 7 days per week and that 34 people were employed by the facility, with 4 additional corporate employees that visited regularly. PQ Corporation was a global company and was headquartered in Malvern, Pennsylvania. The facility representatives said that PQ Corporation had 9 facilities in the U.S. and estimated it had around 30 facilities globally. The facility was located on 6.2 acres of land, which the facility representatives said was a medium-sized site for PQ Corporation. The facility was built in 1926 to serve PQ Corporation customers in the Midwest and originally only included the “ICD Plant”, the part of the facility that produced sodium silicate. The “Gel Plant”, where silica gel was produced at the facility, was added in 1993 to serve Anheuser-Busch and other customers. This facility was one of two facilities owned by PQ Corporation that produced silica gel. The facility’s environmental permits included a Title V permit, a water discharge permit, and a nuclear gauge permit.

The facility representatives described the sodium silicate production process, which they said had changed very little since PQ Corporation began producing it in 1851. The facility received both sand and soda ash (the two raw materials used to produce sodium silicate) by rail, and the final product was shipped out by rail and truck. In the ICD Plant, sand and soda ash were combined in a natural gas-fired glass melting and regenerating furnace operated at 2,200 to 2,500°F, which was the facility’s main source of PM emissions. The facility representatives said the last stack test on the furnace was completed in 2014. Continuous scales controlled the ratio of sand to soda ash fed to the furnace, which could vary between ratios of 1.6 and 3.2. A product with a lower sand to soda ash ratio would have a higher alkalinity. From the furnace, the melted material would go to a glass bunker, through pressure dissolvers, to unfiltered finished product storage, through a filtration process, then to finished lot tanks.

The facility used a pressure leaf filter process which involved combining the sodium silicate with a filter aid in an Admix tank, then the material went to a filter feed tank which fed it to the filter, and finally to the finished lot tanks. The facility performed quality checks on the product in the finished lot tanks before shipping it out. The final product was approximately 65% water and could be used in multiple applications (e.g., as an adhesive or to coat metals for corrosion prevention). Although the final sodium silicate product was a liquid, the facility representatives said that it was chemically the same as hardened glass. The site typically shipped 1 to 4 railcars worth of sodium silicate product each day, and product could also be shipped via truck. A truck would hold 45,000 pounds of sodium silicate, while a railcar would hold 180,000 pounds.

The facility representatives described the silica gel production process and its applications. Sodium silicate product from the ICD Plant was combined with sulfuric acid which was sprayed from a nozzle over a catch pan, then magnesium sulfate was added to the material in an ion exchange extractor. From there, the material went through a wash water extractor and was then sent to the mill and mill heater, where it was dried with 1,400°F air and ground to a specified size. The silica gel mill and mill heater included a baghouse with 244 bags, and the facility representatives said it used high temperature bags that were changed about once per year. The facility representatives said that 97.5% of the silica gel produced at the facility was used by Anheuser-Busch for filtering beer, so employees commonly referred to the silica gel as “beer gel.” The silica gel was used to make beer clear and was preferable to alternative means of filtration because it left no taste behind. The silica gel was also used by other customers for oil purification. The Gel Plant produced six different products which were sold globally, including D300 which was a “base set” gel that would set in a fraction of a second. The Gel Plant produced a larger diameter product called “XLC” and a fine powder product called “L10”.

The inspectors asked whether the facility produced any container glass, pressed and blown glass, wool fiberglass, or flat glass. The facility representatives responded that no hard glass was produced at the facility; all the glass it produced was liquid sodium silicate or “water glass.”

The inspectors asked when the melting furnace was installed at the facility. The facility representatives said that the furnace was installed in 1926 and was originally coal-powered but now used natural gas. It was also converted into a regenerating furnace in 2020.

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 Annual HAP and VOC Emissions Reports. The following is a summary of the discussion.

The inspectors noted that the permit limited PM emissions from several sources but did not require specific monitoring procedures for a lot of said sources. The inspectors asked how the facility ensured they were meeting those emission limitations. The facility representatives explained that they conducted opacity readings using EPA Method 22 every month on all sources and EPA Method 9 every month on the melting furnace. Facility employees, including Mr. Heisse and Mr. Zurbriggen, were trained on how to conduct Method 9 opacity readings. The inspectors asked to see examples of Method 9 and Method 22 observations, as well as the Method 9 certification for the person who performed the Method 9 observations. The facility representatives provided a Method 22 observation log for September 25, 2023, a Method 9 observation log for September 26, 2023, and a Method 9 certification for Mr. Zurbriggen issued September 19, 2023. See Appendices H, M, and N.

The inspectors explained that low levels of emissions of metal HAPs, such as chromium, lead, manganese, nickel, and cadmium, had been reported to the National Emissions Inventory (“NEI”) for the facility. The inspectors asked whether any of these emissions came from the ingredients used to produce sodium silicate and/or silica gel. The facility representatives responded that there were trace metals present in finished products but only very minimal amounts. They explained that the final products were tested for trace metals in the facility’s research and development lab, and silica gel was tested for soluble iron and arsenic. The inspectors asked how the facility calculated its metal HAP emissions, and the facility representatives said that calculations were based on stack testing results and emission factors from AP-42.

The inspectors noted that the permit limited PM emissions from the silica gel mill and mill heater (EP-102) to 3.71 pounds per hour and 0.30 grain per standard cubic foot of exhaust gases. The permit required daily visible emissions monitoring and baghouse pressure drop checks to ensure it stayed between 0.1 and 7 inches of water. The inspectors asked to see records of pressure drop measurements. The facility representatives presented daily pressure drop measurements for the baghouses for both EP-102 and the silica gel product bagging unit (EP-103) for August 2023, which the inspectors reviewed. The inspectors noted that all the pressure drop measurements they reviewed for both baghouses appeared to be within the permitted range. See Appendix L.

The inspectors noted that the permit limited the 30-day average oxygen concentration from the melting furnace to 3.0 percent by volume on a dry basis and required the facility to calculate an average oxygen concentration for each furnace operating hour and record any deviations in a logbook. The inspectors asked to see the furnace logbook. The facility representatives presented the logbook, and the inspectors reviewed a few days’ worth of oxygen concentration records, all of which appeared to be within the permitted range. See Appendix K for an example of a furnace oxygen monitoring log.

The inspectors noted that the permit limited emissions of sulfur compounds when using Fuel Oil No. 2 as backup fuel for the melting furnace. They asked how frequently Fuel Oil No. 2 was used and how the facility ensured compliance with the emission limit for sulfur compounds. The facility representatives explained that Fuel Oil No. 2 was no longer used at the facility, and the facility’s Fuel Oil No. 2 tank had been emptied and cleaned. The facility’s furnace could technically still run on Fuel Oil No. 2, but that was no longer done. Instead, the facility only used natural gas which was received by pipeline.

The inspectors asked how the facility calculated the potential to emit (“PTE”) listed for each of the pollutants in the SOB and from where they derived the emission factors used to calculate the PTE. The facility representatives responded that all of the calculations and emission factors used to determine PTE were based on the stack tests performed at the facility.

The inspectors noted that, for the emissions reported to the NEI, the emission calculation methods listed for many of the pollutants included “USEPA Speciation Profile,” “USEPA Emission Factor,” or “Engineering Judgment.” They asked the facility representatives if they could elaborate on these calculation methods or explain what sources were used for USEPA Speciation Profiles or USEPA Emission Factors. The inspectors noted that a few pollutants had “Stack Test” listed as the calculation method and asked why stack tests were not used for more pollutants. The facility representatives explained that the EIQ calculations for the facility were performed by a consultant, so they did not know exactly how the calculations were performed. They said that stack tests were used as the basis for calculations from emission points where stack testing had been performed, and AP-42 was used for other emission points.

The inspectors asked to see examples of any remaining attachments from the SOB that they had not yet reviewed, which included the Inspection/Maintenance/Repair/Malfunction Log and the Monthly Fuel Usage Monitoring Log. The facility representatives provided the Inspection/Maintenance/Repair/Malfunction Log for August of 2023 and the Monthly Fuel Usage Monitoring Log for January through August of 2023. See Appendices I and J.

The inspectors asked how the facility determined the capture and control efficiencies of its control devices as listed in the SOB. The facility representatives responded that the capture and control efficiencies were determined from manufacturer specifications. The inspectors asked how often the bags on the baghouses were replaced. The facility representatives said that the bags were replaced yearly or as needed if any rips were seen, but that rips did not occur frequently.

The inspectors noted that the permit limited emissions from the facility's natural gas emergency generators under 40 CFR Part 60 Subpart JJJJ, *Standards of Performance for Spark Ignition Internal Combustion Engines* and asked to see records of operating hours for the generators. The facility representatives provided run time logs for the 60-kW generator located in the Gel Plant and the 80-kW generator located in the ICD Plant. See Appendices F and G.

The inspectors noted that the permit mentioned 40 CFR Part 60 Subpart CC, *Standards of Performance for Glass Manufacturing Plants* and 40 CFR Part 63 Subpart SSSSSS, *National Emission Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources* did not apply to the facility because the facility was not a glass manufacturing plant. The inspectors asked how these determinations were made. The facility representatives explained that, in 2002, MoDNR had tried to model the facility as a glass plant and apply these regulations to the facility. The facility had pushed back because it was not a glass plant, and these regulations were determined not to be applicable. They explained that their process was much smaller and less complicated than that of a glass manufacturer's. For example, hard glass manufacturing would require a melting furnace 4 to 5 times larger than the furnace at the facility.

#### **4. Facility Tour/Walkthrough:**

At approximately 11:15 am, the facility representatives led the inspectors on a walkthrough of the facility. They started at the truck loading area, toured the ICD Plant, visited the sodium silicate product storage tanks, proceeded to the location where the facility regularly performed opacity observations, then toured the Gel Plant, and walked by the railcar loading area. The list of digital images and FLIR videos taken during the walkthrough are included in Appendix A.

The facility representatives informed the inspectors that the ICD Plant was making a 3.2 ratio (sand to soda ash) product that day, while the Gel Plant was making L10.

At the truck loading area, the facility representatives informed the inspectors that all trucks were top filled for sodium silicate loading.

At the ICD Plant, the facility representatives showed the inspectors the plant's 80-kW emergency generator and its run time log screen. See photos CBI\_DSCN7540.JPG and CBI\_DSCN7541.JPG.

The group proceeded to the melting furnace, where the facility representatives pointed out that the furnace length to width ratio was not optimal, which was causing flames to come out of the furnace door and waste energy. See photos CBI\_DSCN7542.JPG and CBI\_DSCN7553.JPG. The facility representatives informed the inspectors that the conveyor that carried the molten glass to the bunker was a couple of hundred feet long and had approximately 500 molds.

The group visited the ICD Plant operator room, and the inspectors reviewed several process control screens. See photos CBI\_DSCN7543.JPG through CBI\_DSCN7546.JPG. They then proceeded past the feed water tank, the blow tank, and the dissolver tanks. The inspectors noted all of these tanks had apparent buildup on their exteriors. See photos CBI\_DSCN7547.JPG through CBI\_DSCN7549.JPG.

At the outdoor storage tank area, the inspectors saw the tank that was formerly used to store Fuel Oil No. 2 and had been emptied and cleaned. The facility representatives informed the inspectors that the tank had not been used since 2018. See photo CBI\_DSCN7550.JPG. The inspectors also saw a multitude of sodium silicate product storage tanks. The facility representatives informed the inspectors that at any given time, there were generally 27 to 28 sodium silicate tanks in use, which stored between 20 and 22 million pounds of total product. See photos CBI\_DSCN7551.JPG and CBI\_DSCN7552.JPG. The group was unable to visit the melting furnace baghouse due to safety concerns regarding its location above the furnace.

Upon exiting the ICD Plant, the facility representatives showed the inspectors the facility's natural gas pipeline manifold. See photo CBI\_DSCN7554.JPG.

The group proceeded to the location from which the facility employees conducted opacity observations for the melting furnace. The facility representatives informed the inspectors that visible emissions were graded between 1 and 100% based on what they saw and that they were typically between 5 and 20% opacity. The facility representatives told the inspectors that there had been two instances they were aware of when black smoke was seen coming from the melting furnace, with the most recent occurrence being in 2019. In both instances, the observations were reported to MoDNR immediately. The inspectors noted that they could see visible emissions coming from the furnace stack at this location, but they appeared minimal. The inspectors did not see any apparent VOC emissions coming

from the furnace stack while using the FLIR camera and took a video of the stack. See photo CBI\_DSCN7555.JPG and video CBI\_MOV\_2765.mp4.

The group proceeded to the Gel Plant, starting at the top floor of the plant where nozzles sprayed sodium silicate and sulfuric acid over a catch pan. The inspectors did not see any apparent VOC emissions from the nozzles when viewing with the FLIR camera. The facility representatives showed the inspectors what the silica gel beads looked like immediately after forming as the sodium silicate and sulfuric acid were combined. The beads could be seen being carried by a flight conveyor. See photos CBI\_DSCN7556.JPG and CBI\_DSCN7557.JPG.

In the Gel Plant operator room, the inspectors reviewed several process control screens and the baghouse pressure drop log for September 2023. The facility representatives informed the inspectors that the Gel Plant generally operated 7 days per week, but for approximately the past month it had been operating 5 days per week. See photos CBI\_DSCN7558.JPG and CBI\_DSCN7559.JPG.

The group then proceeded to the mill and mill heater, the mill baghouse, and the bagging area. See photo CBI\_DSCN7560.JPG.

At approximately 12:30 pm, the group returned to the office for a closing conference.



## 5. Closing Conference

In addition to the personnel who were present at the opening conference, Jennie Houle, EHS Director for Management Systems, Compliance, and Global Silicas, attended via Microsoft Teams.

The inspectors thanked the facility representatives for their time and cooperation during the inspection. The inspectors explained to the facility representatives that EPA would provide PQ Corporation 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, documents, or digital images as confidential business information (“CBI”), they could do so today or within 10 days following the inspection. They provided the facility representatives with the EPA’s confidentiality notice form. Mr. Heisse filled out and signed the form. See Appendix B.

The inspectors summarized questions and concerns raised during the inspection. They noted that during the facility walkthrough, they observed no VOC emissions while using the FLIR camera. The inspectors had no concerns about the facility’s compliance with its permit requirements based on the documentation provided during the inspection. The inspectors provided the facility representatives with a copy of a Notice of Preliminary Findings form and explained that EPA may follow up with additional questions. See Appendix C.

The inspectors provided a receipt for the copies of the documents they received (see Appendices D through N).

At approximately 1:15 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. Opening Conference Attendance Sheet (claimed as CBI)
- F. 60-kW Generator Log (claimed as CBI)
- G. 80-kW Generator Log (claimed as CBI)
- H. Method 22 Observation Log (claimed as CBI)
- I. Inspection-Maintenance-Repair-Malfunction Log (claimed as CBI)
- J. Monthly Fuel Usage Log (claimed as CBI)
- K. Furnace O<sub>2</sub> Monitoring Log (claimed as CBI)
- L. Baghouse Pressure Drop Monitoring Log (claimed as CBI)
- M. Method 9 Certification (claimed as CBI)
- N. Method 9 Observation Sheet (claimed as CBI)

Inspection Report Sign-Off

Lead Inspector's Name: Elizabeth Hubbard, ERG

X

Lead Inspector

Assisting Inspector's Name: Bryan Lange, ERG

Signed by Jason Sese for Bryan Lange

X

Assisting Inspector

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

X

Supervisor