EVALUATION REPORT FOR PERMIT TO OPERATE

Applicant's Name: THE PQ CORP Facility ID: 011435

Mailing Address: 8401 QUARTZ AVE
SOUTH GATE, CALIFORNIA 90280

Equipment Location: SAME

EQUIPMENT DESCRIPTION

Modifications are shown in bold italic, original in bold strike-though.

Appl. No. 528527 – Change of Condition for Process 2 System 2 – Sodium Silicate Melting Furnace (PC No.: 485404):

Appl. No. 528528 Lead Application

Modification to Process 2 System 1 – Raw Material Mixing and Storage (A/N: A24609 P/O: P07036), by:

the addition of:

- an aluminum trihydrate (ATH) feed hopper (D57), and
- an ATH feed screw conveyor (D58)

Equipment	ID No.	Connected to	RECLAIM Source Type/ Monitoring Unit	Emission and Requirements	Conditions
Process 2: FURNACE					
System 1: RAW MATERIAL MIXING AND STORAGE					
CONVEYOR, ~~**DRAG,**~~ ***SCREW,*** SAND A/N: ~~**A24609**~~ ***528528***	D8	C53		**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2
CONVEYOR, ~~**DRAG,**~~ ***SCREW,*** SODA ASH A/N: ~~**A24609**~~ ***528528***	D9	C53		**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2
HOPPER, ALUMINUM TRIHYDRATE OR RECYCLE GLASS FINES ***A/N: 528528***	***D57 (NEW)***			***PM: (9) [RULE 405, 2-7-1986]***	***D323.2***
CONVEYOR, SCREW, ALUMINUM TRIHYDRATE OR RECYCLE GLASS FINES ***A/N: 528528***	***D58 (NEW)***			***PM: (9) [RULE 405, 2-7-1986]***	***D323.2***
CONVEYOR, SCREW, ***BATCH MIXER,*** TUNNEL A/N: ~~**A24609**~~ ***528528***	D11	C53		**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2
BUCKET ELEVATOR A/N: ~~**A24609**~~ ***528528***	D12	C53		**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2

CONVEYOR, ~~DRAG,~~ *SCREW,* CROSS-OVER A/N: ~~A24609~~ *528528*	D13			**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2
BIN, TWO COMPARTMENT, 40 TONS A/N: ~~A24609~~ *528528*	D14			**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2
BAGHOUSE, POLYESTER FELT MIKRO PULSAIRE, MODEL 36S-6-30, 268 SQ. FT.; 36 BAGS A/N: 399814	C53	D8 D9 D11 D12		**PM**: (9) [**RULE 404, 2-7-1986**]	C10.1, D12.1, D322.1, D381.1, E102.1, K67.2
System 2: SODIUM SILICATE MELTING FURNACE					
CONVEYOR, SCREW, *BATCH WETTER, WITH WATER SPRAY NOZZLES AND* A BATCH FEEDER A/N: ~~485404~~ *528527*	D16			**PM**: (9) [**RULE 405, 2-7-1986**]	*C8.1,* D323.2
CONVEYOR, SCREW, *BATCH WETTER, WITH WATER SPRAY NOZZLES AND* A BATCH FEEDER A/N: ~~485404~~ *528527*	D17			**PM**: (9) [**RULE 405, 2-7-1986**]	*C8.1,* D323.2
FURNACE, MELTING, (TOTAL OF 12 BURNERS), NATURAL GAS, WITH TWO REGENERATORS AND 20 OVERFIRE AIR PORTS, 56.6 MMBTU/HR A/N: ~~485404~~ *528527*	D18		NOX: MAJOR SOURCE**	**CO:** 2000 PPMV NATURAL GAS (5) **[RULE 407, 4-2-1982]**; **PM:** 0.1 GRAINS/SCF (5A) [**[RULE 409, 8-7-1981]**; **PM:** (9) **[RULE 404, 2-7-1986 RULE 405, 2-7-1986]; PM:** (8) **[40CFR 60 Subpart CC, 10-17-2000]**	A63.2, B59.1, ~~B59.2,~~ D29.1, C1.4, D323.1, E193.1
CONVEYOR, BELT, CHAIN TYPE A/N: ~~485404~~ *528527*	D19			**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2
TANK, T-60, SODIUM SILICATE, 9032 CU. FT. A/N: ~~485404~~ *528527*	D20	C21		**PM**: (9) [**RULE 405, 2-7-1986**]	D323.2
BAGHOUSE, CLOTH FILTER, MIKRO-PUL, MODEL 25S-8-30G, 25 BAGS A/N: 218656	C21	D20		**PM**: (9) [**RULE 404, 2-7-1986**]	C10.1, D12.1, D322.1, D381.2, E102.1, K67.2

Appl. No. 529526 – RECLAIM/Title V Facility Permit Revision

RECLAIM/Title V Facility Permit Revision per Rule 301(k)(5).

PERMIT CONDITIONS

The following Permit Conditions are changed:

~~**B59.2 The operator shall not use the following material(s) in this device:**~~

~~**material with less than 2.5 percent by weight of free water.**~~

~~**[RULE 1303(a)(1) BACT, 5-10-1996; RULE 1303(a)(1) BACT, 12-6-2002]**~~

~~**[Devices subject to this condition: D18]**~~

C8.1 The operator shall use this equipment in such a manner that the flow rate being monitored, as indicated below, is not less than 1 gpm.

The operator shall monitor the spray nozzles for the rate of water being applied to dry materials.

To comply with this condition, the operator shall install and maintain a flow meter to accurately indicate the flow rate of water being supplied to the spray nozzles.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002]

[Devices subject to this condition: D16, D17]

D323.2 The operator shall conduct an inspection for visible emissions from all stacks and other emission points of this equipment whenever there is a public complaint of visible emissions, whenever visible emissions are observed, and on an annual basis, at least, unless the equipment did not operate during the entire annual period. The routine annual inspection shall be conducted while the equipment is in operation and during daylight hours.

If any visible emissions (not including condensed water vapor) are detected that last more than three minutes in any one hour, the operator shall verify and certify within 24 hours that the equipment causing the emission and any associated air pollution control equipment are operating normally according to their design and standard procedures and under the same conditions under which compliance was achieved in the past, and either:

1). Take corrective action(s) that eliminates the visible emissions within 24 hours and report the visible emissions as a potential deviation in accordance with the reporting requirements in Section K of this permit; or

2). Have a CARB-certified smoke reader determine compliance with the opacity standard, using EPA Method 9 or the procedures in the CARB manual “Visible Emission Evaluation”, within three business days and report any deviations to AQMD.

The operator shall keep the records in accordance with the recordkeeping requirements in Section K of this permit and the following records:

1). Stack or emission point identification;

2). Description of any corrective actions taken to abate visible emissions;

3). Date and time visible emission was abated; and

4). All visible emission observation records by operator or a certified smoke reader.

[RULE 3004(a)(4)-Periodic Monitoring, 12-12-1997]

[Devices subject to this condition: D1, D2, D3, D4, D5, D6, D8, D9, D11, D12, D13, D14, D16, D17, D19, D20, D22, D23, D24, D25, D26, D27, D28, D29, D30, D36, D37, D38, D39, D54, ***D57, D58***]

BACKGROUND/HISTORY

The PQ Corp South Gate facility manufactures solid form and aqueous solution sodium silicates. Sodium silicate, also known as waterglass, is used in a variety of products as a catalyst, an adhesive, a coagulant/flocculant in water treatment, a binder in refractory applications, detergent auxiliaries, and among other operations. The PQ Corporation South Gate facility has been operating at its current location since 1930. This facility currently operates an open hearth furnace, a boiler, a sodium silicate dissolving system, and associated storage silos, conveyers, and other supporting equipment. The furnace and the boiler are natural gas fired. PM emissions from the storage silos and conveyers are controlled by dust collectors. NOx emissions from the boiler are controlled by a flue gas recirculation system. The NOx and CO emissions from the open hearth furnace were reduced by separating the combustion zone to a rich burn zone and a lean burn zone (see application no. 485404).

The PQ Corp. facility type:

RECLAIM		Title V
SOx	NOx	
Yes	Yes	Yes

The existing Title V Permit for the facility will expire on June 10, 2013. On October 25, 2011; The PQ Corporation submitted three applications indicated as follows:

Appl. No.	Type	Previous P/O	Equipment	Fee Sch.	Higher Permit Proc. Fee?
528526	Plan	N/A	Facility Permit Revision	RECLAIM/Title V Rev.	No
528527	Change-of-Cond.	PC: 485404	Sodium Silicate Melting Furnace (Proc. 2, System 2)	Sch. E	Yes
528528	Mod.	P07036	Raw Material Conveying (Proc. 2, System 1)	Sch. B	Yes

Appl. No. 528526 is submitted as a plan for the minor revision of the Title V/Reclaim permit as specified in Rule 301.

Appl. No. 528527 is submitted as an expedited class-III application to change of an operating condition (B59.2) to allow aluminum trihydrate (ATH) to be processed in a furnace (D18). The furnace is used to produce sodium silicate, or waterglass, using soda ash (Na_2CO_3) and sand (SiO_2). Some sodium silicate products may be manufactured with alumina contents using ATH. The maximum rate at which ATH is fed into the furnace is 150 lb/hr, and the final product contains ATH at a concentration of 5,000 ppm.

The current operating condition no. B59.2 requires the materials used in the furnace D18 shall contain 2.5% free water or more. Since the manufacturer's MSDS for ATH indicates its moisture content of 1.5%, the applicant feels it is necessary to clarify condition no. B59.2 to allow ATH to be processed in the furnace.

Based on a research conducted, this writer has found out the raw materials, which is a mixture of sand, soda ash and ATH, are water sprayed in the screw conveyors D16 and D17 prior of being fed into the furnace D18. Therefore, instead of changing the raw material type as the applicant proposed, this writer

recommends to replace condition no. B59.2 with a new condition C8.1, which will require the minimum amount of water to be sprayed onto raw materials prior of being fed into the furnace. Based on the calculations performed in this report, the minimum amount of water to be sprayed will be one (1) gpm and that is 4.57% of total raw materials. Therefore, the new condition C8.1 is more stringent as it is compared to the existing condition no. B59.2. In addition, the proposed change of condition will not increase the emissions of this process.

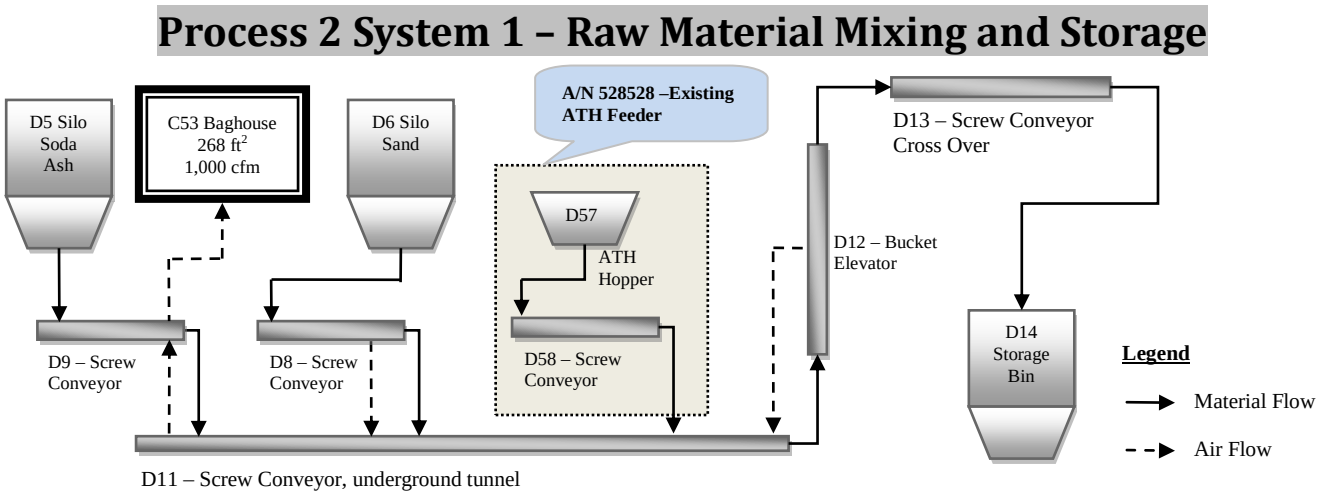
Appl. No. 528528 is submitted as an expedited class-III application for an existing ATH feeder. Since the ATH feeder is considered as a part of the raw material mixing and storage system (PO P07036), this application is accepted as a PO-no-PC modification application for Process 2, System 1.

PROCESS DESCRIPTION

General

The PQ Corporation manufactures sodium silicate (waterglass) by heating/melting a mixture of soda ash (Na_2CO_3) and sand (SiO_2). The chemical reaction is shown as following:

$$SiO_2 + Na_2CO_3 \xrightarrow{\text{Heat to 2,500 deg F}} SiO_2 \cdot Na_2O + CO_2$$



Soda ash (dense type with less than 58% w/w sodium oxide) from storage silo (D5) is weighed automatically, then drops onto a screw conveyor (D9) and travels to an underground tunnel screw conveyor (D11). Sand from storage silo (D6) is also weighed automatically, then drops onto a screw conveyor (D8) and travels to the tunnel screw conveyor D11. In the underground tunnel, the ingredients are mixed while they are screw-augured to the bucket elevator (D12). The bucket elevator D12 conveys the materials to the roof, and another screw conveyor (D13) conveys the materials cross over the building and drops the materials into a two-compartment storage bin (D14).

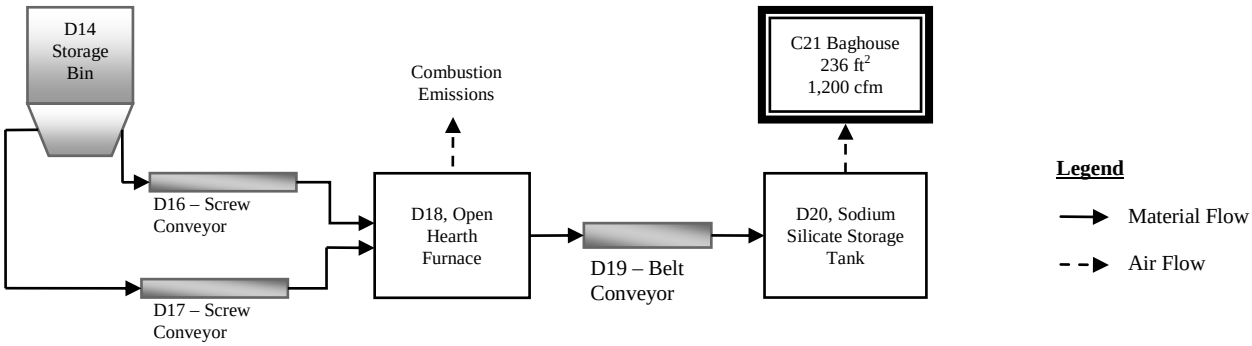
PM Control

Screw conveyors D8, D9 and D11, and the bucket elevator D12 are enclosed and their air spaces are all inter-connected. The 10-hp blower of the baghouse C53 applies 1,000 cfm direct draft to the soda ash screw conveyor D9 at a location near its screw discharge point; this also indirectly vents the air spaces of the underground tunnel, the elevator and the sand screw conveyor D8.

Appl. No. 528528 is submitted for an existing aluminum trihydrate (ATH) feeder, which consists of a hopper (D57) and a screw conveyor (D58). ATH is made up of mainly aluminum trihydrate ($Al_2(OH)_3$), with small amounts of SiO_2, ferric oxide (Fe_2O_3) and sodium oxide (Na_2O), none of which are Rule 1401 toxic compounds. The maximum rate at which ATH is fed into the system is 150 lb/hr, and the final product contains ATH at a concentration of 5,000 ppm.

ATH from a supersack is discharged by gravity into a 2.65 ft^3 vinyl hopper D57. The hopper is equipped with an agitating arm to prevent powder material bridging. ATH from the hopper D57 drops into an underground horizontal screw conveyor, D58. Screw conveyor D58 has a 3.00-inch diameter screw augur which conveys ATH to a chute then to the main underground tunnel screw conveyor D11. No PM emissions are expected because the displaced air is vented to baghouse C53 through the underground tunnel.

Process 2 System 2 – Sodium Silicate Melting Furnace



Sand, soda ash and a small amount of ATH from storage bin (D14) are continuously fed to the melting furnace (D18) through two screw conveyors (D16 and D17). Natural gas is burned in the furnace and the heat melts the raw materials which form a bed of molten sodium silicate. The molten sodium silicate continuously flows out of the furnace by force of gravity through a trough into steel cups on a conveyor belt (D19). Molten sodium silicate solidifies to chunks as it is cooled down on the chain and conveyed to the top of storage tank. The chain inverts for the return on the top of the storage tank and the chunks of sodium silicate break off the chain and fall into the storage tank (D20). On the way down into the storage tank, the sodium silicate chunks impact the breaker bars which break the chunks into smaller pieces. Baghouse C21 is used to control the airborne dust escaping the storage tank.

Batch Wetters / Screw Conveyors, D16 and D17

The two screw conveyors D16 and D17 are used to load the furnace with sand and soda ash from the two compartment storage bin D14. Each of the two screw conveyor is equipped with three water spray nozzles and a batch loader. One (1) gpm or more of water is sprayed on the sand and soda ash in order to make the raw materials fed to the furnace sufficiently moist. If the dry raw materials are loaded to the furnace without being sprayed with water, visible PM emissions would be observed from the furnace stack. Airborne PM is only generated when the dry raw materials first enter the furnace where the hot

combustion air is blown over the dry materials' surface. PM emissions are not expected as the raw materials further into the melter because the surface layer of the sand and soda ash pile melts and forms a layer of glaze.

Open Hearth Furnace, D18

The furnace D18 is a side port continuous regenerative furnace type. This furnace is a RECLAIM major NOx emission source and it is monitored by a CEMS. A drawing of this type furnace can be viewed as follows:

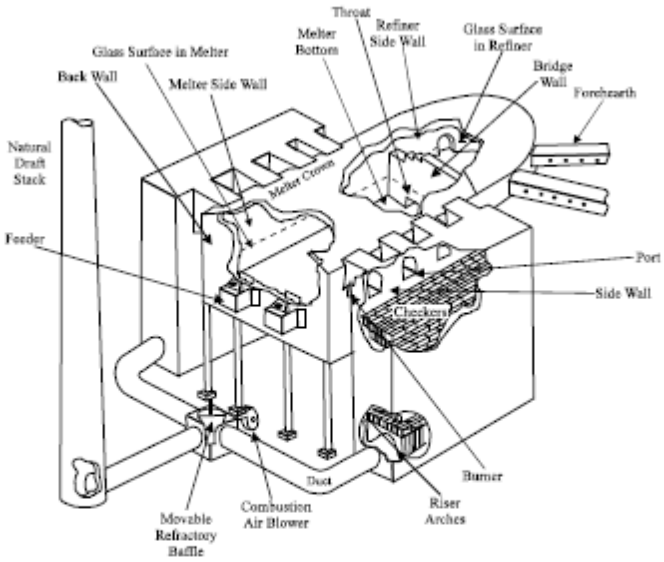


Figure 11.15-3. Side port continuous regenerative furnace.

Note: the above figure is obtained from AP-42, Chapter 11.15 page 11.15-3.

The furnace consists of a melter (combustion chamber) and two regenerators (firing side and exhaust side). Each regenerator side connects to the melter with five air ports and each air port has two burners. Combustion air is drawn in through the firing side regenerator, then through five air ports to the melter. The combustion air is mixed with the natural gas that is injected through the ten (10) burners located in the five air ports, and auto-ignited as soon as it enters the melter. The melter operation temperature is maintained at 2,500^{o}F. The combustion exhaust is vented through the five air ports located at the other side of melter, then through the exhaust side regenerator to the stack. This process is maintained for a cycle of approximately 25 minutes, and then the next cycle will be the reversed direction of air flow, which means the previous cycle exhaust side becomes the firing side and the previous firing side becomes exhaust side. The heat preserved in the regenerator from previous cycle exhaust air will now be used to preheat incoming the combustion air during the new cycle. Typically, the combustion air can be heated up to 1800^{o}F to 2000^{o}F before it enters the melter, and the exhaust air has a temperature range between 800^{o}F to 900^{o}F. The exhaust stack is 150 feet elevated from ground.

Although the furnace physically contains a total of 20 burners (counted as two fuel burners in each air port, and five air ports each regenerator side and a total of two regenerator sides), only 10 burners can be operated during each firing cycle. Otherwise, counter current air flow will be introduced and the furnace will be burned down. Each burner is rated at 5 MMBtu/hr. Therefore, the firing rate is 5 MMBtu/hr × 10 burners = 50 MMBtu/hr. These 20 burners do not have a pilot. Therefore, the furnace is equipped with two warm-up (start-up) burners, each rated at 3.3 MMBtu/hr, to pre-heat the melter to a minimal temperature of 1,400^{o}F during a start-up. 1,400^{o}F is the minimal temperature required to have an auto ignition at the primary burners. Once the 10 primary burners are ignited, the two warm-up burners will be shut-down (because they are not energy efficient). However, in order to be conservative, the total furnace firing rate will be expressed as follows:

No. of Burners		Each Burner Rating (MMBtu/hr)		Total Firing Rate (MMBtu/hr)
10	×	5	=	50
2	×	3.3	=	6.6
		Maximum Firing Rate	=	56.6 MMBtu/hr

A modification project of the furnace occurred in 2009 (A/N: 485404). The furnace was modified by the addition of a total of 20 overfire air lances (10 at each side of the melter). Approximately 80% of the combustion air (stoichiometric to the fuel supply) is drawn in through the five air ports of the firing side regenerator, and the remaining 20% combustion air is introduced directly into the melter (without being pre-heated) through the ten (10) overfire air lances located at the other side of the furnace. This design separates the combustion process to two stages within the melter. The first stage is a fuel-rich combustion stage (air/fuel ratio is at about 8-9) and the fire is longer, smokier, and more luminous. At this stage, more CO and unburned hydrocarbon (CH) are formed and less NOx is created due to insufficient O_2. The second stage combustion occurs when the exhaust from the first stage combustion zone reaches the other side of the melter where the remaining combustion air is injected through the 10 overfire air lances. At the second combustion stage, the CO and unburned CH are burned before they are exhausted to the stack.

Throughput and Operation Schedule

The furnace will manufacture 263 tons/day in maximum and 150 to 200 tons/day in a normal day. In addition, the furnace may be operated 24 hr/day, 7 days/wk and 52 wk/yr.

Source Test Results

A modification project to change the furnace from single stage combustion to two-stage combustion occurred in 2009. Source tests were performed for the furnace on a pre-modification date, May 13, 2008, and on a pose-modification date, August 28, 2009. The 8/28/2009 source test report was submitted and currently is under the District Source Testing Engineer's evaluation. The source test results of the two tests are indicated as follows:

Pollutant	May 13, 2008 test	August 28, 2009 test
NOx @ 3% O_2	427.45 ppm	259.56 ppm
CO @ 3% O_2	4.82 ppm	6.91 ppm
PM emissions	0.057 gr/dscf and 5.18 lb/hr	0.0435 gr/dscf and 3.6478 lb/hr

The majority of the PM emissions consist of the soda ash (Na_2CO_3), and minor combustion PM and sand (silicates) emissions.

Appl. No. 528527 is submitted as an expedited class-III application to change of an operating condition (B59.2) to allow ATH to be processed in the furnace. The final product contains ATH at a concentration of 5,000 ppm; thus, the process throughput or the fuel supply will not be changed. No emission change is expected.

EMISSION CALCULATIONS

Process 2 System 1 – Raw Material Mixing and Storage

A/N 528528

This application is submitted for an existing ATH feeder. No PM emissions are expected from the ATH feeder because the displaced air is vented to baghouse C53 through the underground tunnel. The following calculation will be used to update the current NSR data.

Data:
Operating Schedule: 52 wks/yr, 7 days/wk, 24 hrs/day
Maximum throughput = 263 tons/day (Condition no. C1.4)

Assumption No. 1: Control efficiency of the baghouse C53 = 99%

Based on EPA AP42 Chapter 11.15 – Glass Manufacturing Table 11.15-1, the PM emissions from this raw material handling (batch preparation) process are negligible. In the footnote, EPA indicated the particulate emissions are negligible because almost all plants utilize some form of control (i.e., baghouses, scrubbers, centrifugal collectors).

The current NSR data base indicates no particulate emissions from this process.

Based on a field inspection reported on December 8, 1964, when the "dense type" soda ash ("58%" grade of soda ash) is processed, only trace emissions (less than 10% opacity) occurred for a duration period of three seconds while the 30-pound batch discharged to the weigh hopper. The engineer did not observe any visible emissions from the sand handling process and the sand / soda ash mixing screw. Furthermore, the engineer estimated the particulate emissions from the entire process did not exceed 2.5 lbs/hr. The process weight prior to that inspection date was recorded as 10,772 lbs/hr. Thus, it is this writer's opinion that it is conservative to use the following uncontrolled emission factor for this process.

Uncontrolled PM emission factor = (2.5 lbs/hr) / (10,772 lbs/hr) × (2,000 lbs/ton) = 0.464 lbs/ton

Assumption No. 2: Uncontrolled PM emission factor = 0.464 lbs/ton

PM Emissions
R1, lbs/hr = (263 tons/day) (0.464 lbs/ton) = 122.03 lbs/day
R2, lbs/hr = (122.03 lbs/day) (1 – 99%) = 1.22 lbs/day

Assumption No. 3: 50% PM = PM10

PM10 Emissions
R1, lbs/hr = (122.03 lbs/day) (50%) = 61.02 lbs/day
R2, lbs/hr = (61.02 lbs/day) (1 – 99%) = 0.61 lbs/day

A/N 528528		Hourly (lb/hr)	Daily (lb/day)	Annually (lb/yr)	30 day ave. (lb/day)	30day NSR (lb/day)
PM	**R1**	5.08	122	43,931	122	122
	R2	0.05	1.22	439	1.22	1
PM10	**R1**	2.54	61.02	21,965	61	61
	R2	0.03	0.61	220	0.61	1

Hourly, lb/hr = (daily, lb/day) / (24 hours/day)
30day average, lb/day = daily, lb/day

Process 2 System 2 – Sodium Silicate Melting Furnace

A/N 528527

This application is submitted to change of an operating condition (B59.2) to allow ATH to be processed in the furnace. The final product contains ATH at a concentration of 5,000 ppm; thus, the process throughput or the fuel supply will not be changed. No emission change is expected.

The existing permit condition B59.2 requires the raw materials to be fed to the furnace D18 to contain 2.5% or more of water. However, this condition is difficult to enforce; thus, it is replaced with a new condition (C8.1) requiring minimum one (1) gpm of water to be sprayed on the raw materials before being fed into the furnace. The following calculation is to show the new condition C8.1 is more stringent as it is compared to the existing condition B59.2.

Maximum throughput = 263 tons/day = 526,000 lb/day (condition no. C1.4)
Minimum water spray = 1 gpm per screw conveyor (condition no. C8.1)

% water = (1 gpm/screw) (2 screws) (60 min/hr) (24 hrs/day) (8.34 lb/gal) / (526,000 lb/day)
= 4.57 % > 2.5%

The following calculations are to update the current NSR data.

FURNACE D18 EMISSIONS

Operating Schedule (Max.): 24 hrs/day, 7 days/week, 52 weeks/yr
Fuel used: Natural Gas
Natural Gas F-factor: 8,710 dscf/MMBtu @ 68°F and 29.92 in Hg
Natural Gas Higher Heating Value: 1,050 Btu/scf (Regulation XX, Rule 2012, Table 3-D)
Maximum Load: 100%

Emission Factors

$$\text{Emission}_{\mathbf{ROG,SOX,PM10}}\ (\text{lb/MMBtu}) = EF_{ROG,SOX,PM10}\left(\frac{lb}{MMscf}\right) x \frac{1MMscf}{1050MMBtu}$$

$$\text{Emission}_{\mathbf{NOX,\ CO}}(\text{lb/MMBtu}) = \frac{MW \times N_{@3\%O_2} \times ppm}{H}$$

Where: H= Heating value of fuel (Btu/lb) (for natural gas= 23,440 btu/lb)
$N_{@3\%O2}$= 0.618 mole of dry gas per lb of natural gas.
MW= Molecular weight (lb/lb-mole)

Pollutant	Emission Factor (Source Test 8/28/2009) ppmV @ 3% O2	Emission Factor (AQMD Default) lb/mmscf	Emission Factor (for this report) lb/MMBtu
VOC	-	5.5	0.00524
SOx	-	0.6	0.000571
NOx	259.56	-	0.3148
CO	6.91	-	0.00510

AQMD Default emission factors for natural gas fired external combustion equipment were taken from "General Instruction Book for the AQMD 2007-2008 Annual Emission Reporting Program", Appendix A- Table 1.

In addition, the source test performed on August 28, 2009 indicated a total PM emissions of 3.65 lb/hr and 0.0435 gr/dscf.

Open Hearth Burner rating: 56.6 MMBTU/hr
Operating Schedule: 24 hrs/day; 7 days/week; 52 weeks/yr
Assume: PM10 = 75% PM (This assumption is based on AP42 Chapter 11.15 page 9)

The calculated emission results for the furnace D18 are indicated below:

		Lb/hr	Lb/day	Lb/year	30 day ave.
R1=R2	VOC	0.297	7.12	2,591	7.12
R1=R2	SOx	0.0323	0.776	282	0.776
R1=R2	PM10	2.738	65.70	23,915	65.70
R1=R2	PM	3.650	87.60	31,886	87.60
R1=R2	NOx	17.818	427.62	155,655	427.62
R1=R2	CO	0.289	6.93	2,522	6.93

RULE 409 CALCULATIONS:

$$C, grains/cf = \frac{(R2)(0.00959)}{\left(\frac{Q}{H}\right)(T)(N_{@12\%CO2})}$$

Where: R2 = Controlled Emission Rate, lb/hr
Q = Maximum Rated Input, MMBtu/hr
H= Heating value of fuel (Btu/lb) (for natural gas= 23,440 Btu/lb)
T = Standard Operating Temperature, 530 ^{o}R
$N_{@12\%CO2}$= 0.539 mole of dry gas per lb of natural gas.

The particulate matter concentration at the exhaust stack is calculated using equation above and the result is indicated as below:

$R2^{\alpha}$ (lb/hr)	Q^{β} (MMBtu/hr)	H (Btu/lb)	T (^{o}R)	$N_{@12\%CO2}$ (moles/lb)	C_{pm} (grins/ft^3)
3.6478	50	23,440	530	0.539	**0.057**

Note:

α: 3.6478 lb/hr which includes 3.440 lb/hr solid particulate matters

β: The furnace may only be operated with 10 burners at one time; thus, the firing rate is 5 MMBtu/hr × 10 burners = 50 MMBtu/hr.

SODIUM SILICATE STORAGE TANK D20 EMISSIONS

Data:

Operating Schedule: 52 wks/yr, 7 days/wk, 24 hrs/day

Maximum throughput = 263 tons/day (Condition no. C1.4)

Assumption:

- Control efficiency of baghouse C21 = 98%
- PM emissions, R1 = 3.0 lb/hr (based upon observations made during a field evaluation on 9/27/1990)
- PM10 = 50% PM

PM Emissions
R1 = 3.0 lb/hr
R2 = (3.0 lb/hr) (1 – 98%) = 0.06 lb/hr

PM10 Emissions
R1 = (3.0 lb/hr) (50%) = 1.5 lb/hr
R2 = (1.5 lb/hr) (1 – 98%) = 0.03 lb/hr

EMISSION SUMMARY:

The total emissions from the sodium silicate manufacturing process are calculated as the sum of the emissions from the furnace D18 and the storage tank D20, which are indicated as follows:

A/N 528527		Hourly (lbs/hr)	Daily (lbs/day)	Annually (lbs/yr)	30 day ave. (lbs/day)	30day NSR (lbs/day)
VOC	R1=R2	0.30	7.13	2,566	7.13	7
SOx	R1=R2	0.03	0.78	279	0.78	1
PM10	R1	4.24	101.71	36,616	101.71	102
	R2	2.77	66.43	23,916	66.43	66
PM	R1	6.65	159.60	57,456	159.60	160
	R2	3.71	89.04	32,054	89.04	89
NOx	R1=R2	17.82	427.63	153,948	427.63	428
CO	R1=R2	0.29	6.94	2,497	6.94	7

Hourly, lb/hr = (Hourly Emission from furnace D18) + (Hourly Emission from storage tank D20)
Daily, lb/day = (Hourly, lb/hr) (24 hrs/day)
30day average, lb/day = daily, lb/day

RULES AND REGULATIONS EVALUATION

Rule 212: **Standards for Approving Permits** – The facility is not located within 1,000 feet of a K-12 school (a map is attached). In addition, there are no emission increases due to this project and no increases of the individual cancer risk. A Public Notice is not required.

Section (g)

Item	Lb/dy daily maximum	Allow limit-lb/dy	Trigger Public notice
NOx	+0	40	No
ROG	+0	30	No
CO	+0	220	No
PM10	+0	30	No
SOx	+0	60	No

Rule 402: **Public Nuisance** – The facility is located in a commercial/industrial area. The potential for public nuisance is minimal.

Rule 404: **Particulate Matter Concentration**
A source test was performed on 8/28/2009. The test results indicated a grain loading of 0.0435 gr/dscf for a stack air flow of 9,786 dscfm. Table 404(a) allows a maximum concentration of PM 0.08 grains/ft^3 for a discharging rate of 9,786 CFM. Therefore, the furnace is in compliance.

There are no emission increases due to this project; thus, compliance is expected.

Rule 405: **Solid Particulate Matter - Weight**
There are no emission increases due to this project; thus, compliance is expected.

Rule 407: **Liquid and Gaseous Contaminants** – This rule limits the furnace to emit a maximum of CO level of 2000 ppmv. This equipment was tested on 8/28/2009 and the results indicated a CO emission level of 6.91 ppmv @ 3% O_2. Compliance with this rule is expected.

Rule 409: **Combustion Contaminants** – This rule limits the furnace to emit a maximum of PM level of 0.1 grain/cf @ 12% CO_2. Based on a test result obtained on 8/28/2009, the calculation indicated a grain loading of 0.057 grain/cf @ 12% CO_2. Compliance with this rule is expected.

Rule 1117: **Emissions of NOx from Glass Melting Furnaces** – The furnace D18 is a major device under NOx RECLAIM program. Therefore, this rule does not apply.

REG XIII: The PQ Corp is operating under the RECLAIM program, the NOx and SOx emissions are not subject to Regulation XIII per Rule 1301(b)(1).

BACT – No emission increases for other pollutants are expected this modification project. BACT is not required.

Modeling – Modeling is not required for this facility since there is no net emission increase of any nonattainment air contaminant due to the existing modification.

Offset – Offsets are not required for this facility since there is no net emission increase of any nonattainment air contaminant due to the existing modification.

	VOC (lb/day)	PM10 (lb/day)	NOX (lb/day)	CO (lb/day)	SOX (lb/day)
Current NSR (PTE)	**17**	**198**	**N/A**	**25**	**N/A**
528527 – Sodium silicate melting furnace	**+0**	**+0**	**N/A**	**+0**	**N/A**
528528 – Raw material mixing and storage	**+0**	**+0**	**N/A**	**+0**	**N/A**
Total PTE	**17**	**198**	**N/A**	**25**	**N/A**
Threshold limit	**22**	**22**	**N/A**	**159**	**N/A**
Offset required	**N/A**	**0**	**N/A**	**0**	**N/A**

RULE 2005: **New Source Review for RECLAIM**

There is no net emission increase associated with this modification project. BACT is not required.

RULE 2011: Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Sulfur (SOx) Emissions

There is no net emission increase associated with this modification. No emission offset is required.

RULE 2012: Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NOx) Emissions

There is no net emission increase associated with this modification project. No emission offset is required.

REG IX Subpart CC: Standards of Performance for Glass Manufacturing Plants (40 CFR 60 Subpart CC)

The subject furnace is a glass melting furnace and it is used to manufacture sodium silicate (water glass). Based on Hawley's Condensed Chemical Dictionary, sodium silicate is defined as "*$Na_2 \cdot 3.75SiO_2$ to $2Na_2O \cdot SiO_2$ and with various proportions of water*…. ***The simplest form of glass***." Therefore, the subject furnace appears to be subject to 40 CFR 60 Subpart CC. However, the furnace is only subject to 40 CFR 60.290 and 40 CFR 60.296(a).

40 CFR 60.290: Furnace is subject to 40 CFR 60 Subpart CC. This requirement is reflected in section K – Title V Administration of the PQ Corp's facility permit.

40 CFR 60.296(a): requires notification if the furnace is modified such that emissions are minimized without the use of add-on pollution controls (called a furnace with modified processes), or if a furnace with modified processes is changed to a furnace without modified processes. If the facility performs such a modification, they are required to notify the Administrator at least 60 days before the change is scheduled to occur. Condition No. E193.1 for such notification for the proposed modification and/or future modification is added. The existing modification is not to modify the furnace; thus, compliance with this rule is achieved.

Reg XXX: Title V Permit

The PQ Corp (Facility ID: 11435) currently operates under Title V permit, which expires on June 10, 2013. Based on the above evaluation, the proposed modification will not result an emission increase. Therefore, the permit revision application No. 528526 is considered a Minor Permit Revision of The PQ Corp's Title V Facility Permit.

CONCLUSION AND RECOMMENDATIONS

Based on my evaluation, the subject equipment will operate in compliance with all applicable District Rules and Regulations. Permit to Operate is recommended.