Amerex…

Forward Thinking Air Emission Solutions

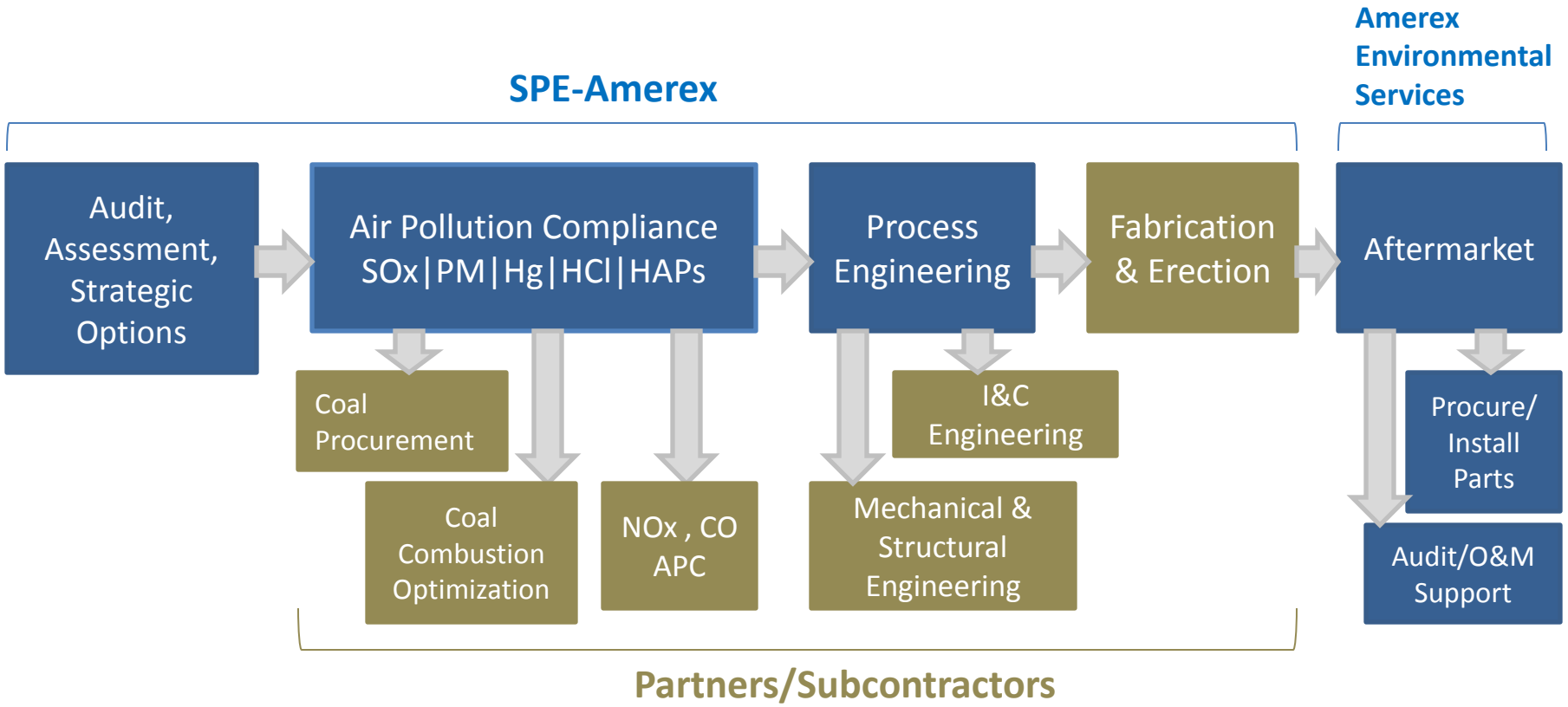
Prepared for: McIlvaine Hot Topic Hour
Industrial MACT—Impact and Control Options
November 18, 2010

Who is Amerex?

Air Emission Compliance Solutions Company

- APC for SOx, PM, Hg, HCl, HAPs
- Complete "Value Chain"—Audit, Assessment, Strategy, Engineering, Installation, Training, Aftermarket
- Key Personnel average 28 years in APC Industry
- " Rebrand" Amerex (2010) → Smart Compliance[SM]

Smart Compliance System



Proposed MACT Standards: Existing and New Coal-Fired Boilers

Existing Boilers

Coal Boilers (burning at least 10% coal or petcoke)

Compound	Original Existing MACT Limit	Proposed Rule	Units
PM	0.07	0.02	lb/MMBtu
HCl	0.09	0.02	lb/MMBtu
Hg	9E-06	3E-06	lb/MMBtu
Dioxin (TEQ basis) (no limit under original MACT)	Stoker/grate/other	0.003	TEQ ng/dscm @ 7% O2
	Pulverized Coal	0.004	TEQ ng/dscm @ 7% O2
	Fluidized Bed	0.002	TEQ ng/dscm @ 7% O2
Carbon Monoxide (no limit under original MACT for existing)	Stoker/grate/other	50	ppm @ 3% O2 as Propane
	Pulverized Coal	90	ppm @ 3% O2 as Propane
	Fluidized Bed	30	ppm @ 3% O2 as Propane

New Boilers

Coal Boilers

Compound	Original MACT Limit	Proposed Rule	Units
PM	0.025	0.001	lb/MMBtu
HCl	0.02	6E-05	lb/MMBtu
Hg	3E-06	2E-06	lb/MMBtu
Dioxin (TEQ basis) (no limit under original MACT)	Stoker/grate/other	0.003	TEQ ng/dscm @ 7% O2
	Pulverized Coal	0.002	TEQ ng/dscm @ 7% O2
	Fluidized Bed	3E-05	TEQ ng/dscm @ 7% O2
CO (original new MACT limit of 400)	Stoker/grate/other	7	ppm @ 3% O2 as Propane
	Pulverized Coal	90	ppm @ 3% O2 as Propane
	Fluidized Bed	30	ppm @ 3% O2 as Propane

Amerex Compliance Technologies for Boiler MACT

SOx

- DSI-Hydrated Lime/Trona (≤ 80%)
- DSI-Sodium Bicarbonate (≤ 90%)
- Semi-Dry Scrubber (≤ 95%): Rotary Atomizer
- Semi-Dry Scrubber (≤95%): Two Fluid Nozzle

PM

- Pulse Jet Fabric Filter
- Reverse Air Fabric Filter
- ESP-to-PJFF

HCl

- DSI-Hydrated Lime (≤95%)

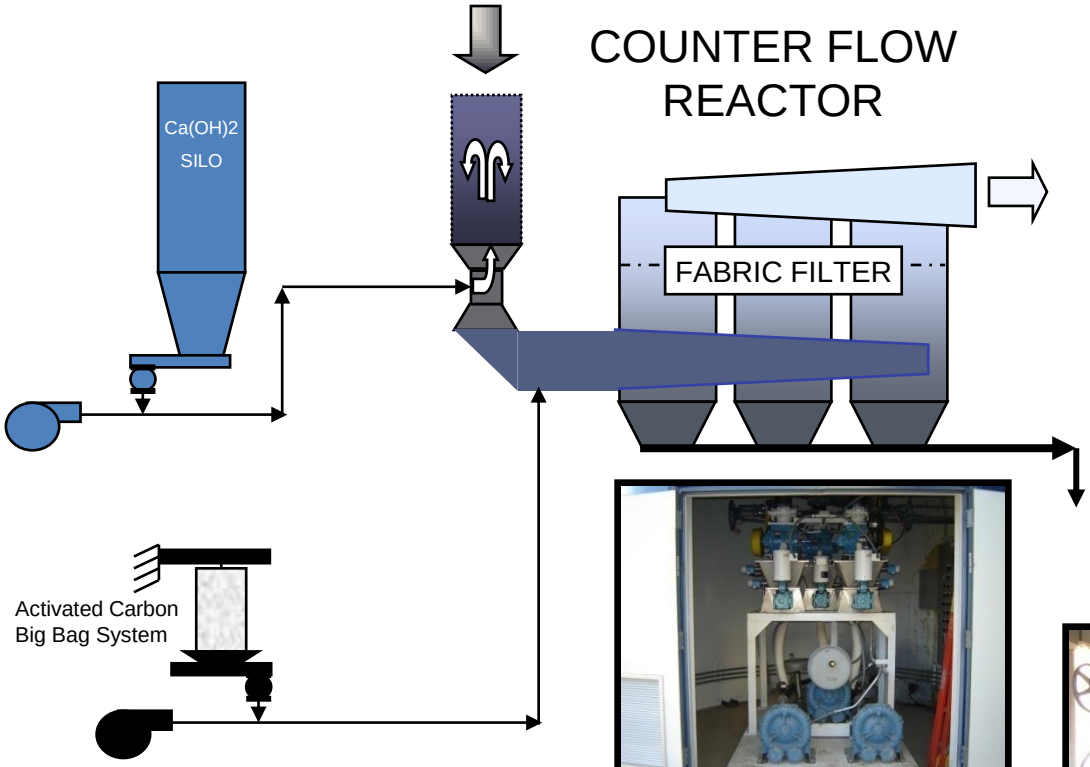
Hg

- DSI-Powder Activated Carbon (≤ 90%)
- DSI-Brominated Powder Activated Carbon (≤ 90%)

Dioxin/ Furan

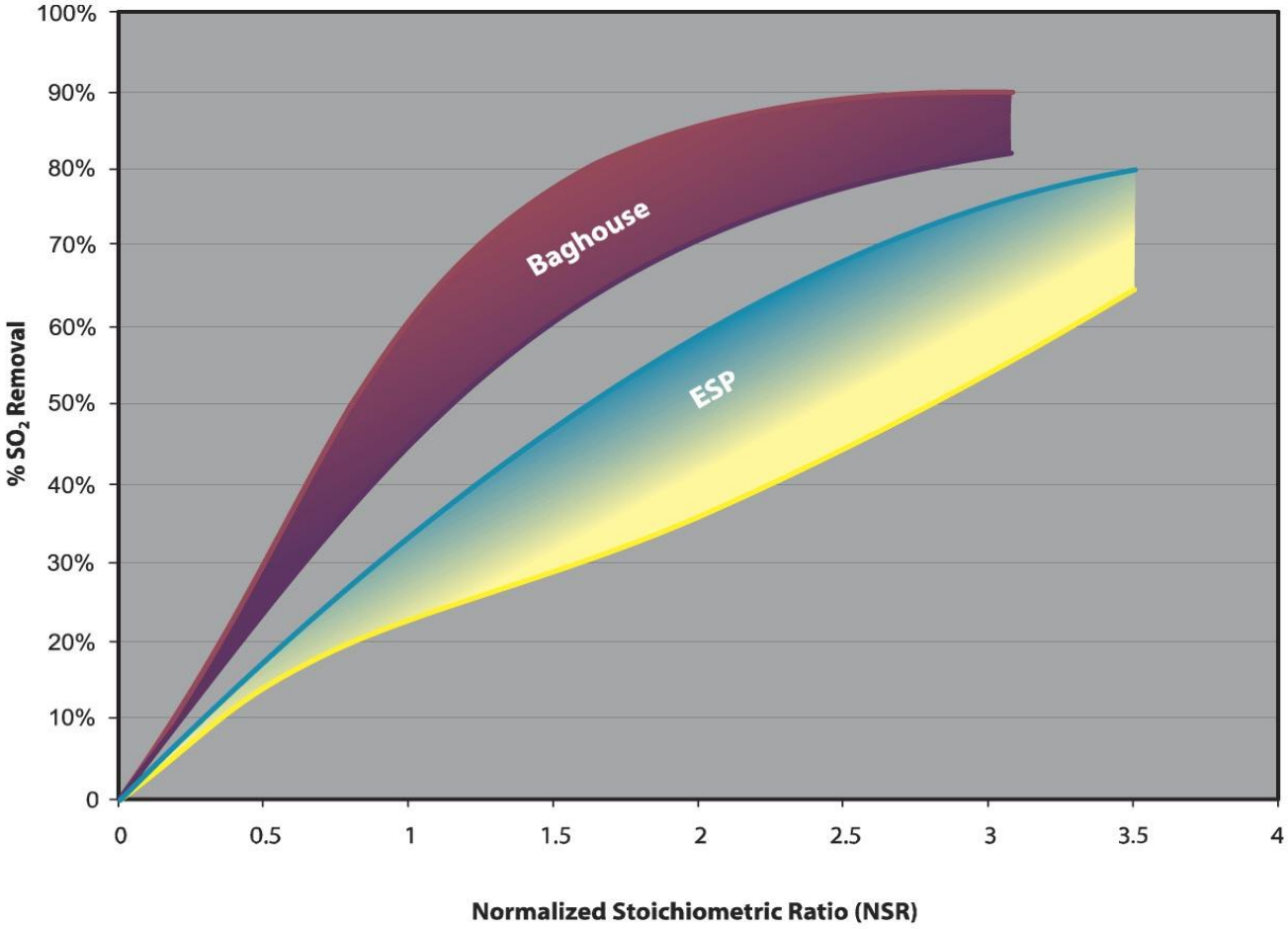
- DSI-Powder Activated Carbon (99+%)
- DSI-Brominated Powder Activated Carbon (99+%)

Dry Scrubbing Systems – Carbon, Lime Trona and SBC



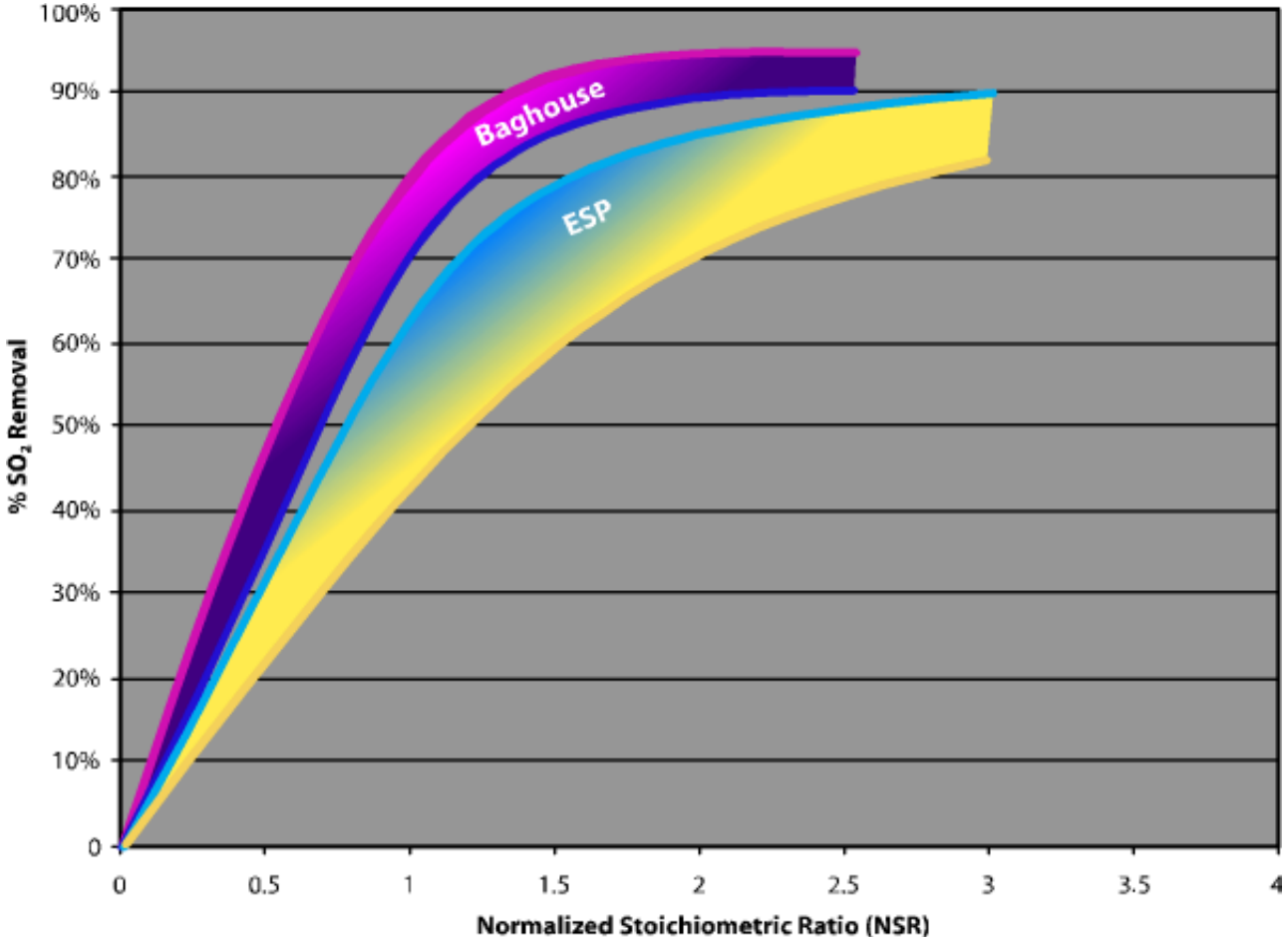
Industry	Dry Process	Pollutants	Reagent	Removal
Incineration and Coal Fired Boilers	Simple Venturi	HCl	Lime/Sodium	95%/99%
		SO_2	Lime/Trona/ Sodium	< 35%/95%
		Dioxin	Carbon	+ 99%
		Hg (1)	Carbon	60% – 90%

Performance of Trona in SO_2 Mitigation



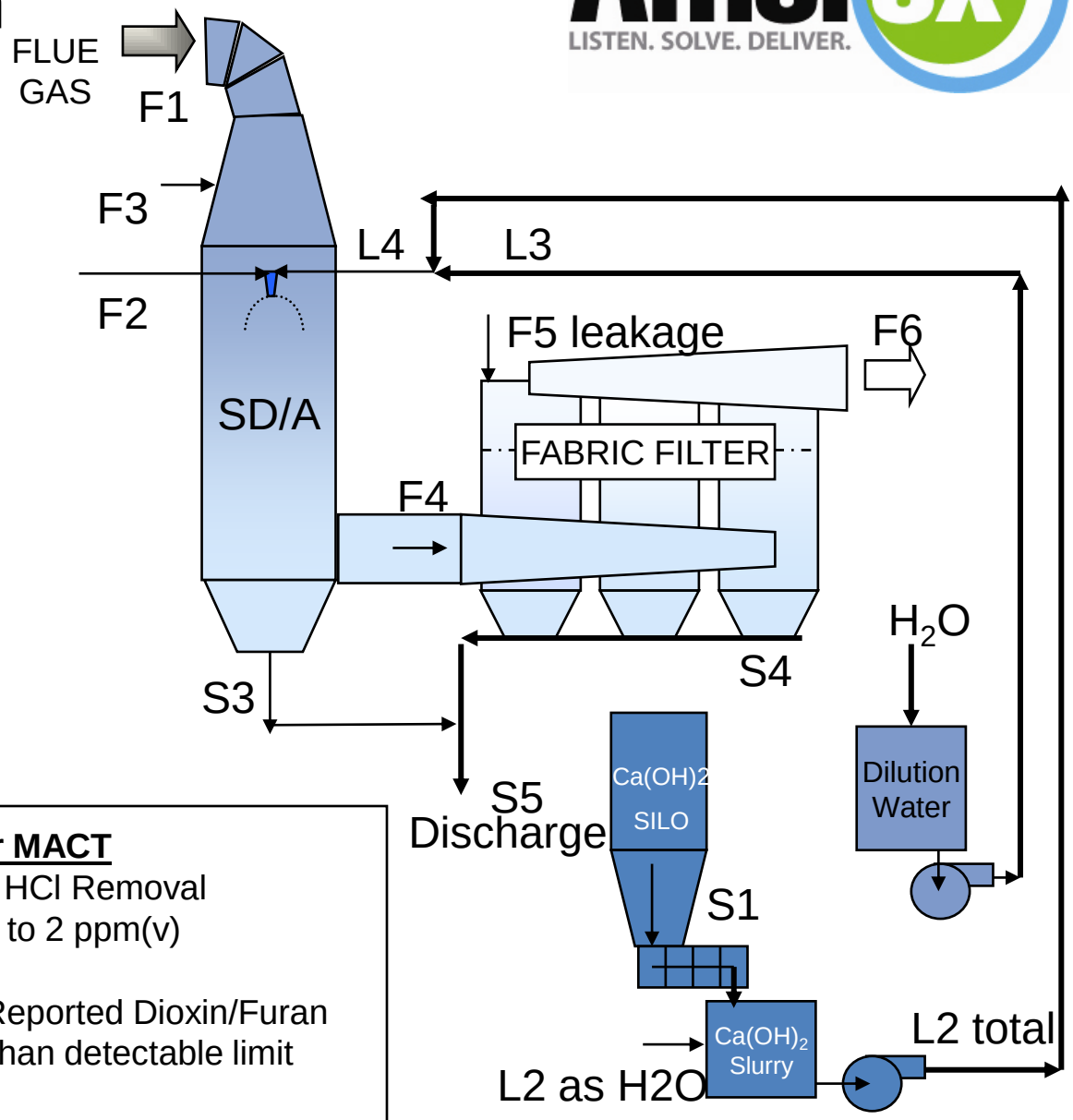
@ 80% SO2 Removal
HCl Removal is 98%
With NSR of 1.0

Performance of Sodium Bicarbonate in SO_2 Mitigation



@ 80% SO2 Removal
HCl Removal is 98%
With NSR of 1.0

Semi-Dry/Spray Dryer Absorber System



KEY

F1 Gas From Boiler
F2 Atomizing Air
F3 Shroud Air
F4 Filter Inlet
F5 In-leakage/Pulse Air
F6 Filter Outlet

S1 Ca(OH)2 Feed shown in L2
S2 Grit Discharge – not used
S3 SD/A Discharge
S4 Filter Discharge
S5 System Discharge

L1 Slaker H2O – not used
L2 Slurry Feed
L3 Dilution Water
L4 SD/A Feed

Boiler MACT

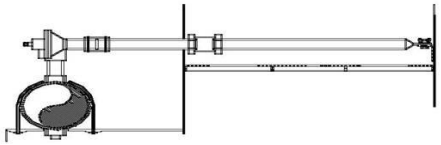
99+% HCl Removal
Outlet to 2 ppm(v)

First Reported Dioxin/Furan
Less than detectable limit

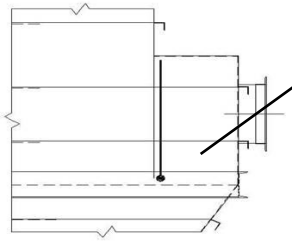
Pulse Jet Fabric Filters

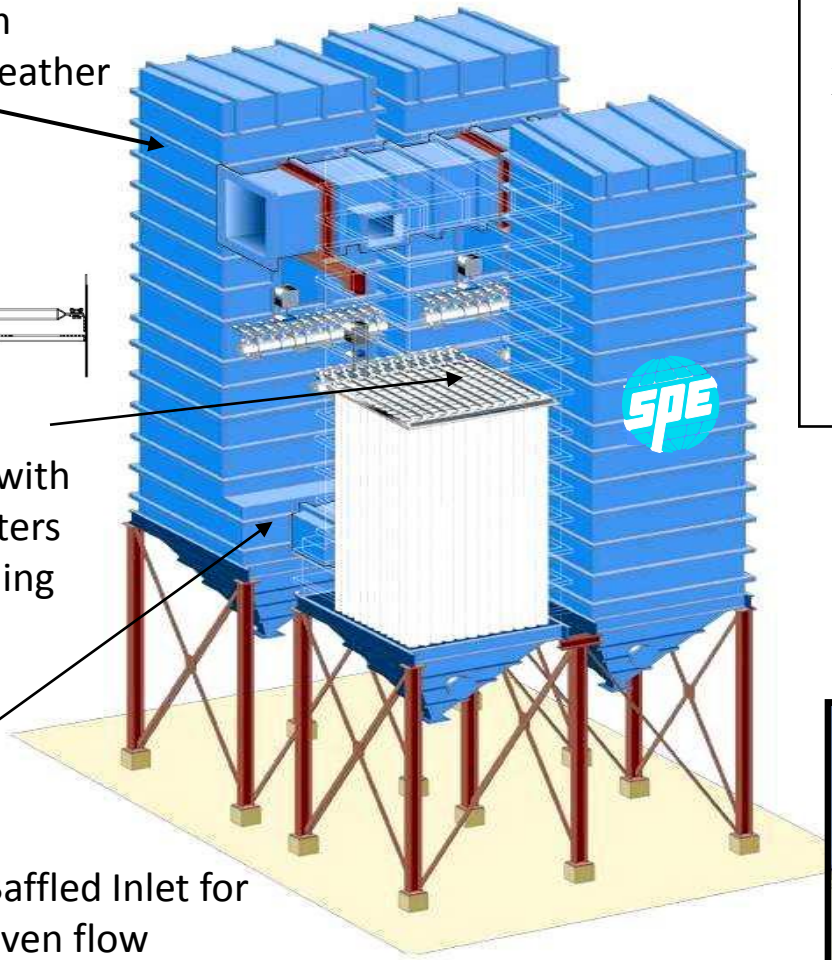
Amerex
LISTEN. SOLVE. DELIVER.

Full Height Outlet Plenum with walk-in access for weather tight maintenance and corrosion resistance

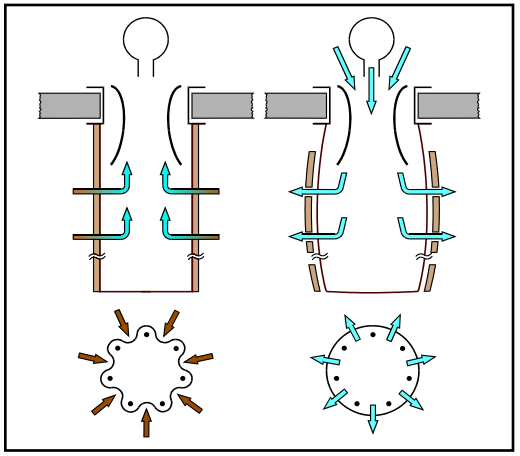


Tuned Blowtubes with varied hole diameters for balanced cleaning performance



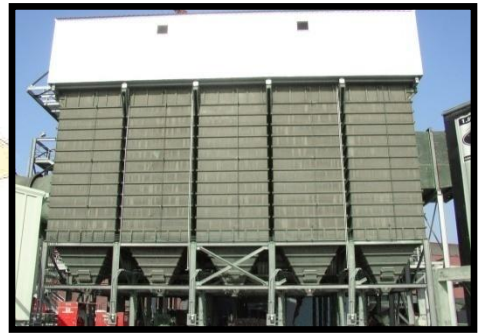


Baffled Inlet for even flow distribution



Pulse Jet

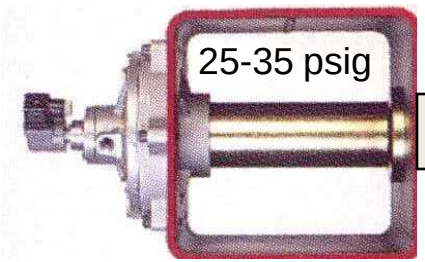
- Split Hopper/Side Ash Laden Gas Entry
- Outside of Bag Ash Collection
- Tube Sheet Suspension/Anti-Collapse Cage
- On-line Cleaning via Compressed Air Jet
- Typical 4:1 (ft/min) Air-to-Cloth Ratio
- Felt Filter Bags + Optional PTFE Membrane



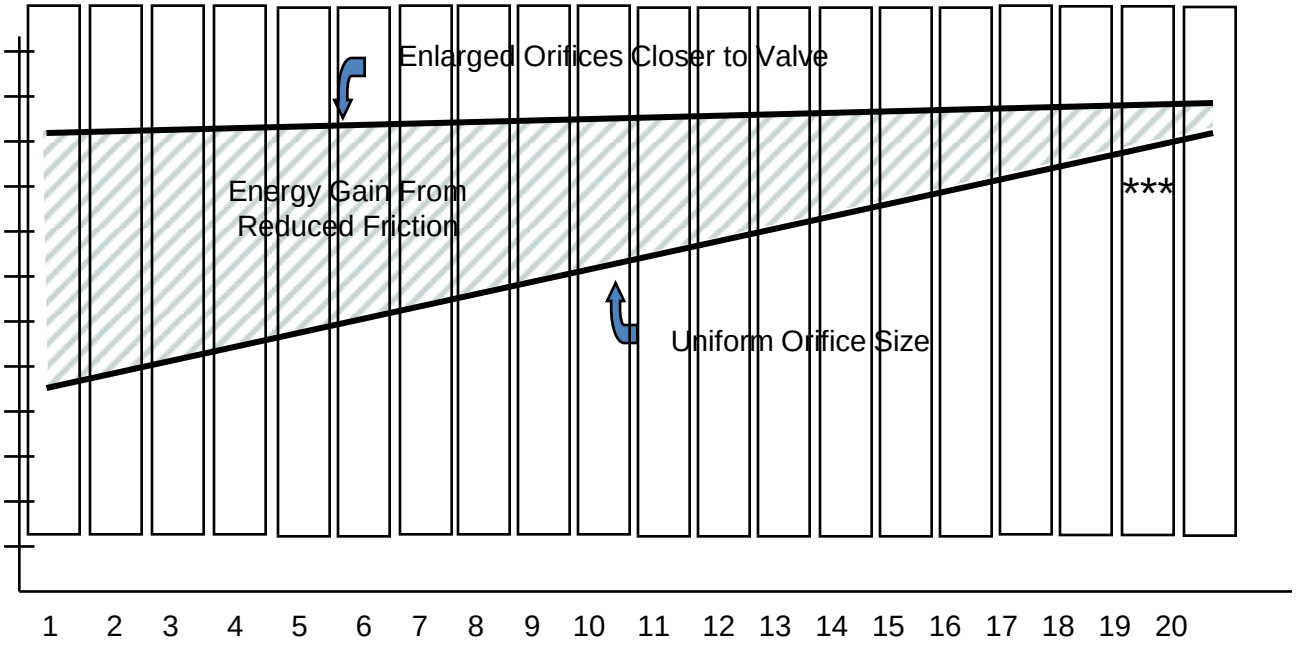
CLEANING SYSTEM FEATURES

TUNED BLOWTUBE SYSTEM

Orifice size varied according
to position relative to valve

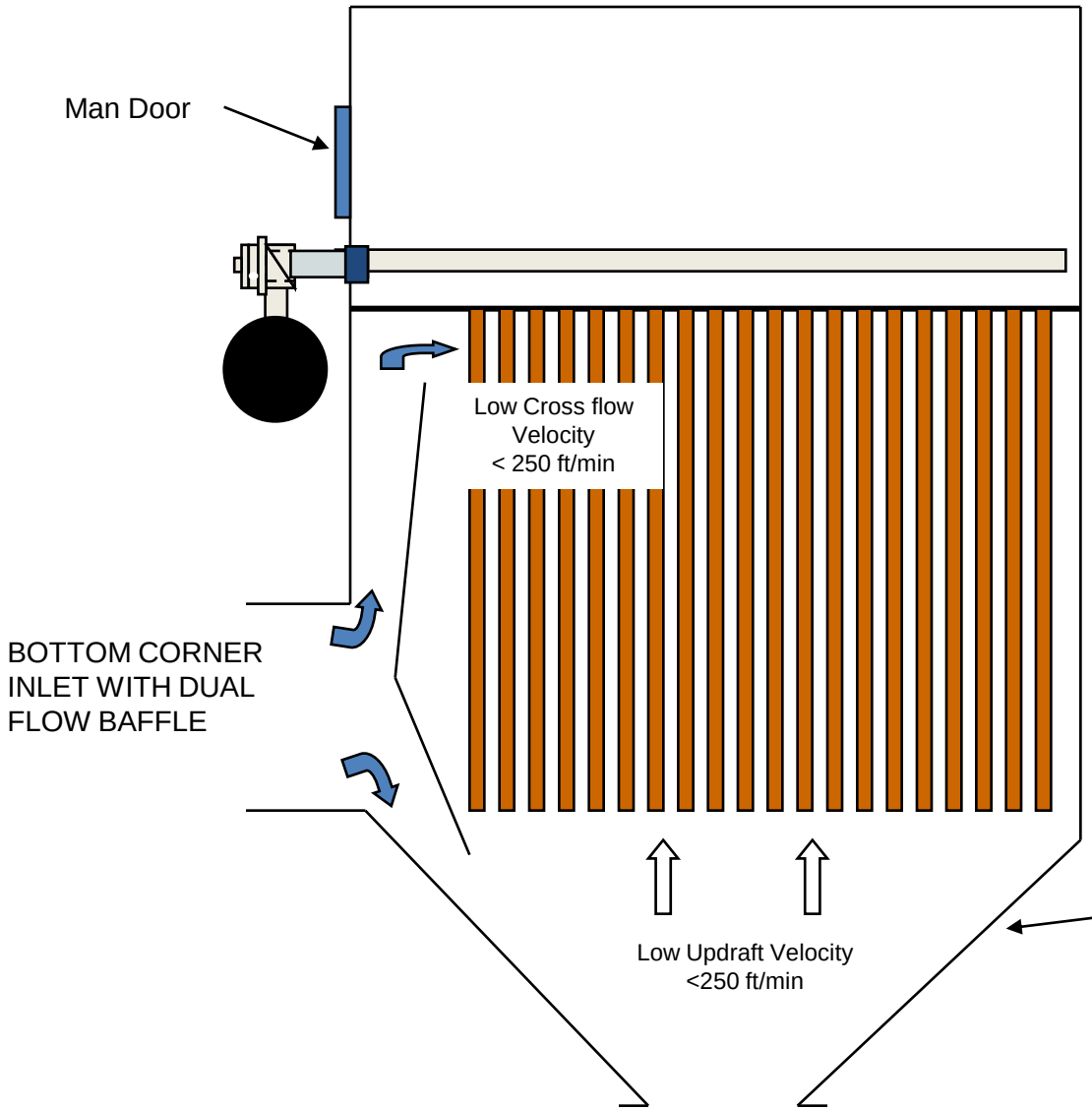


$Pt = \frac{1}{2}\rho V^2 + Ps$



*** Curve fit from test data

COMPARTMENT DESIGN



WALK-IN PLENUM ACCESS

- Weather Tight Maintenance
- No Hoists Needed for access
- Fully Insulated
- No-leak Gasket on Door
- Reduced In-leakage
- Reduced Corrosion

Compartments designed using CFD to attain velocity parameters and eliminate turbulent areas or dead zones.

Installation List (2005-Present)

Online Date	Boiler MACT	Client	State	Fuel Type	Equip (E) or Turnkey (T)	Pulse Jet Fabric Filter	Reverse Air	ESP to PJFF	SDA	CFB	Sorbent Injection Systems				ACFM
											B-PAC	Carbon	Lime	Trona	
Aug-05		Menasha Utility	WI	Coal	T			√							2 x 85,000
Sep-05	√	Jim Beam	KY	Coal	E	√							√		1 x 25,000
Jun-07	√	Morton Salt--Rittman	OH	Coal	E	√						√	√		2 x 76,800
Jul-07	√	El Lilly	IN	Coal	T	√						√			1 x 152,000
Jul-07	√	Morton Salt--Manistee	MI	Coal	E	√							√		1 x 79,300
Sep-07	√	Abbott Laboratories	IL	Coal	E	√							√		2 x 48,000
Oct-07		Barton Brands	KY	Coal	T	√							√		1 x 50,600
Oct-07		Severstal Steel	MI		E	√									1 x 285,000
Feb-08	√	U of Virginia	VA	Coal	E	√			√			√			3 x 45,000
Mar-08	√	Purdue University	IN	Coal	E	√			√						1 x 118,000
Jun-08		New Energy	IN	Coal	T	√			√						1 x 140,000
Jun-08		Wheeling Pittsburgh	PA		E	√									1 x 300,000
Jun-08		KHH Olmstead (Units 1 + 2)	MN	MSW	T	√									2 x 31,000
Jul-08	√	Delphi	MI	Coal	E	√									3 x 72,000
Sep-08	√	Indiana University	IN	Coal	E	√						√	√		2 x 94,821
Feb-09		City of Lakeland	FL	Coal	E								√		1 x 1,072,000
Apr-09	√	Miami University	OH	Coal	E	√			√			√			3 x 60,000
Jun-09		Encore Wire	TX		E	√							√		1 x 33,500
Nov-09		Covanta (Lines 1 + 2)	HI	MSW	E		√								2 x 330,000
Jan-10		WPS (Pulliam)	WI	Coal	T							√			1 x 585,000
Oct-10		Mittal Steel	South Africa		T	√				√					2 x 550,000
Dec-11		Covanta (Line 3)	HI	MSW	E	√			√						1 x 200,737

Selected Results, First Round (2004) Boiler MACT

Site	Boiler	Coal	Equipment	C- Rate (lb/MMACF)	Hg In (lb/TBTU)	Hg Out (lb/TBTU)	SO_3 (ppmv)
1	Stoker	OH/IN Bit	Dry lime Inj. Carbon Inj Fabric Filter	1.8 B-PAC	30	2.8	1
2	PC	IN Bit	Carbon Inj. Fabric Filter	2.2 B-PAC	20	2.5	2
3	Stoker	IN Bit	Evaporative Cooler Fabric Filter	0	15	6	20
4*	Stoker	Eastern Bit	SD/A Carbon Inj. Fabric Filter	2.0 PAC	25	2	<1

* Dioxin/Furan below detectable limits

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