SUMMARY OF AIR EMISSIONS FROM THE FIRST YEAR OPERATION OF JEA'S NORTHSIDE GENERATING STATION

By
William Goodrich – JEA
Michael Sandell – Wheelabrator Air Pollution Control
Vincent Petti – Wheelabrator Air Pollution Control
Louis Rettura – Wheelabrator Air Pollution Control

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Introduction

The JEA, formerly the Jacksonville Electric Authority, currently provides water, sewer, and electric service to more than 360,000 customers in Jacksonville and parts of three adjacent counties. JEA owns and operates three generating plants and all transmission and distribution facilities. The Northside Generating Station is located in North Jacksonville, in an environmentally sensitive area surrounded by wetlands. The Northside Generating Station Repowering Project provided JEA with the two largest circulating fluidized bed combustors, or CFB's, in the world. These CFB's produce nearly 300 megawatts each, and were intended to burn 100% petroleum coke or coal. The units are currently operating on a blend of 80% petroleum coke and 20% coal. Construction of one of the two units was partially funded by the U.S. Department of Energy. The repowering project targeted reduced emissions of nitrogen oxides, sulfur oxides and particulate matter by at least 10 percent when compared to 1994/95 Northside Station base year levels. In addition, emission levels for selected trace metals were established during the permitting stage. Emission limits are summarized in Table 1.

Unit 2 first achieved preliminary rated output in May, 2002 and Unit 1 in July, 2002. Since JEA assumed control of the start-up of the CFB boilers in September of 2002, the units have demonstrated the potential to operate at full load with increasing availability on a blend of petroleum coke and coal. The boilers are not yet capable of operating on 100% petroleum coke. This installation also represents the first use of a polishing spray dryer absorber (SDA) in conjunction with a CFB boiler on a commercial scale to achieve even greater control of emissions in the USA. Each boiler train employs a separate Air Quality Control System (AQCS) consisting of a two fluid nozzle spray dryer absorber and an eight (8) module JET VIP™ medium pressure pulse-jet fabric filter (FF) supplied by Wheelabrator Air Pollution Control. Pebble lime is used as the absorbent for the various acid gases. Dried reaction products and boiler fly ash collected in the system are recycled back to the spray dryer absorber to improve reagent utilization.

This paper will discuss the Northside Generating facility and its air pollution control equipment in detail. Initial test results in 2002 demonstrated the AQCS system's potential to meet the stringent emission requirements on both coal and petroleum coke. Results of continuous monitoring and stationary stack emission testing from the first year of operation, including SO_2 total particulate, PM10, mercury, trace metals and the comparison with permitted levels will be presented.

Dry Scrubbing System Process Description

Each CFB's Dry Scrubbing System consists of a Wheelabrator Air Pollution Control, 48 ft. diameter, spray dryer absorber followed by an eight compartment JET VIP™ intermediate pressure pulse jet fabric filter (See Figures 1, 2, & 3). The slurry feed into the SDA consists of lime slurry with boiler fly ash and recycled reaction products collected by the fabric filter. The slurry is atomized into the flue gas using 16 two fluid nozzles in each SDA. The atomized slurry is mixed with the flue gas. SO_2 is initially absorbed into the slurry droplets. The heat of the flue gas evaporates the slurry water and cools the flue gas. SO_2 continues to be adsorbed onto the dried slurry surface. Flue gas exits the SDA and is ducted to the fabric filter. Cooling the flue gas condenses some of the mercury and additional trace metals.

Solid particulate, additional sulfur dioxide, sulfur trioxide, and trace metals are removed in the fabric filter . Flue gas travels down the inlet plenum and into the eight compartments. A baffle in each compartment's hopper directs the majority of the flue gas upward. The flue gas then flows horizontally across the compartment. The fabric filter bags are 5.25 in. diameter, 23.5 ft long PPS felt. The fabric is cleaned on-line using intermediate pressure (<35 psig) pulse air.

Solids collected in the fabric filter are pneumatically conveyed to a recycle surge bin or to the plant flyash storage silo. Solids from the recycle surge bin are slurried and blended with additional fresh lime slurry to make up the SDA slurry feed. The solids that fall out in the SDA are mechanically conveyed directly to the recycle mix tank. The reaction products from the SDA contain excess Ca(OH)2. Recycling the reaction products reduces the requirement for fresh lime slurry feed to the system. Approximately 50% of the solids collected in the fabric filter are pneumatically conveyed to the flyash storage silo. . The ash is then hydrated and transported by dense slurry to the byproduct storage area where the product cures and can be reclaimed for beneficial reuse.

The total amount of slurry feed to the process is controlled to obtain maximum SO_2 removal, while producing a dry product. The system is designed to operate at an outlet temperature setpoint of approximately 165^{o}F. This is 30^{o} F above the flue gas adiabatic saturation or wet bulb temperature. The spray dryer absorber is designed to provide twelve (12) seconds flue gas residence time at these conditions.

Additional SO_2 removal occurs in the fabric filter when the flue gas passes through the built-up filter cake on the fabric filter bags. The fabric filter uses on-line cleaning. Cleaning is initiated on reaching a high fabric filter differential pressure setpoint. Two rows of bags in each compartment are pulsed on-line without isolating a fabric filter compartment. This design maximizes the filter cake on the bags, improving SO_2 removal across the fabric filter.

The design Performance Condition for the CFB and Dry Scrubbing System was

- 6.7% Sulfur Petroleum Coke Fuel

- 85% SO_2 Removal in the CFB
- 89.5% SO_2 Removal in the SDA/FF

SO_2 removal requirements for the SDA/FF range between 70 and 95.1% depending on the fuel fired, the fuel sulfur content, and the SO_2 removal in the CFB (75-90%). The Dry Scrubbing System design parameters are listed in Table 2. Fuel data is listed in Table 3.

Cooling the flue gas condenses SO_3, Hg, and other heavy metals in the flue gas. These materials can then be collected as an aerosol or fine particulates on the filter cake in the fabric filter.

TABLE 1 EMISSION REQUIREMENTS

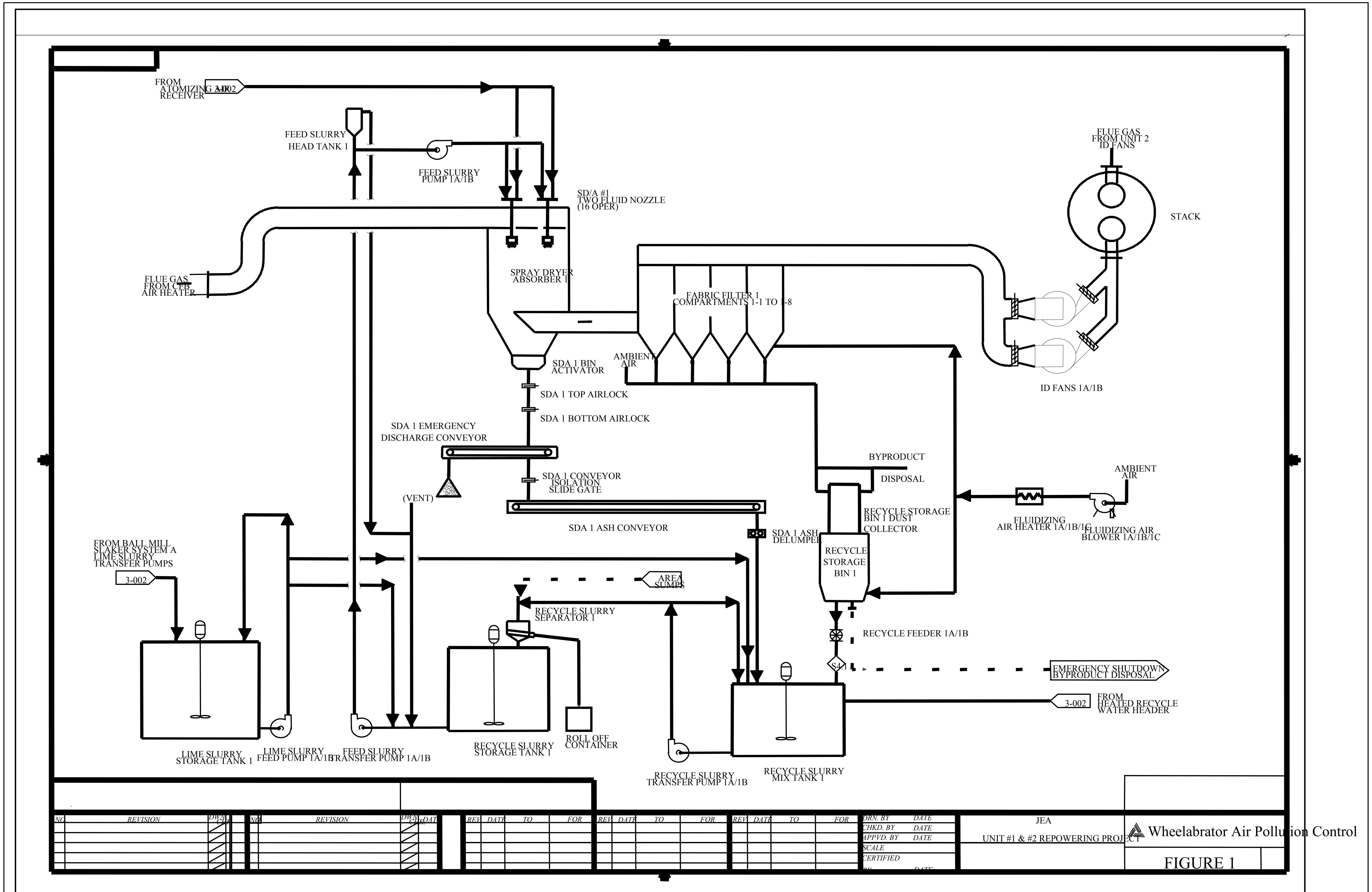
SO_2	<0.15 lb/mmbtu
NOx	<0.09 lb/mmbtu
CO	<0.22 lb/mmbtu
Particulates	<0.011 lb/mmbtu
PM10	<0.011 lb/mmbtu
SO_3	1.1 lb/hr
Fluoride	0.43 lb/hr
Lead	0.070 lb/hr
Mercury	0.03 lb/hr
VOC	14 lb/hr
Opacity	<10%
Ammonia Slip	<40 ppm
Steam Flow	>1,794 Klb/hr
Boiler Efficiency	88.1%

TABLE 2 JEA NORTHSIDE REPOWERING PROJECT
DRY SCRUBBING SYSTEM DESIGN CONDITIONS

Fuel		Petroleum Coke Performance	Coal Performance	Maximum
Inlet Flue Gas				
lb/hr		2,630,000	2,576,000	2,724,000
ACFM		831,700	826,000	879,280
°F		280	280	280
Static Pressure	in. wg.	-20	-19	-22
Sulfur Dioxide	ppmv	660	366	1,405
	lb/mmBTU	1.42	0.77	3.05
Sulfur Dioxide Removal		89.4%	80.5%	95.1%
Fly Ash	gr/ACF	2.9	2.9	2.9
SO_3	lb/mmBTU	0.054	0.018	0.054
HF	lb/mmBTU	0.016	0.0028	0.0106
Pb	lb/mmBTU	0.0028	0.0028	0.0028
Hg	lb/mmBTU	$1.7x10^{-5}$	$1.7x10^{-5}$	$1.7x10^{-5}$

TABLE 3 JEA NORTHSIDE REPOWERING PROJECT PERFORMANCE FUEL PARAMETERS

	Petroleum Coke	Coal
Ultimate Analysis		
H_2	3.6%	4.6%
C	79.0%	68.6%
S	6.7%	3.8%
S range	3 < 8%	0.5 – 45%
N_2	1.0%	1.3%
O_2	0.3%	4.1%
H_20	9.0%	5.2%
Ash	0.4%	12.8%
Cl	--	0.09%
HHV BTU/lb	14,000	12,690
Trace Elements		
F (ppm)	31	100
Hg (ppm)	0.03	0.17
Pb (ppm)	2	9.5
CFB Limestone		
$CaCO_3$	92%	
$MgCO_3$	3%	
Inerts	4%	
H_2O	1%	
F (ppm)	1	
Pb (ppm)	48	
Hg (ppm)	0.01	
Cl (ppm)	1,200	


FROM ATOMIZING AIR RECEIVER
3-002
FEED SLURRY HEAD TANK 1
FEED SLURRY PUMP 1A/1B
SD/A #1 TWO FLUID NOZZLE (16 OPER)
FLUE GAS FROM UNIT 2 ID FANS
STACK
FLUE GAS FROM CFB AIR HEATER
SPRAY DRYER ABSORBER 1
FABRIC FILTER 1 COMPARTMENTS 1-1 TO 1-8
AMBIENT AIR
SDA 1 BIN ACTIVATOR
ID FANS 1A/1B
SDA 1 TOP AIRLOCK
SDA 1 BOTTOM AIRLOCK
SDA 1 EMERGENCY DISCHARGE CONVEYOR
BYPRODUCT
DISPOSAL
AMBIENT AIR
SDA 1 CONVEYOR ISOLATION SLIDE GATE
(VENT)
RECYCLE STORAGE BIN 1 DUST COLLECTOR
SDA 1 ASH CONVEYOR
FLUIDIZING AIR HEATER 1A/1B/1C
FLUIDIZING AIR BLOWER 1A/1B/1C
SDA 1 ASH DELUMPER
RECYCLE STORAGE BIN 1
FROM BALL MILL SLAKER SYSTEM A LIME SLURRY TRANSFER PUMPS
3-002
AREA SUMPS
RECYCLE SLURRY SEPARATOR 1
RECYCLE FEEDER 1A/1B
S4
EMERGENCY SHUTDOWN BYPRODUCT DISPOSAL
3-002
FROM HEATED RECYCLE WATER HEADER
LIME SLURRY STORAGE TANK 1
LIME SLURRY FEED PUMP 1A/1B
FEED SLURRY TRANSFER PUMP 1A/1B
RECYCLE SLURRY STORAGE TANK 1
ROLL OFF CONTAINER
RECYCLE SLURRY TRANSFER PUMP 1A/1B
RECYCLE SLURRY MIX TANK 1
NO
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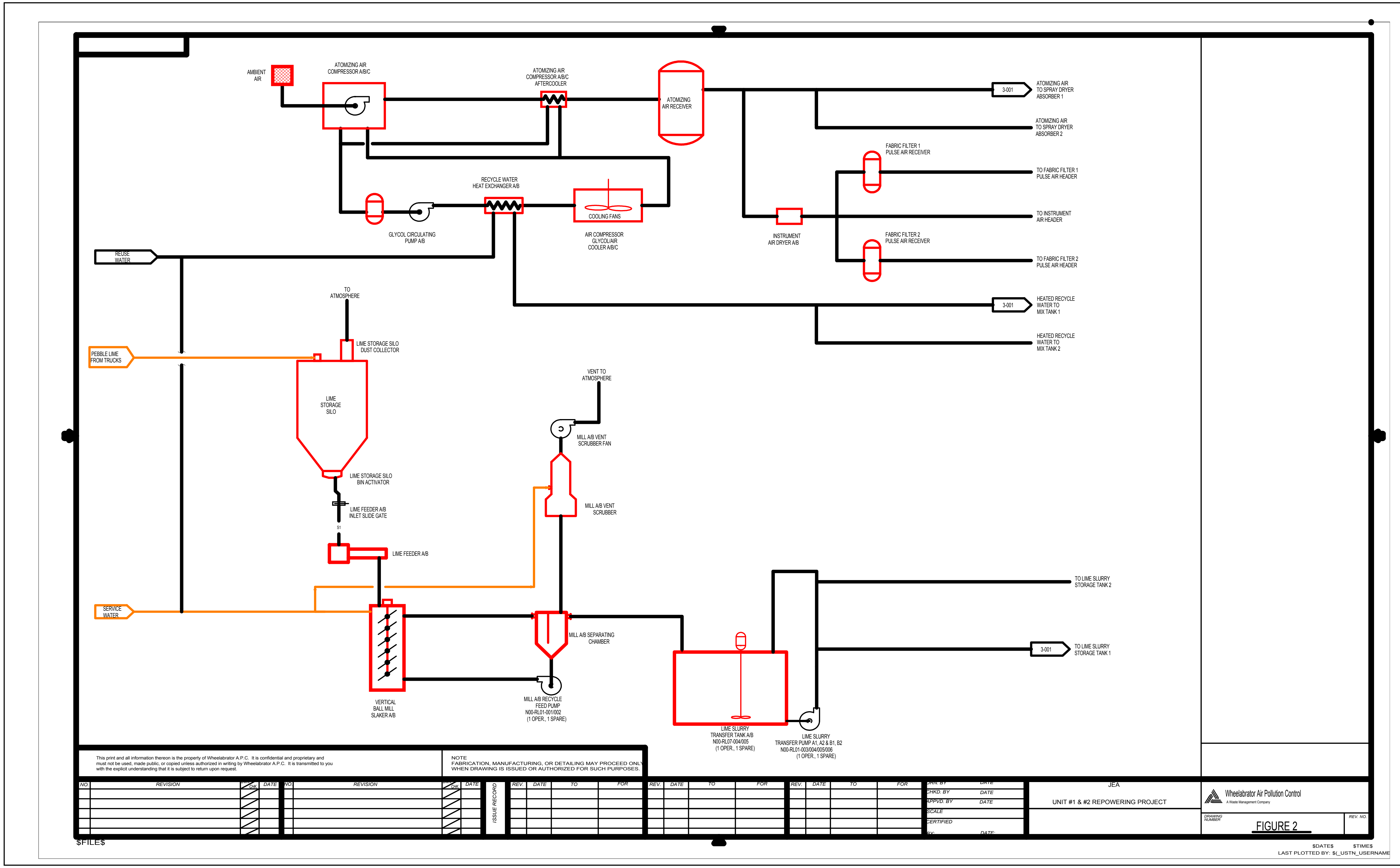
JEA
UNIT #1 & #2 REPOWERING PROJECT
Wheelabrator Air Pollution Control
FIGURE 1


AMBIENT AIR
ATOMIZING AIR COMPRESSOR A/B/C
ATOMIZING AIR COMPRESSOR A/B/C AFTERCOOLER
ATOMIZING AIR RECEIVER
3-001
ATOMIZING AIR TO SPRAY DRYER ABSORBER 1
ATOMIZING AIR TO SPRAY DRYER ABSORBER 2
FABRIC FILTER 1 PULSE AIR RECEIVER
TO FABRIC FILTER 1 PULSE AIR HEADER
INSTRUMENT AIR DRYER A/B
TO INSTRUMENT AIR HEADER
FABRIC FILTER 2 PULSE AIR RECEIVER
TO FABRIC FILTER 2 PULSE AIR HEADER
RECYCLE WATER HEAT EXCHANGER A/B
GLYCOL CIRCULATING PUMP A/B
COOLING FANS
AIR COMPRESSOR GLYCOL/AIR COOLER A/B/C
REUSE WATER
3-001
HEATED RECYCLE WATER TO MIX TANK 1
HEATED RECYCLE WATER TO MIX TANK 2
TO ATMOSPHERE
LIME STORAGE SILO DUST COLLECTOR
PEBBLE LIME FROM TRUCKS
LIME STORAGE SILO
LIME STORAGE SILO BIN ACTIVATOR
LIME FEEDER A/B INLET SLIDE GATE
S1
LIME FEEDER A/B
VENT TO ATMOSPHERE
MILL A/B VENT SCRUBBER FAN
MILL A/B VENT SCRUBBER
SERVICE WATER
MILL A/B SEPARATING CHAMBER
VERTICAL BALL MILL SLAKER A/B
MILL A/B RECYCLE FEED PUMP N00-RL01-001/002 (1 OPER., 1 SPARE)
LIME SLURRY TRANSFER TANK A/B N00-RL07-004/005 (1 OPER., 1 SPARE)
LIME SLURRY TRANSFER PUMP A1, A2 & B1, B2 N00-RL01-003/004/005/006 (1 OPER., 1 SPARE)
TO LIME SLURRY STORAGE TANK 2
3-001
TO LIME SLURRY STORAGE TANK 1
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JEA
UNIT #1 & #2 REPOWERING PROJECT
Wheelabrator Air Pollution Control
A Waste Management Company
DRAWING NUMBER
FIGURE 2
REV. NO.
$FILE$
$DATE$ $TIME$
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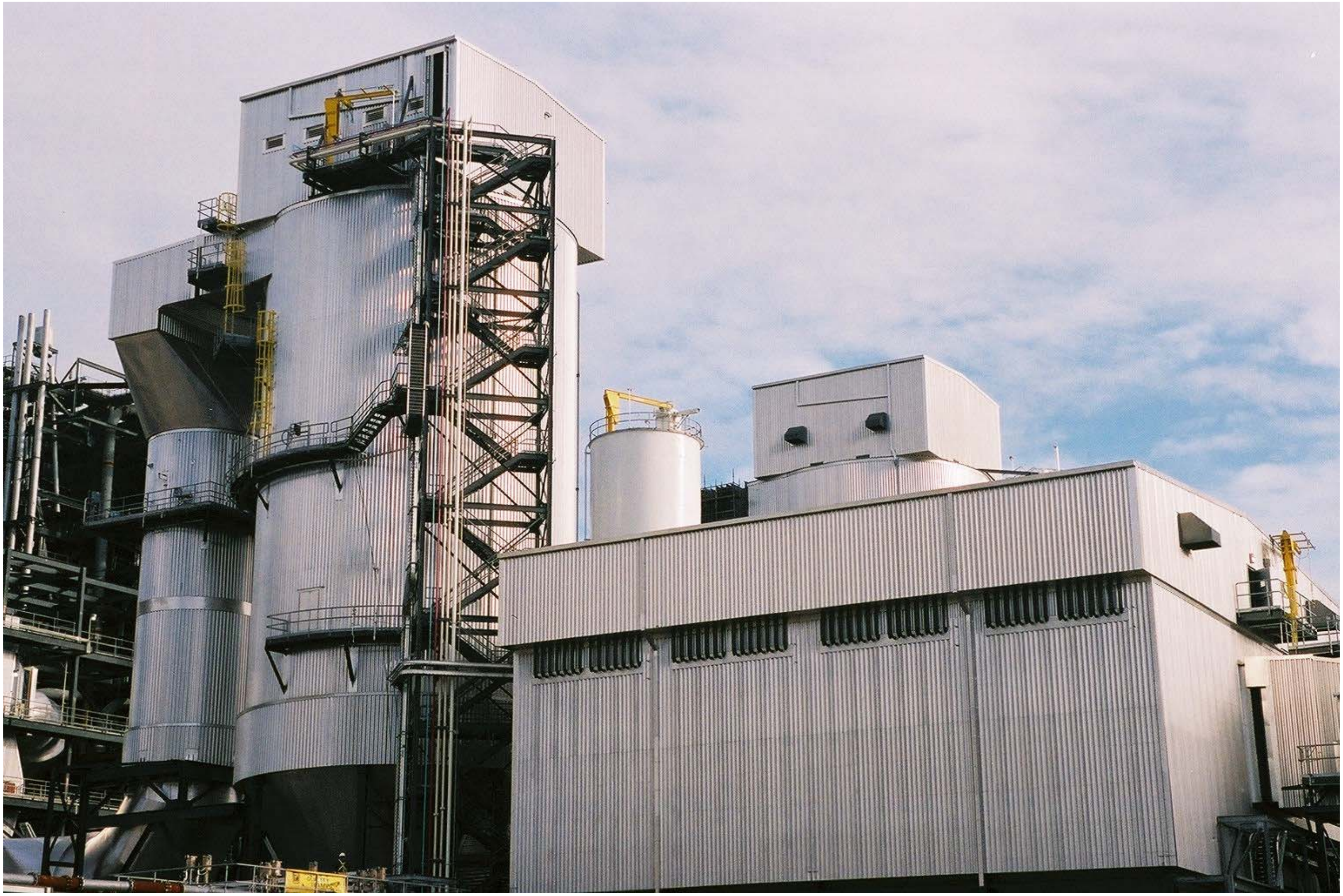


Figure 3. JEA Northside Unit 2, WAPC Spray Dryer Absorber/Fabric Filter

Spray Dryer Absorber

Flue gas is ducted from the multiple boiler air heater outlets to the SDA inlet plenum. Flue gas enters the side of the inlet plenum. Ladder vanes turn the gas down into a perforated plate and egg crate flow straightener system. The duct transition/elbow and SDA inlet plenum are designed to create an even gas distribution (plug flow) pattern at the SDA nozzle injection point. See Figure 4.

Sixteen (16), multiple-port two-fluid nozzle atomizers spray the feed slurry down into the SDA vessel, parallel to the gas flow. The flue gas and the evaporating slurry droplets pass down through the vessel. The flue gas makes a 90^{o} turn, exits the SDA, and enters the fabric filter (FF). The entire duct system was modeled to optimize gas pressure loss and minimize dust fallout.

Each two-fluid nozzle consists of a stainless steel head with multiple, ceramic two-fluid nozzle inserts.

Each nozzle is provided with a feed lance assembly consisting of a concentric feed pipe (air around slurry), hose connections, and the nozzle head. The feed lance assembly is inserted down through the SDA roof through a nozzle shroud assembly. See Figure 5. The shroud firmly positions the nozzle in the dryer isolating the feed lance assembly from the flue gas. Ambient air is drawn into the shroud by the negative pressure in the vessel. The shroud air minimizes the external buildup of ash on the nozzle. The shroud air enters through a silencer (muffler) to minimize noise.

The nozzle shroud is flange mounted on the SDA roof. The nozzle feed lance assembly is in turn flange mounted to the nozzle shroud. This allows the nozzle to be removed without removing the nozzle shroud. The feed lance has quick disconnects for slurry and atomizing air.

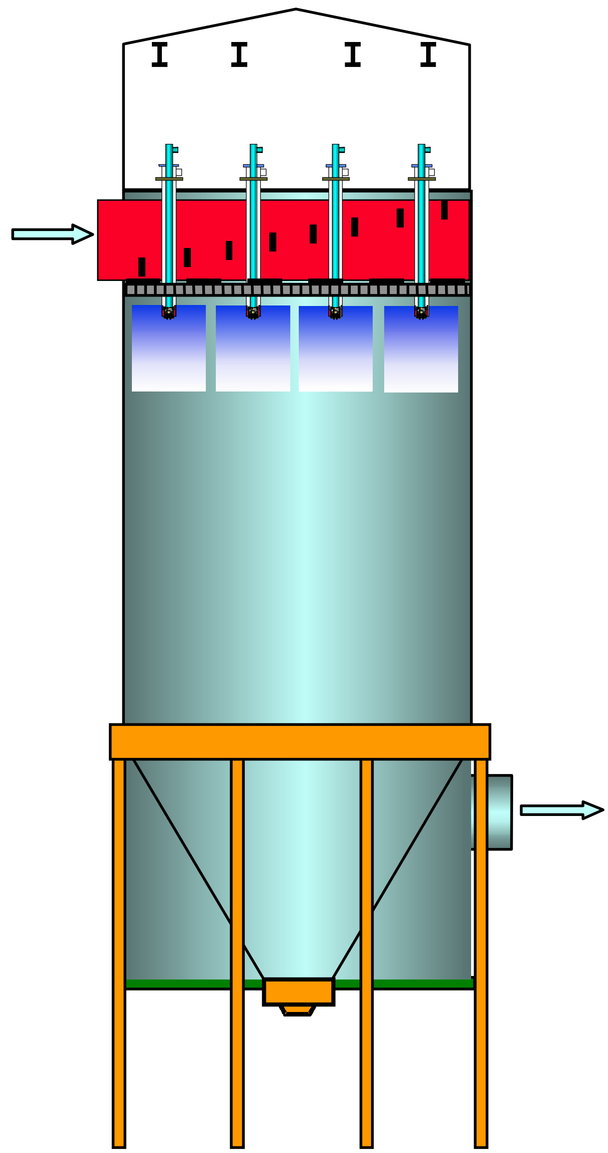


Figure 4

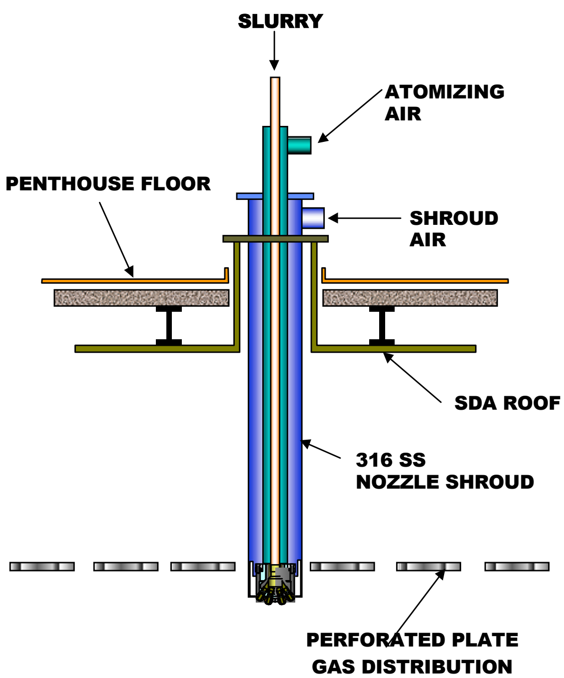


Figure 5. Two Fluid Atomizer Assembly

Each nozzle uses nine - 7 mm diameter abrasion resistant ceramic inserts. Slurry enters through the back of the nozzle head and is distributed to the nine nozzle inserts. Atomizing air enters concentrically into a reservoir in the nozzle head. The atomizing air enters each insert through holes along the length of each insert, and mixes with the slurry. The atomizing air expands as it passes through the air holes and nozzle exit. This expansion creates the shear necessary to atomize the slurry. See Figure 6.

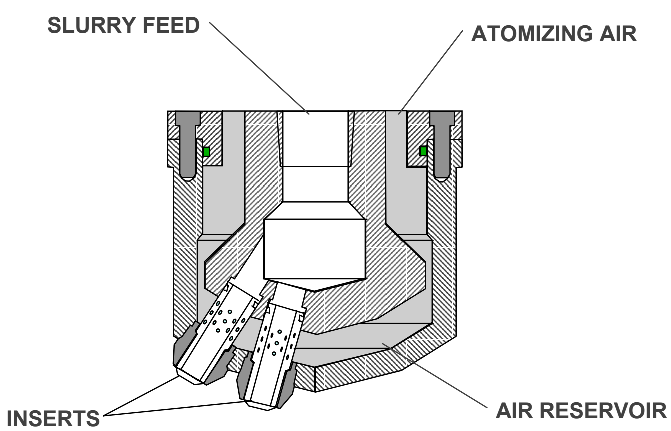


Figure 6. Atomizing Nozzle Head

Atomizing air flow to each nozzle is held constant. It is set at a flow rate consistent with the maximum flow of the nozzle. Therefore as slurry flow to the nozzle is reduced the air flow/slurry flow ratio or atomization energy/unit of slurry increases. This results in greater atomization as the slurry flow is reduced.

A penthouse enclosure is provided for nozzle and slurry feed system maintenance. See Figure 7. If a nozzle requires cleaning, it is accomplished with the unit on-line, without affecting SO_2 removal performance. The nozzle is isolated by closing local nozzle atomizing air and slurry shutoff valves. The feed lance is unbolted from the nozzle shroud and removed using a chain fall suspended from an overhead trolley/monorail. A spare feed lance is lowered into the shroud and connected. A nozzle can be removed and a spare nozzle installed in approximately five to ten minutes.

The flue gas passes to the bottom of the spray dryer absorber and then out of the side of the vessel. The outlet duct extends into the center of the SDA, to maintain an even gas distribution pattern in the bottom of the SDA vessel. The majority of the fly ash entering the spray dryer absorber and the solids generated by the spray dryer absorber are conveyed with the gas to the downstream fabric filter. A small portion falls out in the spray dryer absorber hopper.

Hopper heaters maintain the hopper plate at the flue gas temperature, minimizing condensation and the buildup of solids. The bottom third of the hopper is coated with phenolic epoxy based coating to minimize corrosion, caused by cold spots from the different hopper accessories. The cold spots can result in localized chloride corrosion.

Ash is discharged from the SDA through a ten (10) foot diameter live bottom and 18" diameter, double slide gate airlock. Fly ash and reaction products will exit the SDA through the airlock and enter a SDA drag chain conveyor. The SDA drag conveyor continuously discharges through a delumper to the recycle slurry mix tank. The mechanical conveyor eliminates the problems, experienced by the industry associated with pneumatic conveying of SDA solids.

Spray Dryer Absorber Process Control

Feed slurry is pumped from the feed slurry transfer pump to a head tank, at the top of each SDA. The head tank provides slurry to the redundant SDA feed pumps located in SDA penthouse enclosure. See Figure 1. Slurry is distributed to the multiple two fluid nozzles through a header and hose system.

The main control loops for the spray dryer absorber are total slurry feed control, which is designed to maintain the flue gas leaving the SDA at a fixed outlet temperature (165°F approx.), and the control of the mixture of concentrated lime slurry and recycle slurry.

Temperature control is considered primary. Temperature is measured at the spray dryer outlet by four redundant thermocouples and is indicated on the DCS. The operator selects one thermocouple to provide a feedback signal to the temperature controller. The output from this controller is used as a flow set point (gpm) for the SDA total flow controller. This controller modulates the speed of the Feed Slurry Pump based on a feed back signal from a total flow meter. SDA outlet temperature is controlled within ±3°F of the setpoint

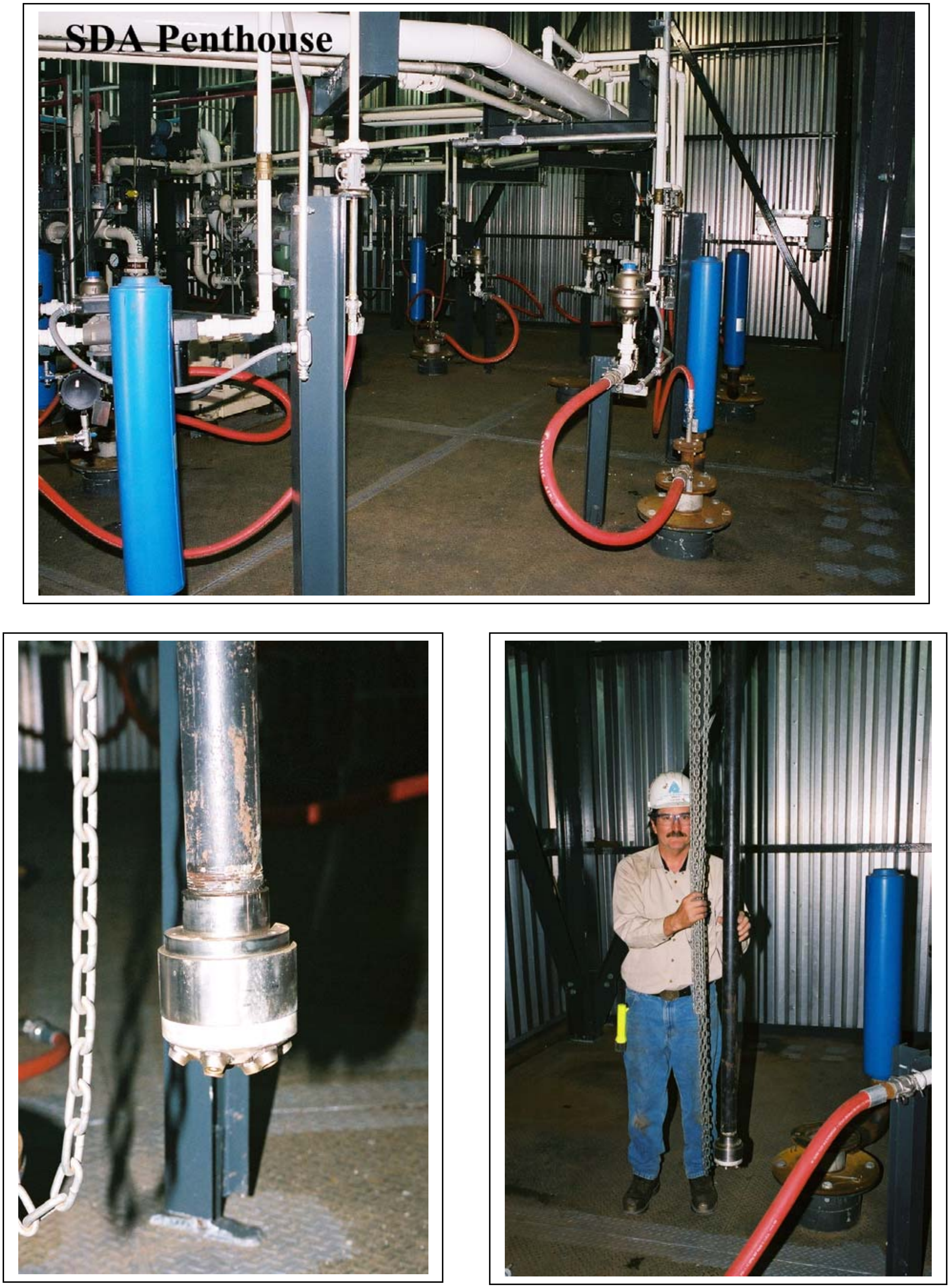


Figure 7. SDA Penthouse and Nozzles

Alarms are provided to indicate high and low spray dryer absorber outlet temperature. A separate low-low temperature alarm is provided for slurry feed shutdown. Temperature in the spray dryer absorber hopper is also measured by three thermocouples and indicated on the DCS. The hopper temperature is compared to the spray dryer absorber outlet temperature.

Atomizing air flow to each nozzle is controlled at a constant rate by an individual Atomizing Air Flow Controller and is measured by a local flow indicating switch. Low atomizing air flow is alarmed on the DCS and is used to automatically stop slurry flow to a nozzle.

C. <u>JET VIP Pulse Jet Fabric Filter</u>

Flue gas leaves the SDA and immediately enters the fabric filter inlet plenum. The plenum is tapered along its length to maintain gas velocity and to promote gas/duct distribution to the eight compartments. Flue gas leaves through the bottom of the plenum into the bottom side of each compartment. See Figure 8. An automatic compartment inlet damper is provided to isolate the compartment for maintenance. The flue gas flows down through the plenum floor minimize dust fallout. Baffles evenly distribute flue gas and dust into the eight compartments.

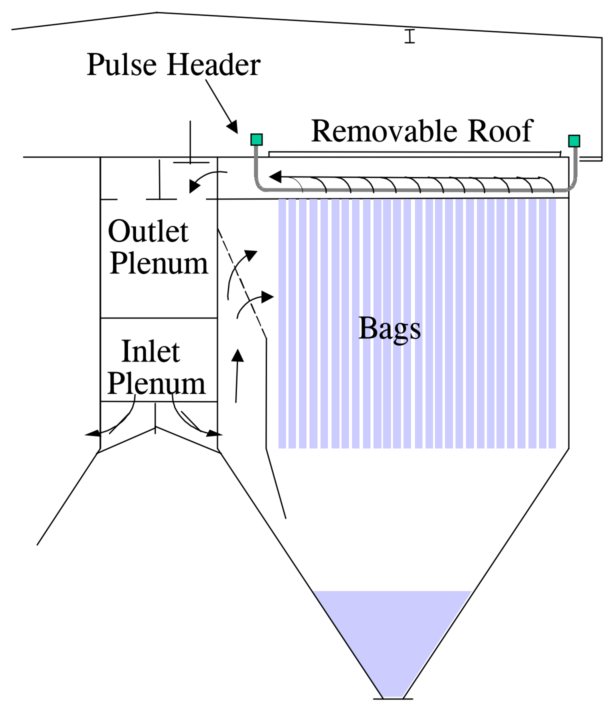


Figure 8: Fabric Filter

Flue gas and particulate is directed upward toward the top of the bags by an internal baffle system in each compartment. Heavier particles are separated from the gas stream before reaching the filter bags. Gas flow through the filter bags is primarily downward. This flow pattern enhances even gas distribution and minimizes dust abrasion and reintrainment when pulsing on line. Each compartment has 1,040, 5.25 in. dia. by 23.5 ft. long PPS felt bags. This provides over 250,000 square feet (5.8 acres) of filtering surface. The PPS felt weighs a nominal 16 oz/yd. The felt is rated at a 375°F maximum continuous operating temperature. This allows the fabric filter and boiler to continue to safely operate if the SDA should trip off line. Each bag is supported on a 9 gauge, 10 wire, two piece cage. The units were designed to operate at a 3.5:1 air to cloth ratio.

Bags are cleaned by pulsing with intermediate pressure (35 psig) compressed air. The pulse valves are mounted on four oversized headers per compartment to assure adequate air supply to each pulse valve. Each valve pulses 20 bags. Pulse air travels down the 3.5 in. manifold pipe and is directed into the center of each bag using a nozzle. The size of the discharge orifices from the manifold pipes are varied along its length to provide even cleaning force from each bag. No venturis are required at the top of the bags.

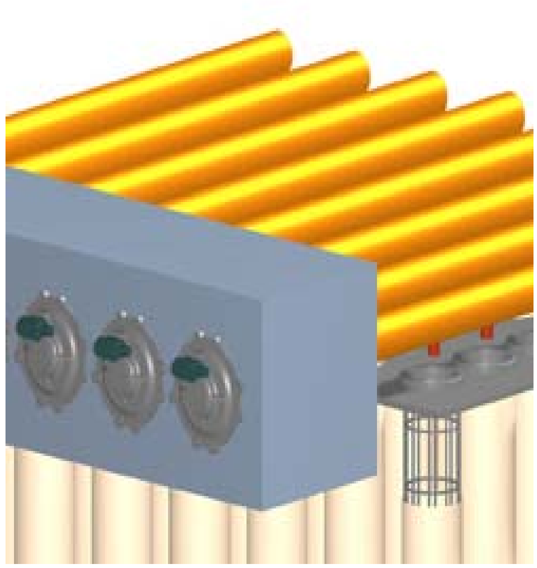


Figure 8 FF Cleaning System

The double diaphragm valve provides fast acceleration of the particulate away from the cage and a gentle return of the bag to the cage. The combination action (low pressure/high pressue) provides optimum cleaning for the long bags and long bag life. The gentle cage return is also important to minimize particulate penetration into and through the bag material.

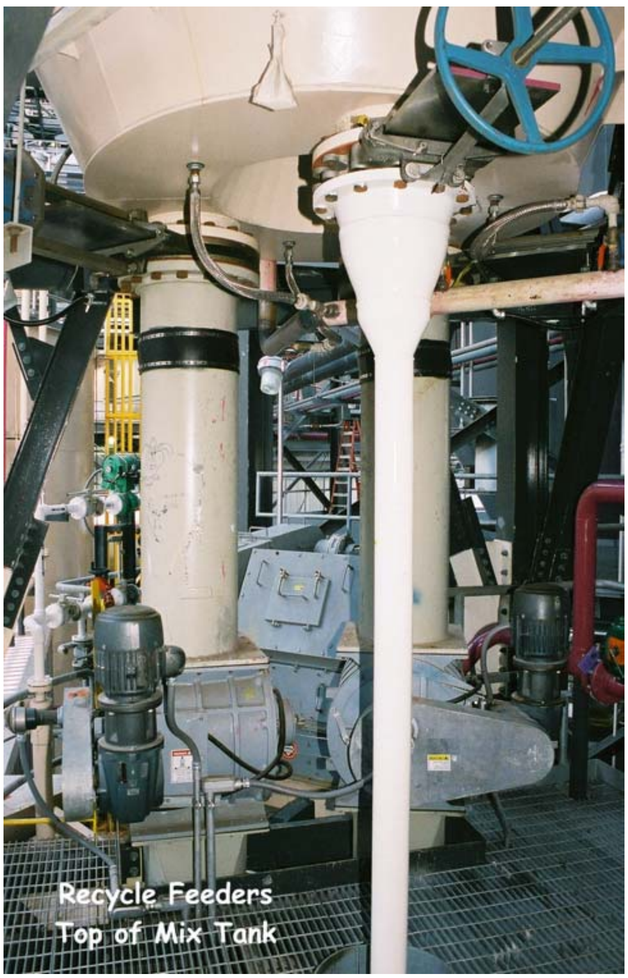
The bags are normally cleaned on-line using a pressure loss initiation signal. Two rows of bags are cleaned in a compartment. The sequence then steps to the next compartment and repeats until the pressure loss setpoint is satisfied. The controls also provide for automatic off-line cleaning, manually initiated off-line cleaning, and a timer initiated sequence.

Pulsed dust is collected in a pyramidal hopper and is discharged through a 12 in. opening to a pneumatic conveying system. Hopper heaters are provided to minimize dust hang-up on the hopper walls. Fluidizing pads using heated air are installed along the discharge to minimize packing and ratholeing. The bottom 6 feet of each hopper is coated with a phenolic epoxy to minimize corrosion at cold spots, created by the different hopper connections and accessories.

Feed Slurry Preparation System

The feed slurry to the SDA consists of lime slurry from the lime slaking system and recycle slurry prepared by reslurrying flyash and reaction products collected in the SDA/FF. The ratio of the two slurry feeds is modulated to maintain the required outlet SO_2 emission concentration. The dried solids from the SDA and FF contain excess $Ca(OH)_2$. Recycling the dried reaction products allows the use of this excess alkalinity, lowering the amount of lime slurry added from the slaking system.

Flyash and reaction products collected in the FF are pneumatically conveyed to a recycle surge bin. This material is metered to a recycle mix tank. Solids that drop out in the SDA are mechanically conveyed using a drag conveyor directly to the mix tank. The SDA solids drop through a delumper before entering the tank. The flow of water, lime slurry and solids feed from the recycle surge bin are controlled to makeup a 35 wt % slurry concentration.



The slurry from the mix tank is pumped to a grit screen to remove any tramp materials (>20 mesh). The slurry then flows by gravity to the recycle slurry storage tank. Two (2) 100% capacity feed slurry transfer pumps transport the recycle slurry from the storage tank to the head tank at the top of the SDA. Excess slurry overflows the head tank back to the feed slurry transfer pump inlet. Lime slurry from the lime slurry recirculation loop is added to the recycle slurry at the feed transfer pump inlets. Fresh lime slurry flow is modulated to maintain the required SO_2 emission concentration at the FF outlet based on the CEM signal.

Redundant variable speed feed slurry pumps are provided at the top of each SDA. The feed slurry pumps, pump the combined lime/recycle feed slurry to the two fluid nozzle atomizers, from the head tank.

The CaO absorbs SO_2 in the CFB to form calcium sulfate. The fly ash particles leaving the boiler consist of CaO covered with $CaSO_4$ molecules. Some of the CaO is slaked to form $Ca(OH)_2$ when the recycled ash is mixed with water to make up the recycle slurry. This further reduces the fresh lime slurry feed to the system. The $CaSO_4$ on the particle surface, however, retards the slaking reaction. Heated recycle water is used to improve the slaking reaction. A heat exchanger is used to recover waste heat from the atomizing air compressors.

An eight hour recycle slurry storage tank is also provided to allow the slaking reaction to continue after the material is degritted.

The unit has operated at times using no lime slurry from the slaking system, using only the recovered CaO from the CFB fly ash. Provisions have been made in the ball mill slaking system to utilize CFB bed ash as an absorbent in the future. The CFB bed ash will be slurried and piped to the ball mills. The grinding action of the mill will free up the surface area of the CaO particles to promote slaking.

Pebble Lime Slaking System

A common 200% capacity slaking system is provided for both units. Pebble lime delivered in pneumatic self unloading trucks, is stored in a single 700 ton, storage silo. Redundant 100% capacity vertical ball mill slaking systems are provided to prepare a lime ($Ca(OH)_2$) slurry. Each slaking system feeds slurry to individual unit lime slurry storage tanks.

A dual discharge live bin bottom feeds the two redundant slaking systems. Lime is discharged from the silo live bottom to each slaking system weigh belt feeder. The feeder discharges to a premix chamber where the slaking water is blended with the lime. This discharges to the top of vertical ball mill. The vertical ball mill consists of a lined chamber with a helical screw driven from a top mounted gear box and motor. The screw agitates the ball charge.

Slurry overflows the mill to a separator tank. The separator tank is a conical discharge tank with a center vertical baffle plate. The mill recycle pump draws slurry from the bottom of the tank and discharges to the bottom of the mill. The high flow through the tank causes the larger slurry particles to be drawn out the bottom of the tank and to be recycled back into the mill. The slurry with the finer particles makes a 180° turn, under the baffle, at the bottom of the tank. Slurry overflows to the lime slurry transfer tank. A lime slurry transfer pump conveys the slurry to the lime slurry storage tank.

Performance Testing
Preliminary Emission Tests were conducted over the summer of 2002. Testing was conducted on both units burning coal and petroleum coke. Results are summarized on Table 2. Emissions results are from both units met all emission requirements for particulate, SO_2, acid gases and heavy metals.

Table 2.0 Emission Test Results			
		Coal	Petroleum Coke
SO_2	< 0.15 Lb/mmbtu	0.0 – 0.04	0.03 – 0.13
NOx	< 0.09 Lb/mmbtu	0.04 – 0.06	0.02
Solid Particulate	<0.011 Lb/mmbtu	0.004	0.007
PM10	< 0.011 Lb/mmbtu	0.006	0.004
SO_3	1.1 Lb/hr	0.43	0.0
Fluoride	1.57×10^{-4} Lb/mmbtu	1.06×10^{-4}	0.95×10^{-4}
Lead	2.6×10^{-5} Lb/mmbtu	0.56×10^{-5}	0.59×10^{-5}
Mercury	1.05×10^{-5} Lb/mmbtu	0.095×10^{-5}	0.028×10^{-5}
Opacity	%	< 2%	< 2.6%
Ammonia Slip	ppm	0.9	n/a
Boiler/Process Parameters			
Steam Flow	K lb/hr	1,950	1,937
Flue Gas Flow @ SDA Inlet	ACFM °F	880,000 – 930,000 290 - 310°	

CEM measurements have demonstrated that the units are capable of continuously meeting SO_2 requirements and opacity.