IAC

INDUSTRIAL ACCESSORIES COMPANY

IAC Capabilities

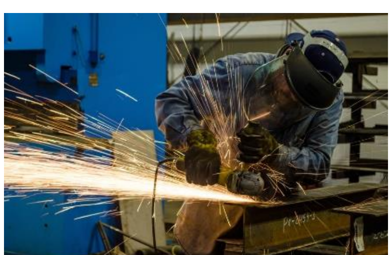
About IAC

IAC is a 32 year old EPC Contract Organization, with principle headquarters in Mission, KS.

As an EPC / Turnkey Industrial Contractor. IAC, and our wholly owned construction company, Adelphi Construction Company, LLC, perform $10 million up to $150 million projects typically in the following industries within North America, Latin America, and Mexico:

- Frac Sand
- Mining
- Steel
- Food
- Cement / Lime
- Industrial Boiler
- DRI
- DSI / PAC

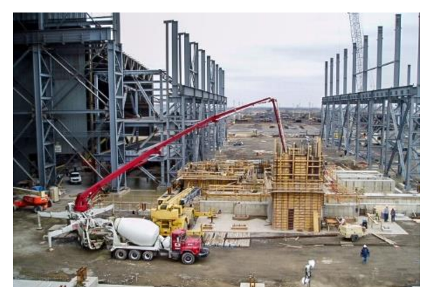
IAC

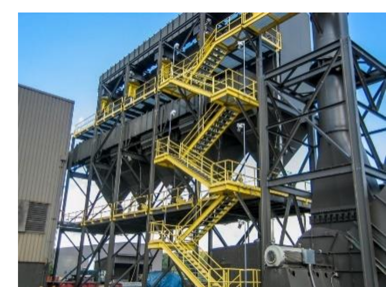



About IAC

In addition to IAC EPC / Turnkey Construction Projects, IAC is unique in that IAC internally designs and engineers IAC OEM equipment product lines for industrial and utility clients. IAC OEM Product Lines:

- Portable Frac Sand Plants
- Air Pollution Control Equipment
- Frac Sand Rotary Dryer/Cooler
    - Patented Design
- Bulk Material Storage Systems
- Pneumatic and Mechanical Handling Equipment
- DSI / BPAC Flue Gas Acid Treatment System
- Motor Control Centers
- Automated Controls, PLC / DCS
- HMI Management and Software Program
- Dry Recirculating Acid Gas Scrubber for SO_2, SO_3, and HCL Mitigation – patented process
- High Temperature Filtration Equipment
- High Pressure >15 psig Filters





About IAC

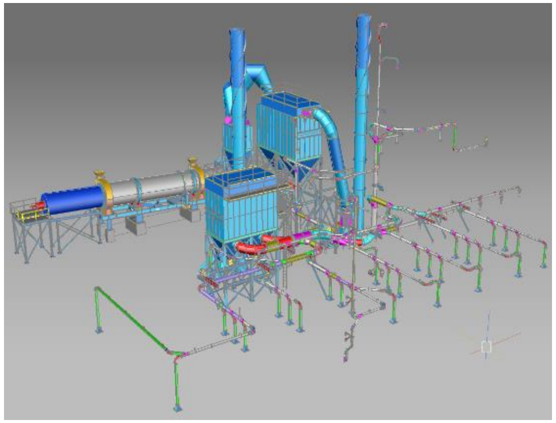
IAC Corporate Headquarters Personnel

- Engineering: 37 people
- Staff: 192 people

IAC Field Personnel

- Sales: 10 people
- Construction: 272 people
- Latin American Sales: 9 people

Full Service EPC Company


Design, Engineering, Service

IAC can provide all of these as EPC contractor with in-house construction through Adelphi Construction


Rail Loadout & Transload Facilities


DSI and ACI Mercury Scrubber System


Dust Collector OEM


Turn-Key Plants

IAC

www.iac-intl.com

IAC/Adelphi Core Competencies

Equipment:

APC – Baghouses 300 to 3 Million ACFM
Bulk Material Handling (Pneumatic and Mechanical)
Welded and Bolted Tank Farms/Silos
Automated Controls/MCC
Dryers, Rock Products
Central Vacuums and Fume extraction

Design/Build:

Frac Sand Dry Plants
Frac Sand Wet Plants
Transload Terminals, Cement and Frac Sand
Activated Carbon Injection Systems
Acid Gas Control Flue Gas Treatment; Frac Sand Plant Upgrades, High Efficiency Separators

Services:

Frac Sand Plant Optimization
Engineering – Civil, Structural, Mechanical and Electrical
Plant Design/Layout
Plant Construction and Design/Build Services

EPC:

Total Processing and Plant Facility Design/Build

Adelphi Construction

Project Engineering

Demolition

Installation

Turnkey Service

ADELPHI
CONSTRUCTION LC

Air Pollution Control

Bulk Material Handling

Pneumatic Conveying

MACT Compliance





IAC's in-house construction resource Adelphi specializes in turnkey Frac Sand Plants. Adelphi has lead the completion of simultaneous Frac Sand plant construction in 8 months.

REGULATORY LANDSCAPE

- MACT for Industrial & Utility Boilers
- MATS
  - Mercury
  - PM (Filterable for non-mercury metals)
  - HCL
  - SO2
- CSAPR (NOx & SO2); Vacated August 21, 2012
- Regional Haze
- NSPS – PM; NOx & SO2
- BART (Best Available Retrofit Technology)
  - Source Specific - SO2 &/or NOx emissions

HCL & SO2 CONTROL TECHNOLOGIES

DSI: **Hydrated Lime – Dry Injection; w/Humidification**
Trona / Sodium Bicarbonate

Circulating Dry Scrubber (Quick Lime / Hydrated Lime)

Semi-Dry FGD (Quick Lime / Hydrated Lime)

Wet FGD

EFFECT OF FLUE GAS CHARACTERISTICS

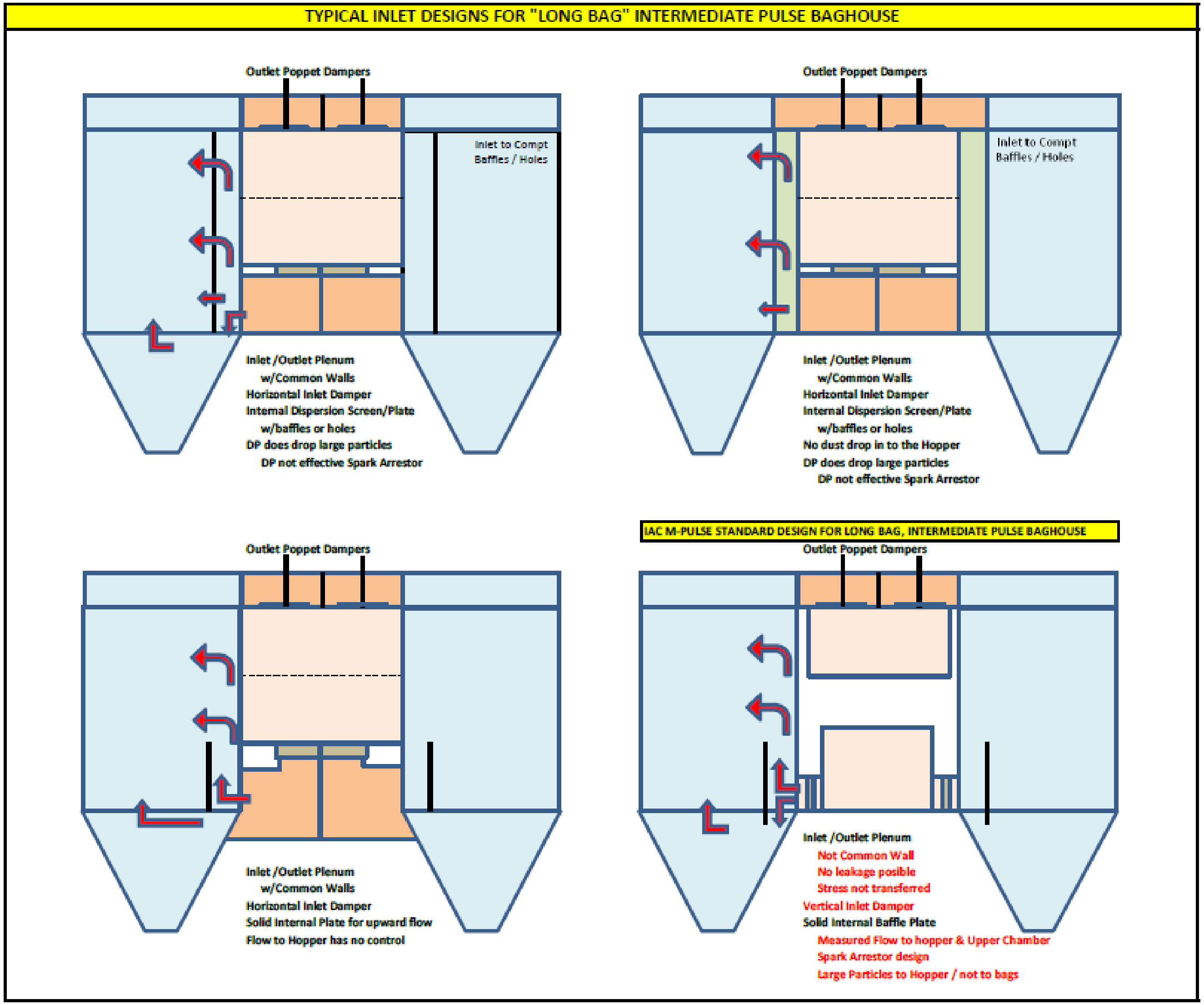
- **The capacity of sorbents to capture mercury decreases at higher temperatures.**
- **Chlorine and other trace acid gases play a significant role in the performance of PAC/BPAC.**
- **SO3 Control Required for high Mercury (Hg) mitigation.**
- **SO3 control with Lime Hydrate; Hg control with BPAC / Amended Silicate.**

IAC M-Pulse Baghouse

DESIGN FEATURES:

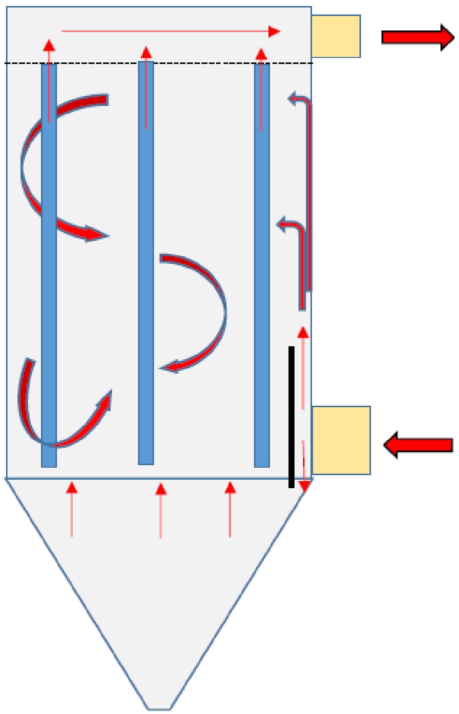
1. Intermediate Pressure – 35 PSIG
2. Bag – 6″ Dia.; up to 10m Long
3. Split Cage Design
4. 20 Bags Per Blowpipe
5. 25 Rows of Bags
6. 12″ to 14″ ASME Header, as Required Pulse Air
7. Integrated Double Diaphragm 3″ Solenoid Valves
8. Casing Inlet With Internal Diverter Plate
9. Automated Controls
10. Penthouse Access
11. Lift-Off Roof-Top Doors for Compartment
12. Hoist For Top Door Removal

IAC M-Pulse Baghouse

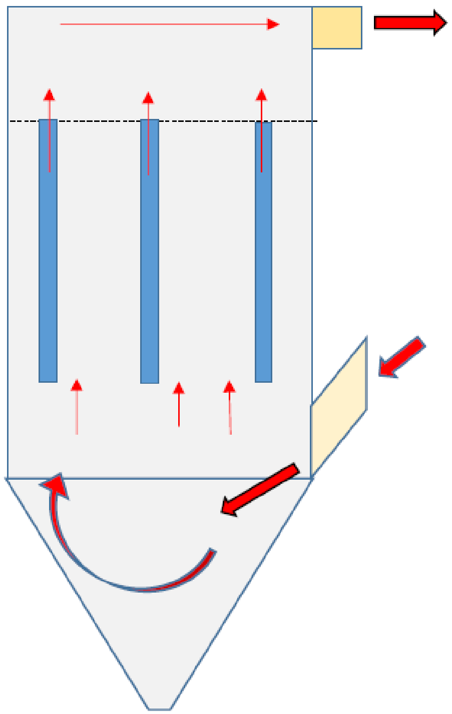


IAC M-Pulse Baghouse Inlet

IAC Mpulse Baghouse



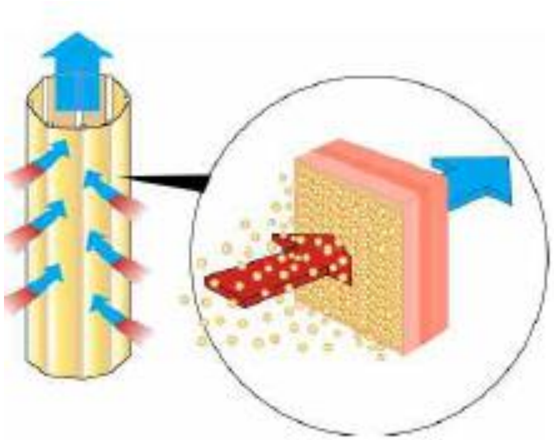
Hopper Entry Baghouse

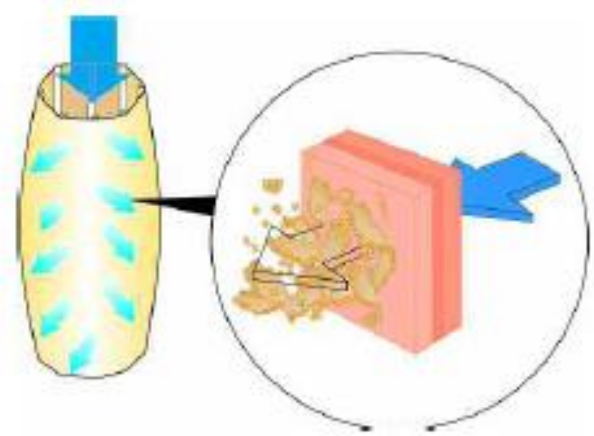


Inlet Flow distributed to upper Casing & Hopper
Inlet Flow Strikes an Inner Plate for Null Flow
60% Flow to Upper Casing; 40% Flow to Hopper
Heavy Particulate Falls to Hopper
Flow from Upper Casing Continuously Cleans Bags
Low Can velocity from Hopper
Cleaning Air at 50 to 70 PSI; Venturi Not Required
2 Piece Cage for Long Bag Design

Traditional Design for Short Bags
100% Flow to Hopper
24'-6" Long Bag is too long for Bag Cleaning.
16'-0" long bag max. for Hopper Entry
Can Velocity Critical for Effective Design
High Pressure Cleaning Required
Cage with Venturi Required
3 Piece Cage with Short Walk-in-Plenum Design.

“M” - Pulse Baghouse
Bag Filtering & Pulse Cleaning



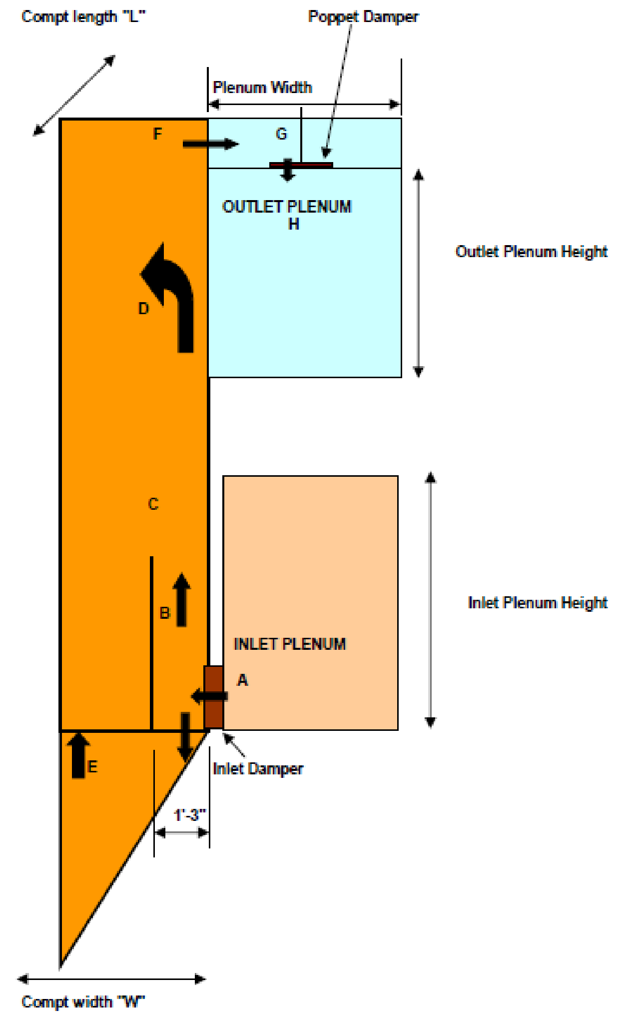


IAC M-Pulse design allows for continuous cleaning of bags:

- Staggered bag arrangement for distribution
- Inline bag arrangement will channel the flow
- Air distributions continuously strips the dust off the bag

IAC M-Pulse Baghouse Module Velocity Profile

Flow:	acfm	220,725	Am3/hr	375,012
# of Compts.		6		6
Flow to One Compt.	acfm	36,788	Am3/hr	62,502
Width of Compartment	ft	10.3	mm	3,150
Length of Compartment	ft	15.0	mm	4,572
Inlet Damper-Height	ft	3	mm	914
Inlet Damper-Width	ft	7	mm	2,136
Compt. Outlet - Height	ft	2.75	mm	838
Compt. Outlet - Width	ft	6.5	mm	1,981
Poppet Damper Size	in.	54	mm	1,372
Inlet Plenum Width	ft	6.0	mm	1,829
Inlet Plenum Height	ft	9.8	mm	2,990
Outlet Plenum Width	ft	6.0	mm	1,829
Outlet Plenum Height	ft	9.8	mm	2,990
VELOCITY PROFILE:				
Inlet Plenum:	fpm	3750	mpm	1143
A Across Inlet Damper	fpm	1750	mpm	533
B 40% Flow to Hopper	fpm	785	mpm	239
C 60% Flow to Casing	fpm	1177	mpm	359
D In to Upper Casing	fpm	84	mpm	26
E From Hopper	fpm	108	mpm	33
F Exit from Compt	fpm	2058	mpm	627
G Across Poppet	fpm	2313	mpm	705
H Outlet Plenum:	fpm	3750	mpm	1143
Can Velocity	fpm	108	mpm	33
Interstitial Velocity	fpm	170	mpm	52



IAC "M" – Intermediate Pressure Pulse Jet Baghouse 6 x 234TB-BHTP-288

Coal Fired Boiler Baghouse
220,000 ACFM @ 420 F

IAC "M" – Intermediate Pressure Pulse Jet Baghouse 6 x 294TB-BHTP-240

Ferro-Nickel Smelter Baghouse
220,725 ACFM @ 500 F

M-PULSE FOR CEMENT KILN/RAW MILL

50MM GPY ETHANOL PLANT
COAL FIRED WITH IAC M-PULSE BAGHOUSE

Corn, LP	Goldfield, IA
Lincolnway Energy	Nevada, IA
Red Trails	Richardton, ND
Heron Lake Energy	Heron Lake, MN

IAC SCOPE OF WORK

- Combustor
- Boiler – HRSG
- M-Pulse Baghouse & FGD
- ID Fan & Motor
- Duct from Boiler to ID Fan
- Fly Ash Handling
- Silo & Truck Loadout
- I&C's (APV & Flyash)
- Automated Controls
- Mechanical Installation
- Start-up

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IAC AIR-TO-AIR HEAT EXCHANGER & 4-COMPARTMENT M-PULSE BAGHOUSE APPLICATION: CLINKER COOLER – CEMENT

IAC M-Pulse Baghouse Penthouse Enclosure

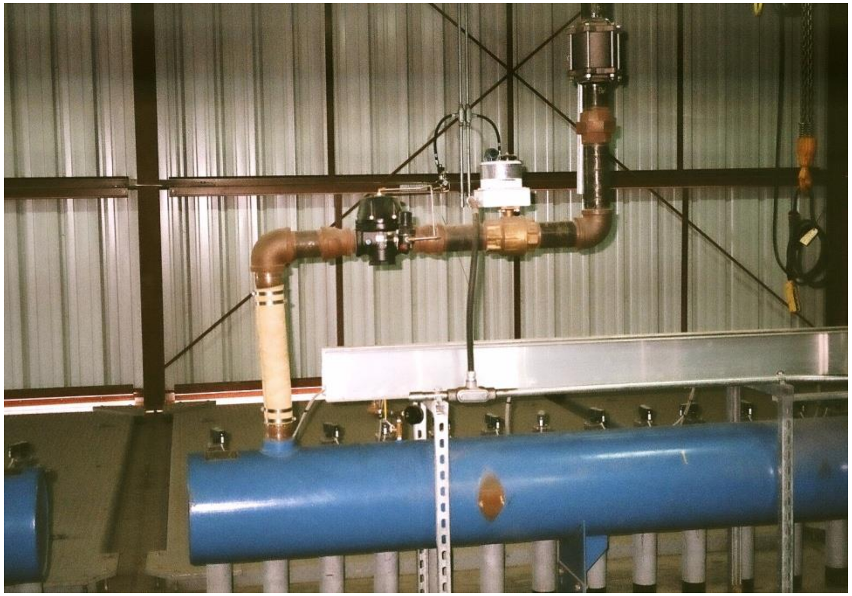
Header Design
- •Shut-off Valve
- •Pressure Transmitter
- •Moisture Purge Valve

Baghouse Design
- •Compt. Pr. Transmitter
- •Baghouse Pr. Trans.
- •Temp. Transmitters

Pneumatic Dampers
- •Inlet Butterfly
- •Outlet Poppet

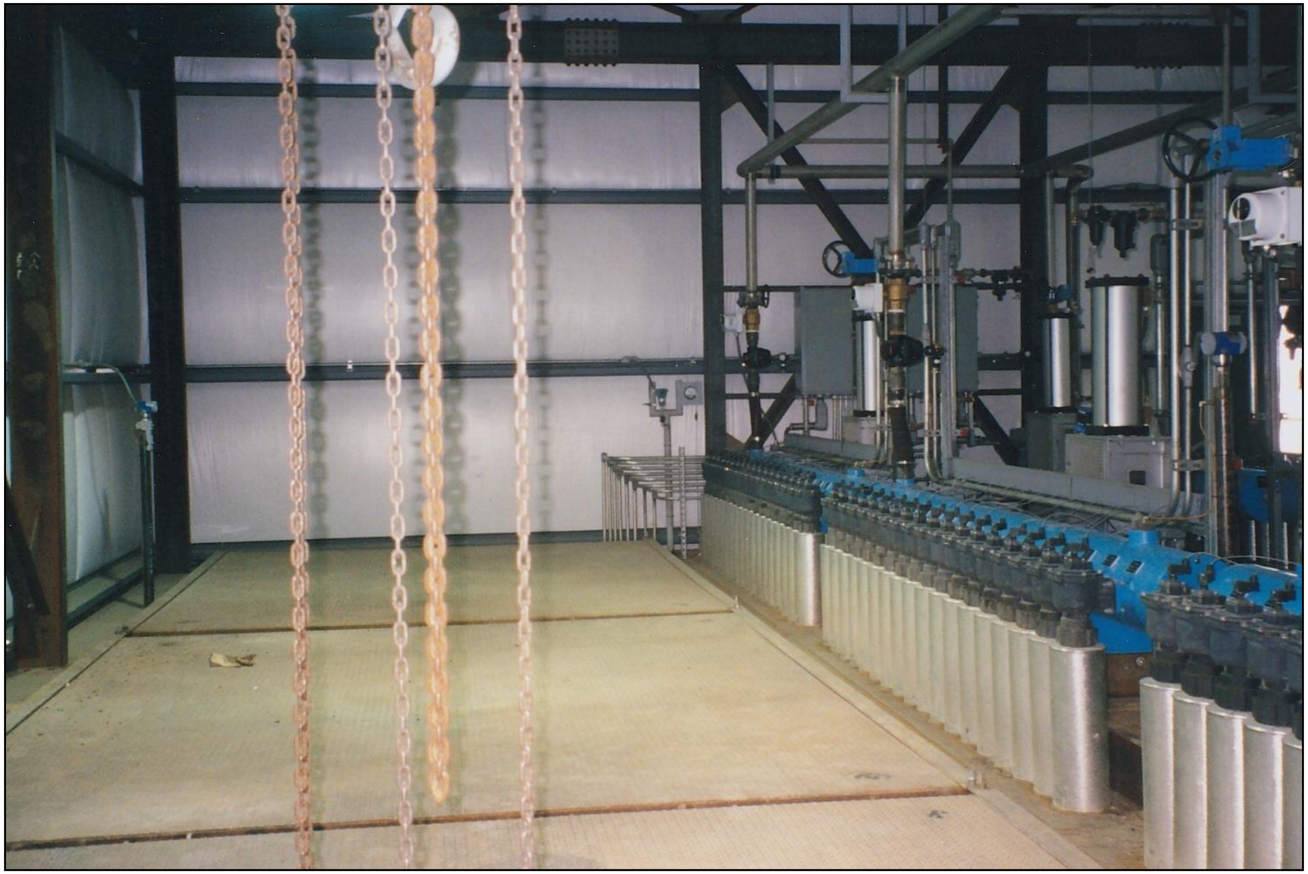
IAC M-Pulse Penthouse

Poppet Damper Operator



Air Inlet to Header

IAC M-Pulse Baghouse
Module Roof Top Doors with Hoist for Lift Off



“M” - Pulse Baghouse
Bag Changeout & Installation

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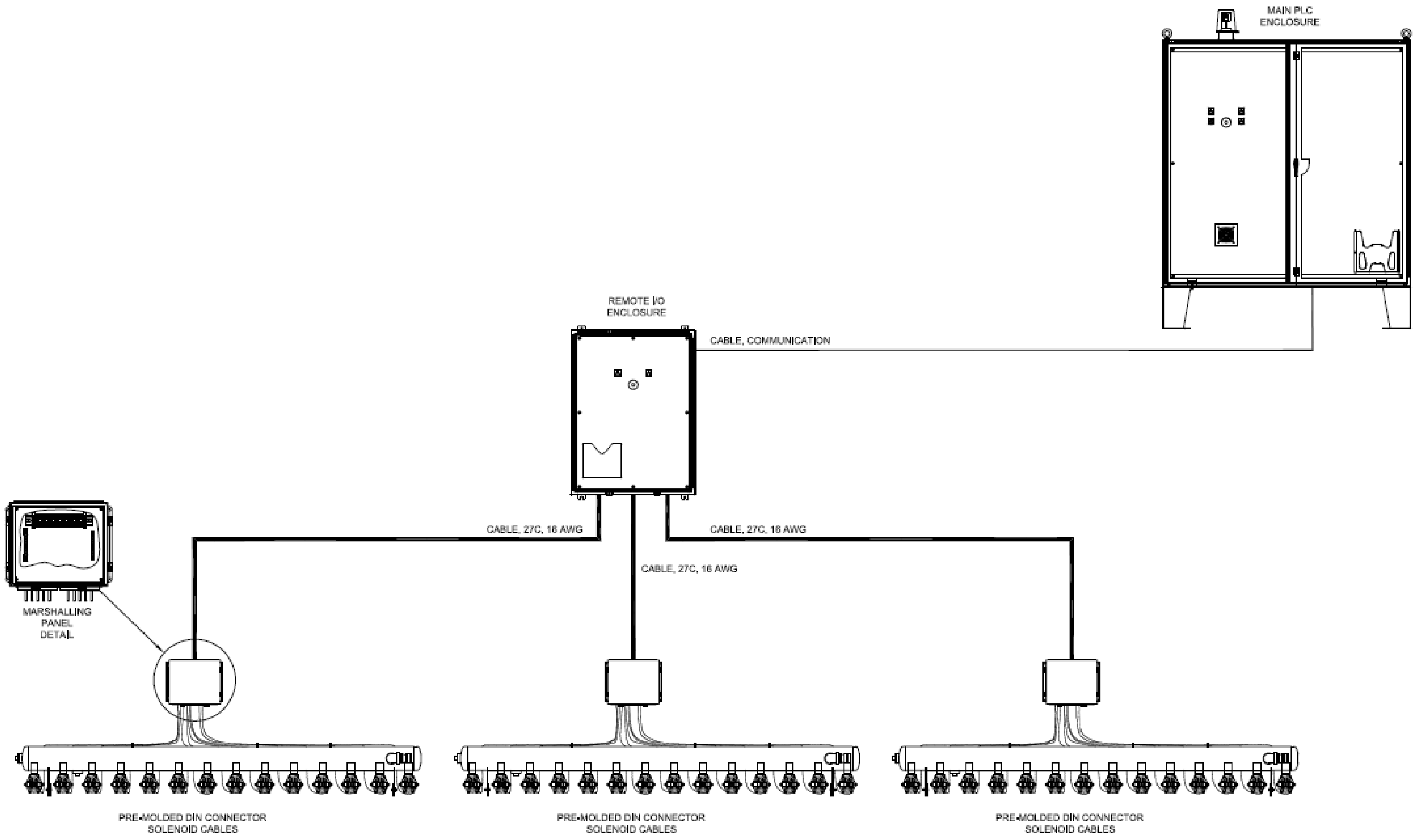
IAC M-Pulse Baghouse Automated Controls



PLC Control Feature & Benefit

FEATURE	BENEFIT
Module Header Pressure	Required Cleaning Air Utilization Sense/Alarm Leak in Solenoid Valve
DP Cleaning	Individual Module DP Baghouse DP Required "Open Time" per Header Pulse Valve
Monitoring & Alarms	Temperature Pressure Hopper Heaters Hopper Vibrators Hopper Level Controls Inlet / Outlet Dampers Hopper Valves and Dust Handling Systems
Trend Analysis	Baghouse & Individual Module
Broken Bag Detection	Detection per Module and Individual Row
Communication	Plant DCS & Local Printer Local and Remote Controls

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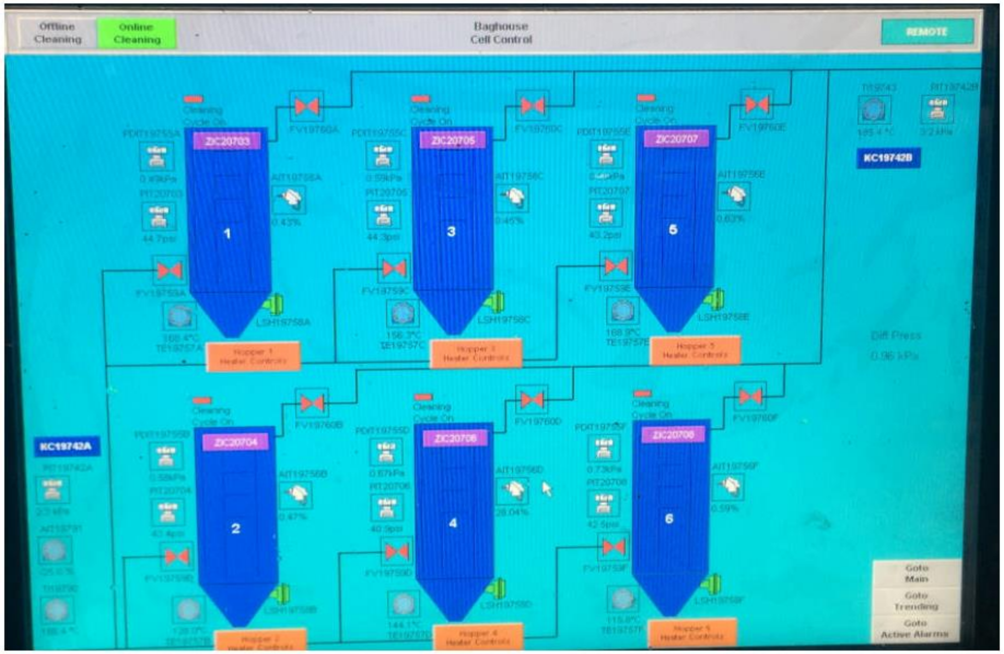
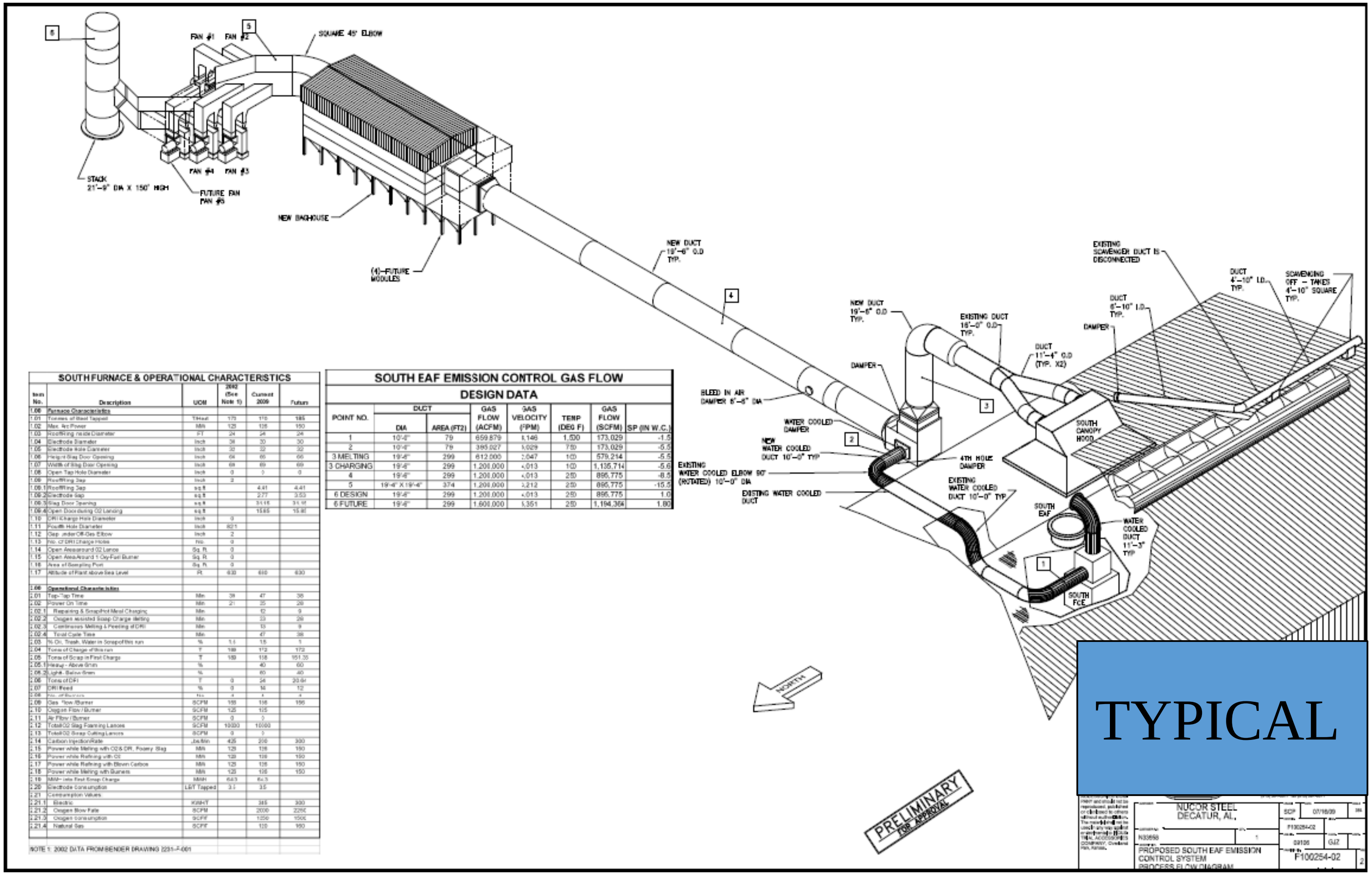
IAC MPULSE BAGHOUSE_ALARMS

item	Description	Unit	Value
1	Poppet and inlet damper translation time alarm	s	30
2	Air Header pressure LowLow Alarm	PSI	25
3	Temperature Hi Alarm	C	240
4	Temperature HiHi Alarm	C	260
5	Inlet pressure HiHi Alarm	kPa	4.5
6	Delay in general	s	10



HMI in Remote control

MELTSHOP VENTILATION
1,200,000 ACFM



SOUTH EAF EMISSION CONTROL GAS FLOW

DESIGN DATA

POINT NO.	DUCT DIA	DUCT AREA (FT2)	GAS FLOW (ACFM)	GAS VELOCITY (FPM)	TEMP (DEG F)	GAS FLOW (SCFM)	SP (IN W.C.)
1	10'-0"	79	659,879	8,146	1,500	173,029	-1.5
2	10'-0"	79	385,027	5,029	750	173,029	-5.5
3 MELTING	19'-6"	299	612,000	2,047	100	579,214	-5.5
3 CHARGING	19'-6"	299	1,200,000	4,013	100	1,135,714	-5.6
4	19'-6"	299	1,200,000	4,013	250	896,775	-8.5
5	19'-4" X 19'-4"	374	1,200,000	3,212	250	896,775	-15.5
6 DESIGN	19'-6"	299	1,200,000	4,013	250	896,775	1.0
6 FUTURE	19'-6"	299	1,600,000	5,351	250	1,194,364	1.80

IAC M-PULSE BAGHOUSE 12X318TB-BHTP-500

NUCOR SOUTH EAF BAGHOUSE
1,200,000 ACFM @ 250F

IAC M-PULSE BAGHOUSE 12X318TB-BHTP-500

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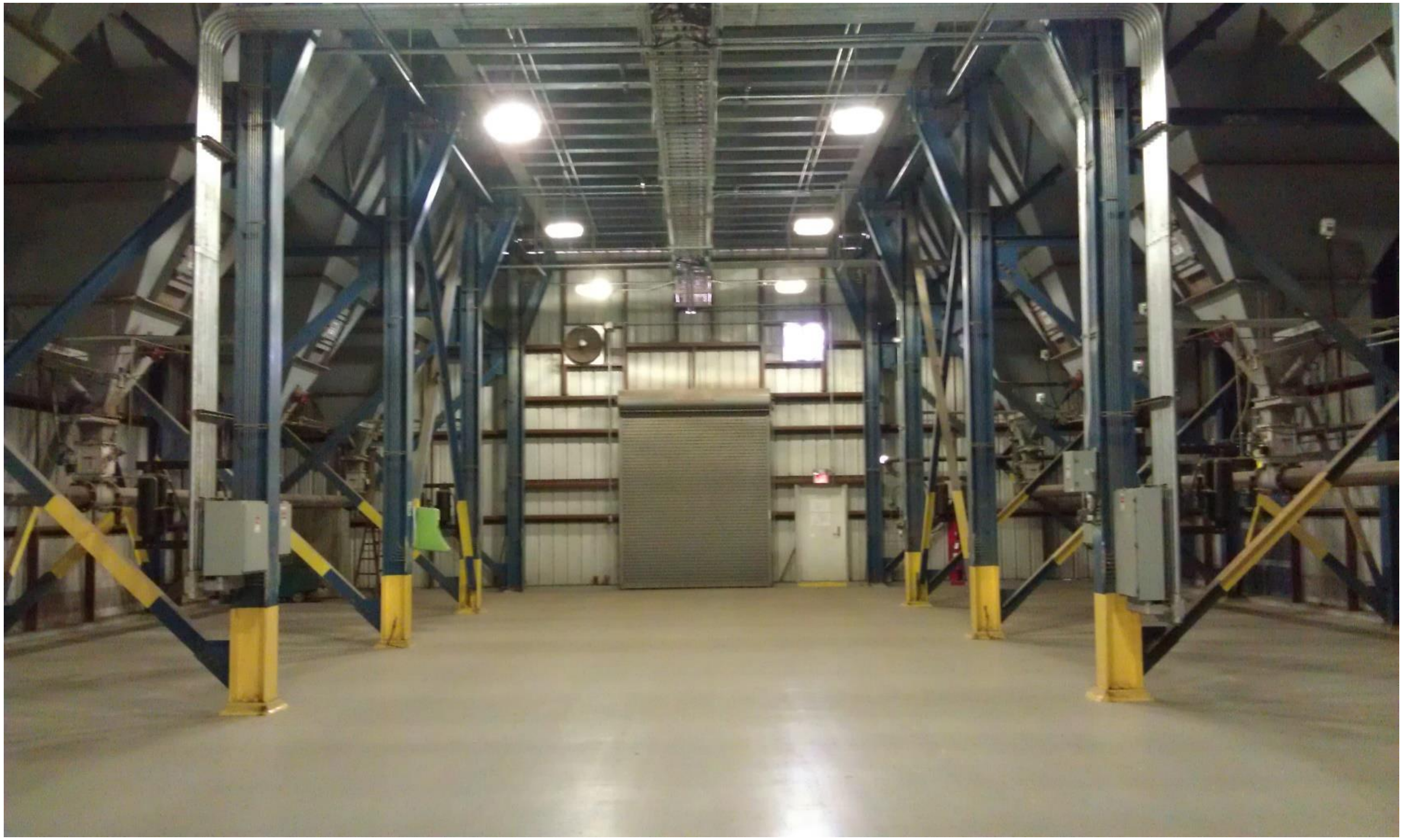
IAC M-Pulse (1,200,000 ACFM)

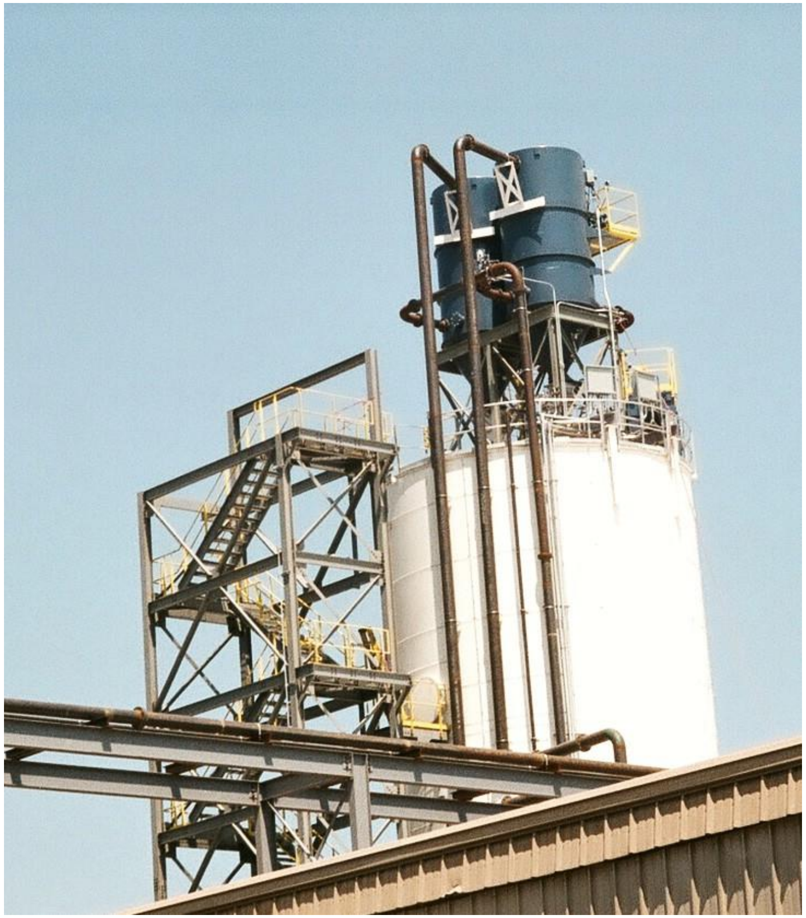
IAC M-Pulse Hopper Enclosure

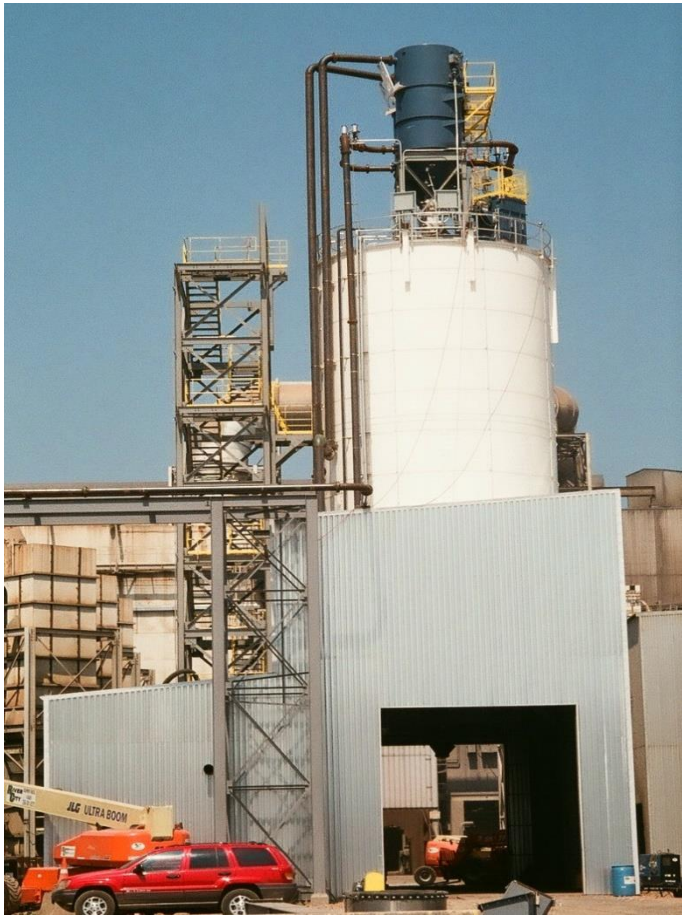


SUCTION CONVEYING FROM HOPPER TO STORAGE AND LOAD-OUT SILO

Pneumatic Conveying from Flap Valve(s) at Hopper Discharge
Receiver Filter at top of Silo
Articulating Arm w/Telescoping Load-Out Chute for Rail Car/Truck Loading

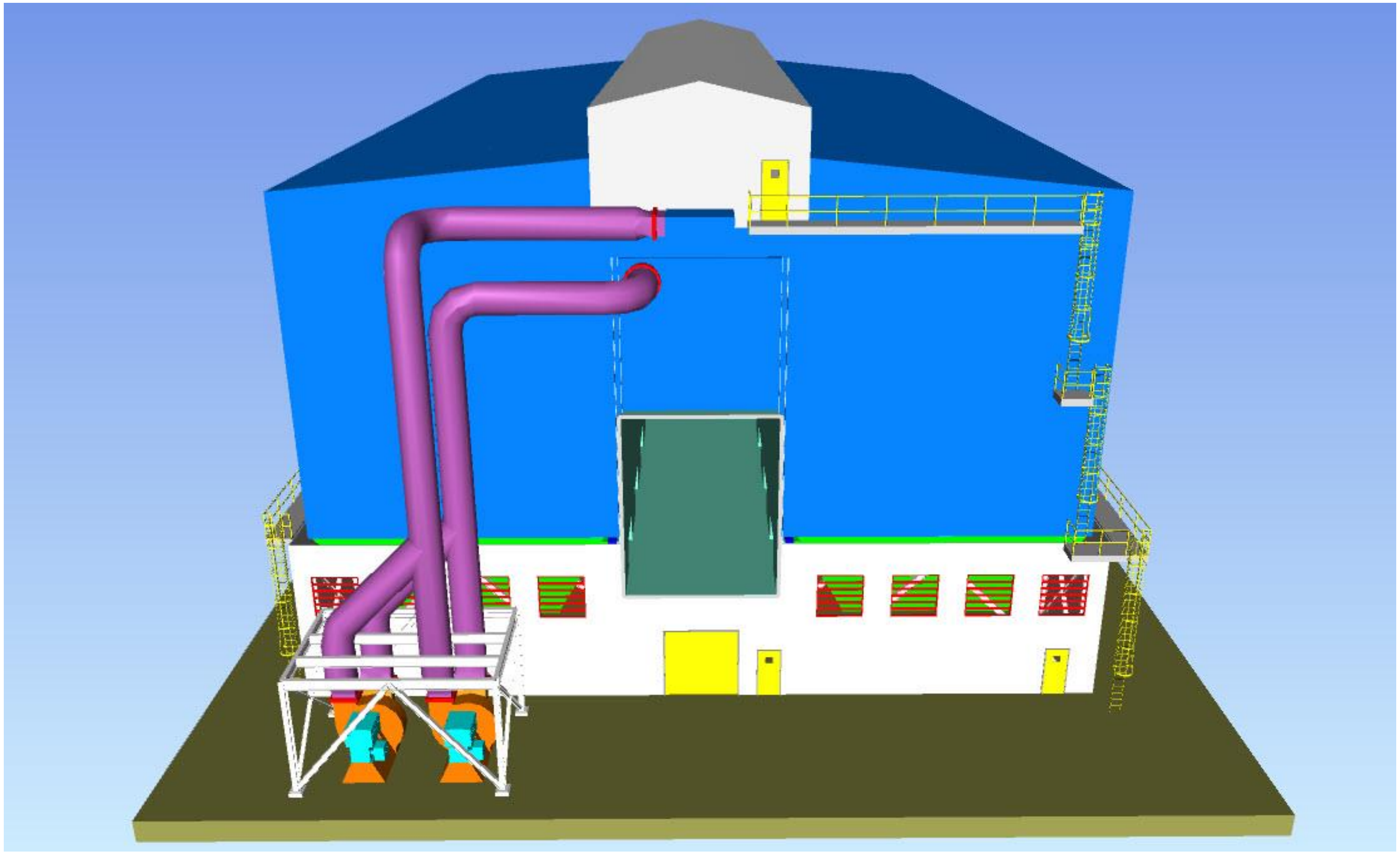
Load-out Silo with Receiver Filters



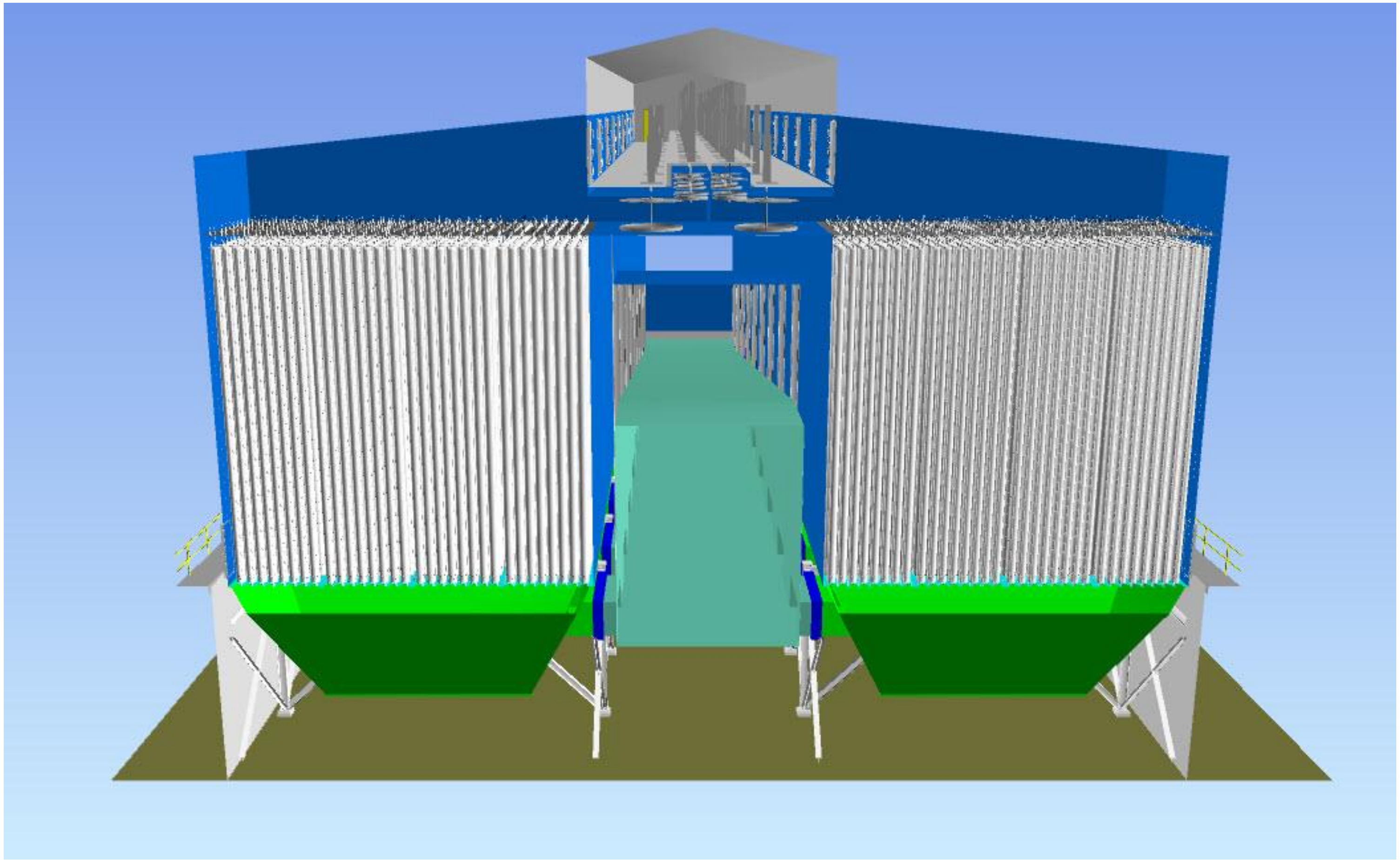


IAC (BAUMCO) REVERSE AIR BAGHOUSE POSITIVE PRESSURE

IAC REVERSE AIR BAGHOUSE NEGATIVE PRESSURE



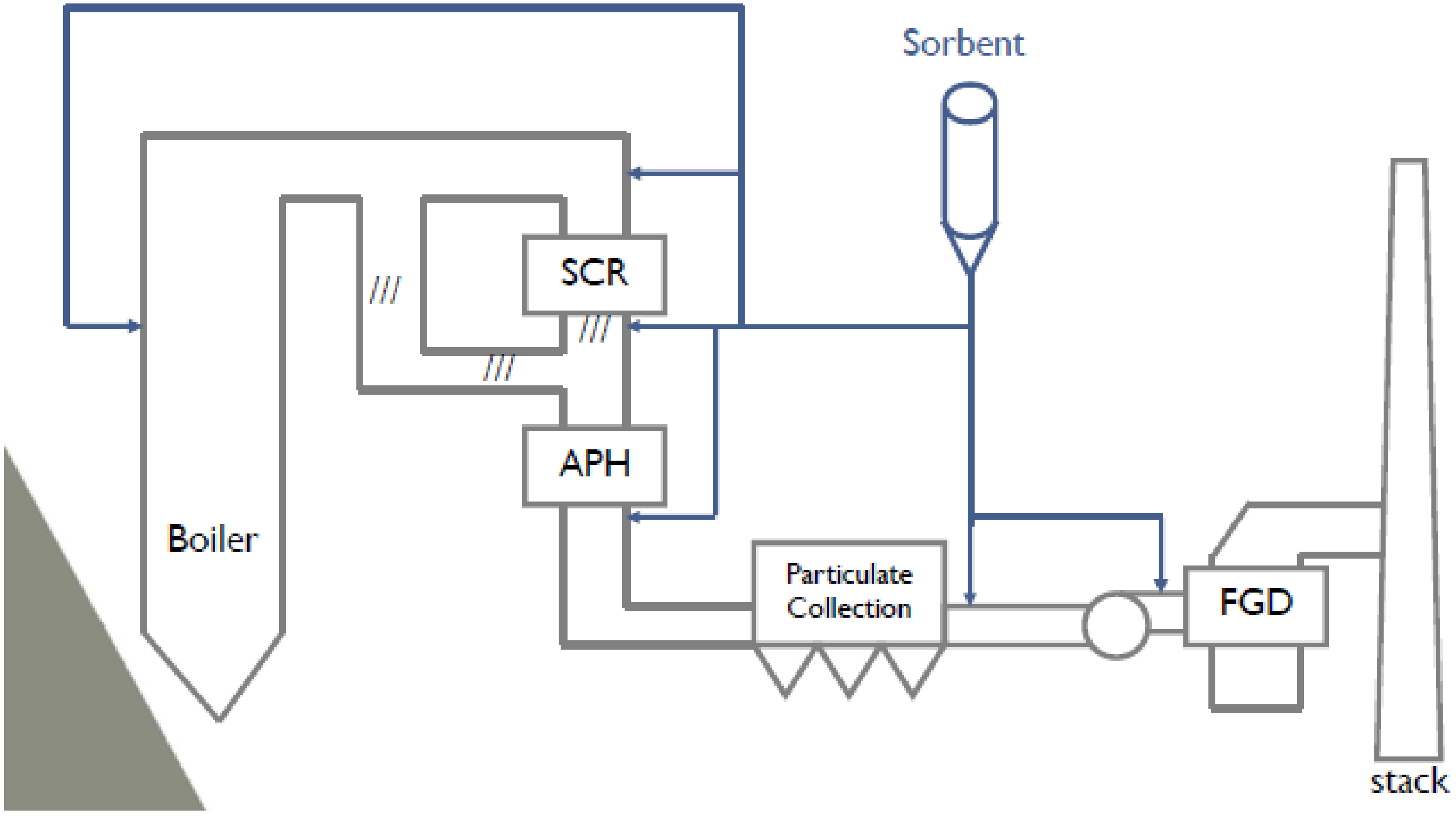
IAC REVERSE AIR BAGHOUSE
NEGATIVE PRESSURE



IAC M Pulse Baghouse & DSI

MPulse Module DSI w/Trona

SORBENT INJECTION LOCATION



TYPICAL DRY SORBENTS		
CALCIUM COMPOUNDS:		
CALCIUM OXIDE	SO_x	SEMI DRY FGD
CALCIUM HYDROXIDE	SO_x; HCL; HF	DRY/SEMI DRY FGD
LIMESTONE/MICRONIZED LIME	SO_x	FURNACE INJECTION (SO_2)
CALCIUM HALIDES	Hg	
SODIUM COMPOUNDS		
TRONA	SO_x; HCL; HF	DRY FGD
SODIUM BICARBONATE	SO_x; HCL; HF	DRY FGD
MAGNESIUM OXIDE / HYDROXIDE	SO_3	DRY FGD
AMENDED SILICATES	Hg	
ACTIVATED CARBON	Hg; ORGANIC HAPS	
MIXTURES AND CUSTOM BLENDS	SO_x; HCL; HF; Hg	

CALCIUM SORBENT REACTIONS

- $Ca(OH)_2 + SO_2 \rightarrow CaSO_3 + H_2O$
- $Ca(OH)_2 + SO_3 \rightarrow CaSO_4 + H_2O$
- $Ca(OH)_2 + 2HCL \rightarrow CaCl_2 + 2H_2O$
- $Ca(OH)_2 + 2HF \rightarrow CaF_2 + 2H_2O$

$CaSO_3$, $CaSO_4$, $CaCl_2$ and CaF_2 are collected in fly ash.

SODIUM BICARBONATE / TRONA REACTIONS

- $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$
- $2(Na_2CO_3 . NaHCO_3 . 2\,H_2O) \rightarrow 3Na_2CO_3 + 5H_2O + CO_2$
- $Na_2CO_3 + SO_2 + 1/2O_2 \rightarrow Na_2SO_4 + CO_2$
- $Na_2CO_3 + SO_3 \rightarrow Na_2SO_4 + CO_2$
- $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$
- $Na_2CO_3 + 2HF \rightarrow 2NaF + H_2O + CO_2$
- $Na_2CO_3 + NO_x \rightarrow NaNO_3 + CO_2$

Na_2SO_4, NaCl, NaF and $NaNO_3$ are collected in fly ash.

SINGLE PASS DRY SORBENT INJECTION

DESIGN VARIABLES FOR DRY SORBENT INJECTION		
Flue Gas Design Flow	Max / Normal / Low	Turndown Considerations & Requirements
Sorbent Characteristics	Particle Size	Milling (Reactivity increases w/surface area)
	Porosity	Increase reactivity
Injection Location	Flue Gas Temp.	Temperature is critical for increased reactivity
	Mixing	Sorbent & Flue Gas Mixing (turndown required)
	Residence Time	Increased time allows for better improved reaction
Type of Particulate Collector	Baghouse / ESP	Required NSR
Computational Fluid Dynamics (CFD)	Mixing	CFD to determine injection locations
Injection Lance Design	Open or w/Nozzles	Mixing & Flue Gas turndown required
Sorbent Feed Rate Controls	Fixed Feed Rate	CEM's control not practical (Hg)
	Adjustable Feed Rate	CEM's controls Feed Rate (SOx)
Demonstration Testing	Full Scale Testing	Verification and Validation of Design

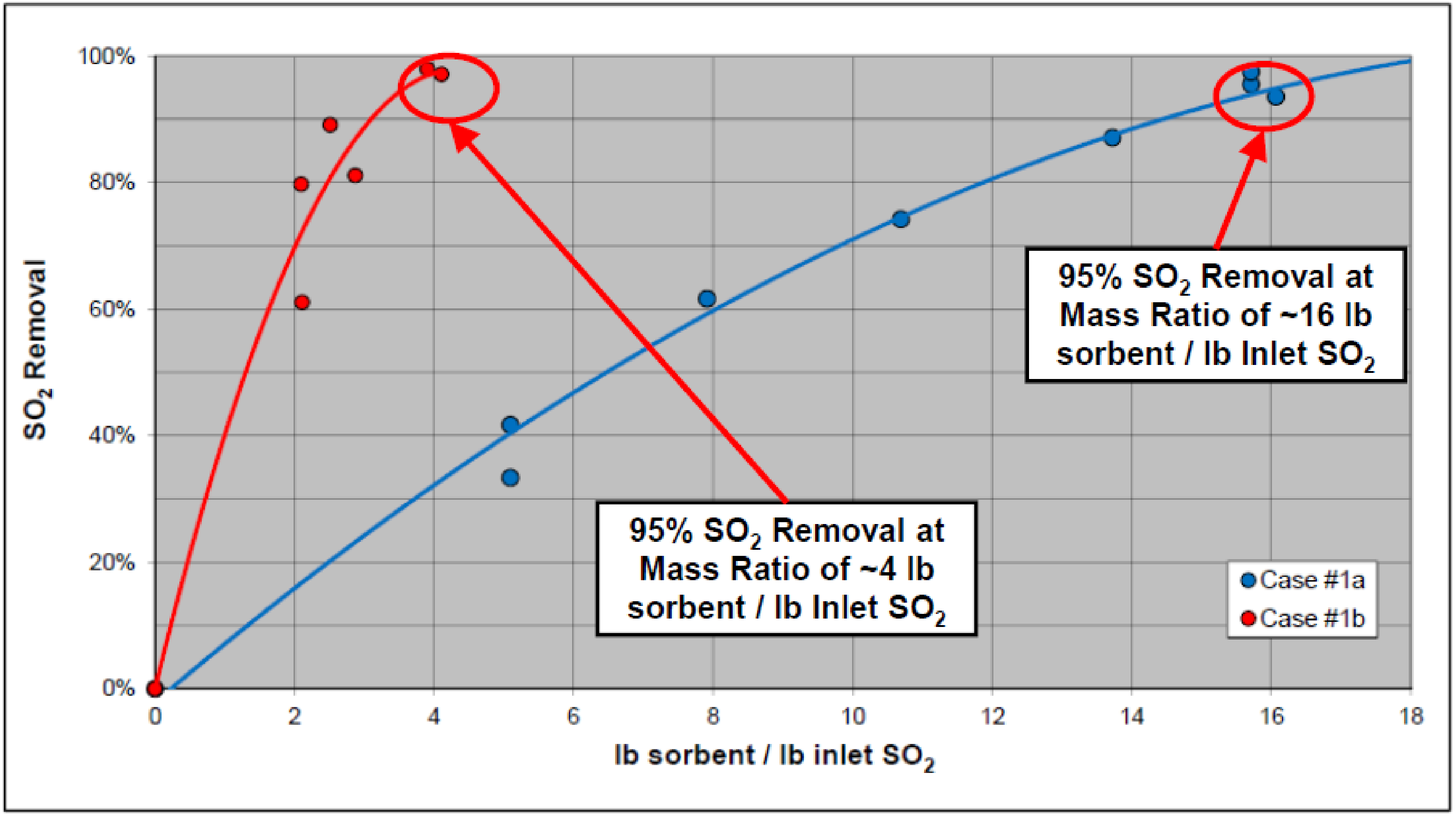
SORBACAL PERFORMANCE AS A FUNCTION OF FLUE GAS HUMIDITY

DSI Case Studies #1a and #1b

- Application → Industrial Manufacturing Process
- Goal → 95+% SO_2 Removal Efficiency
- Why → Meet Future SO_2 Permit Limit
- Process → SDA → Multi-Clone → DSI → FF
- Flue gas temperature at DSI location 300-350°F
- DSI → One (1) Injection Lance @ Fabric Filter Inlet
- Sorbent → Sorbacal® SPS

Case	Flue Gas Volume	Moisture Content	Baseline SO_2 Conc.
	ACFM	Vol. %	ppmv
1a	10,000	~14	100
1b	55,000	~36	300

SORBACAL PERFORMANCE AS A FUNCTION OF FLUE GAS HUMIDITY



Owner: [Big Rivers Electric Corporation]
Plant Nameplate Capacity: 528 MW (Megawatts)
Units and In-Service Dates: 264 MW (1979), 264 MW (1981)
Location: 9000 Hwy. 2096, Robards, KY 42452
GPS Coordinates: 37.645833, -87.503056

HYDRATED LIME DSI & ACI SILOS FOR TWO TRAINS

IAC

TYPICAL DATA

Gross MW	Fuel Flow	AH Gas Out Temp	DSI Rate	ACI Rate	Stack Temp	CO2	NOx	SO2	CEMS Hg	Opacity	Stack Flow
MW	KPPH	Deg F	Lbs/Hr	Lbs/Hr	Deg F	%	ppm	ppm	lb/Tbtu	%	SCFM
256	212	274	1889	282	131	9.42	82.5	61.6	0.972	2.94	801.7
256	222	272	1815	265	130	9.30	80.4	61.1	0.910	2.46	813.9
256	229	270	1749	265	129	9.26	82.1	60.6	0.869	2.73	813.4
205	191	267	1620	210	138	7.80	87.8	60.1	0.877	2.92	761.7
254	195	266	1592	207	130	9.57	73.1	59.6	0.595	2.76	737.4
251	228	268	1730	282	126	9.18	74.2	59.1	1.036	2.64	788.0
254	248	268	1727	281	124	8.52	120.7	58.6	0.997	3.17	872.8
256	235	268	1918	275	124	9.53	75.1	58.1	0.745	2.30	791.7
256	222	270	1852	275	124	9.59	75.8	57.6	0.835	2.45	790.8

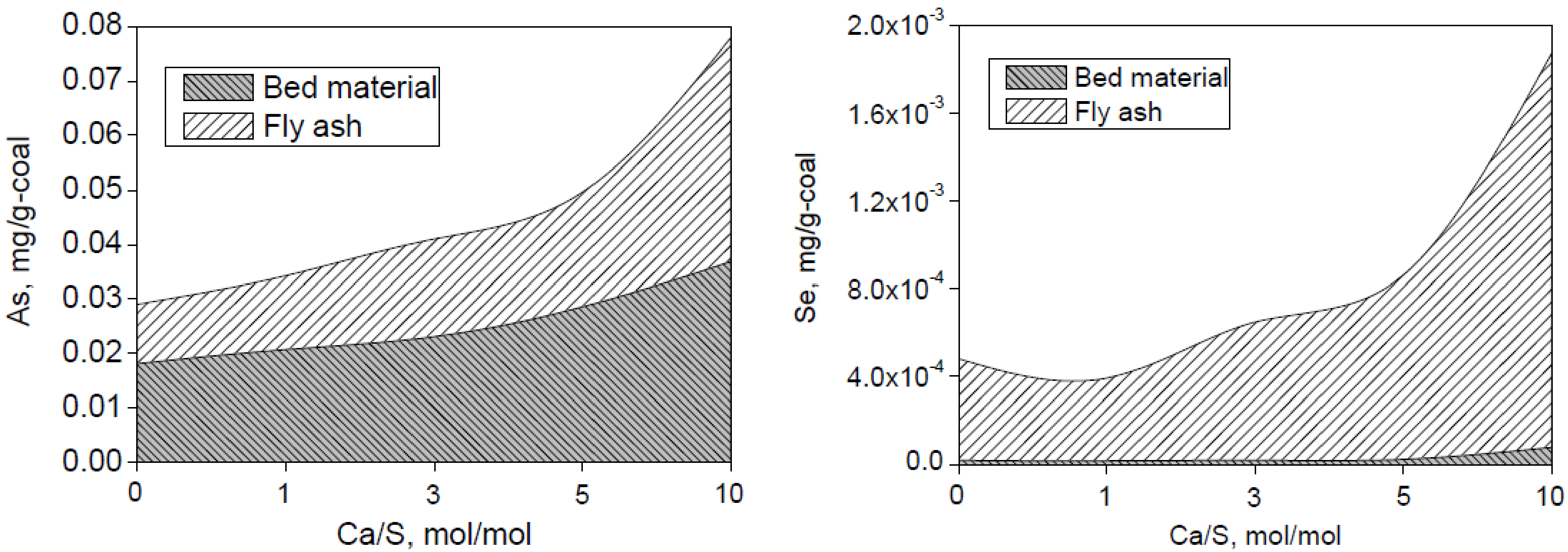
TARGET / DESIGN

- **Hydrated Lime Feed Rate:** **1,400 Lbs/Hr.**
- **BPAC Feed Rate:** **200 Lbs/Hr.**
- **Mercury in Stack:** **0.71 Lbs/TBTU**
- **Stack Opacity:** **2.5%**

ARSENIC MITIGATION

PEBBLE LIME; LIMESTONE ADDITION TO COAL BELT

ARSENIC & SELINIUM MITIGATION



The retention of As and Se during combustion.

$$CaO + \frac{1}{2} SO_2 + O_2 \rightarrow CaSO_4$$

$$3CaO + \frac{1}{2} As_4O_6(g) + O_2 \rightarrow Ca_3(AsO_4)_2$$

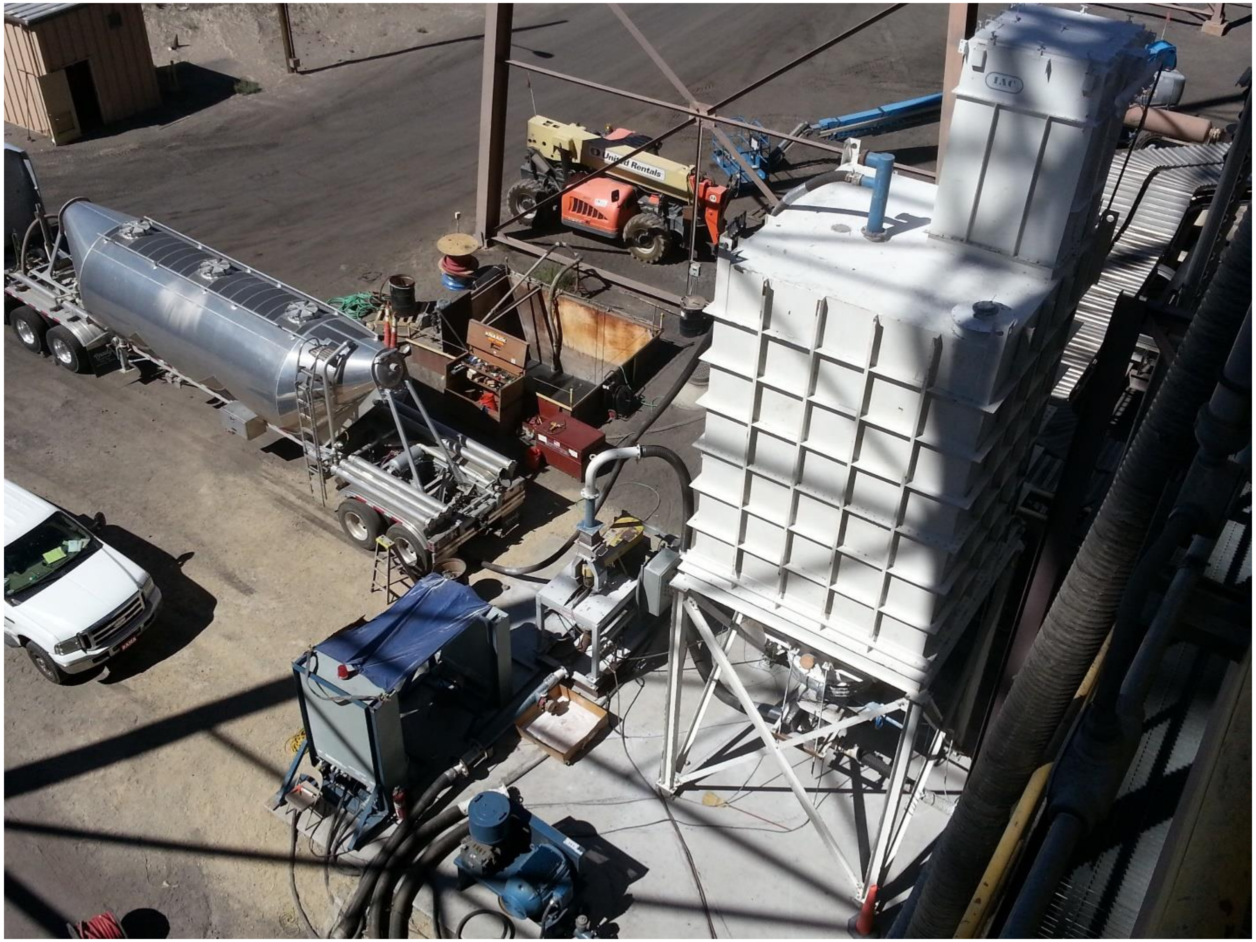
$$CaO + SeO_2(g) \rightarrow CaSeO_3$$

FORMATION TEMPERATURES in Boiler:

Ca3(AsO4)2 formation at 1400 C
CaSeO3 formation at 740 C
CaSO4 formation range 600 C to 1000 C

Recommended Ratio of Ca/S: 6 to 10

IAC DSI DEMONSTRATION TEST



DSI – DEMONSTRATION TESTING
Milled Trona Injection for 80% SO2 Reduction; 36,000 PPH

- 570 MW (5116 mmBtu/hr); PC Boiler
- Tangentially Fired
- Low Sulfur; Subbituminous Coal
- ESP for Particulate Control
- Three DSI Trains with 3 Blowers
- Silos w/LIW Scale for Varied Feed Rates
- Each PD Blower in Sound Enclosure
- One 6-Ton/Hr Pin Mill per Silo
- Pin Mill in Sound/Weather Enclosure
- System Controls: Automated PLC

DSI – DEMONSTRATION TESTING

PD BLOWER IN ENCLOSURE – 800 ICFM CONVEY AIR
HEAT EXCHANGER
SILO ON SCALES
PIN MILL IN ENCLOSURE; RATED CAPACITY: 6 STPH

DSI –TESTING EQUIPMENT

PD Blower in Enclosure
Pin Mill w/Controils in Enclosure
Bin Discharge with Live Bottom & Feeder

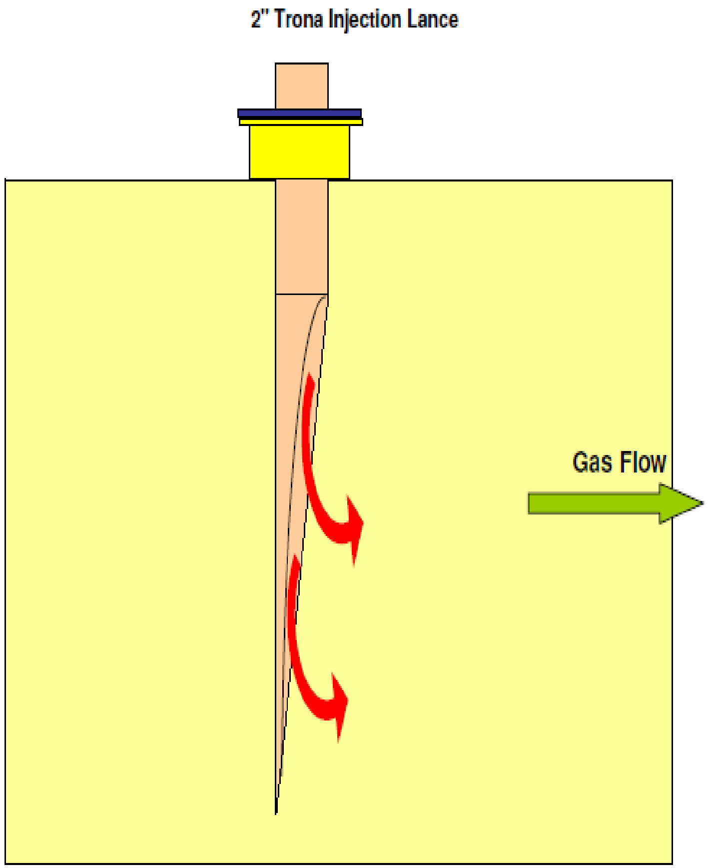
IAC "TRAILER MOUNTED BBU RIG" PAC INJECTION FOR MERCURY REMOVAL TESTING

IAC "BBU RIG" PAC INJECTION FOR MERCURY REMOVAL TESTING

MERCURY TESTING
315 MW PLANT / AIR HEATER OUTLET

IAC

IAC LANCE DESIGN



OPTIONAL LANCE TIP DESIGNS

1. Bayonet Tip for even dispersion.
2. Flat end at staggered depths.
3. Flared end for co-current flow.
4. Dispersion “V” tip end.

Note:

1. Lance tip design is based on duct layout and arrangement
2. Lance diameter based on flow rates and quantity of lances utilized.

IAC/MHC: 30 years, 45 Frac Sand Plants
Unmatched success and experience

Together we design, engineering, install turnkey wet and dry plants and transload facilities. We are the largest in the industry because we offer innovation, durability, and complete systems operation

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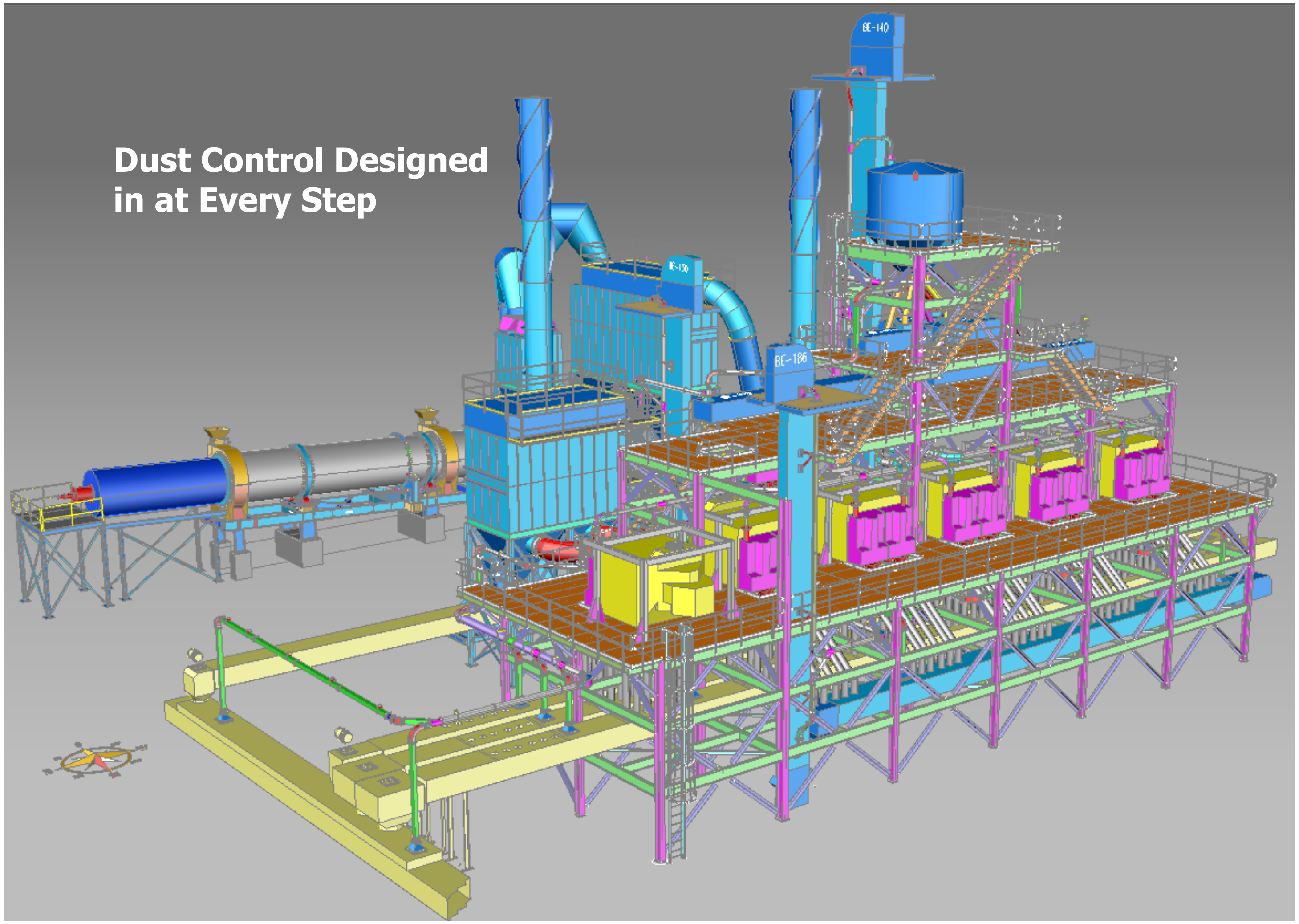
TYPICAL IAC FRAC SAND PLANT DESIGN

TYPICAL IAC FRAC SAND PLANT DESIGN



IAC FLUID BED SAND DRIER & DUST COLLECTOR

IAC CUSTOMER SATISFACTION

- PROVEN EXPERIENCE AND FIELD START-UP
- ENGINEERING SERVICES
  - CIVIL & STRUCTURAL
  - ELECTRICAL & INSTRUMENTATION
- PROVEN PRODUCTS AND TECHNOLOGIES
  - FILTRATION
  - PNEUMATIC TRANSPORT
  - FANS AND BLOWERS
  - CONTROLS; PLC; WONDERWARE INTERFACE
- FLEXIBILITY
- ON-TIME PROJECT EXECUTION
- IN-HOUSE CONSTRUCTION COMPANY – ADELPHI
- IN-HOUSE SERVICE STAFF FOR 24-HR SERVICE

THANK YOU

INDUSTRIAL ACCESSORIES COMPANY

4800 Lamar Avenue

Mission, KS 66202

800.334.7431

www.iac-intl.com