



EXPERIENCE CLEAN AIR

SOUTHERN
environmental INC.

**Air Pollution
Control Systems:
Parts and Service Guide**



Welcome to Southern Environmental.

We truly hope that you will find this Parts and Service Guide useful as you work toward maintaining and servicing your equipment in this competitive business environment. A wise man once told me that there is little reward for hard work unless “smart work” is part of the equation.

This guide provides a multitude of information concerning your air pollution control equipment, including photographs, descriptions and case histories. SEI is a principal supplier of particulate control equipment with extensive experience in Power, Recovery, Refinery, Steel and Cement applications.

Given our vertical integration of Engineering, Design, Manufacturing, Construction and Service, our philosophy is simple:

***“If we don’t have it, we’ll find it.
If we can’t find it, we’ll make it.”***

SEI has built a solid reputation for retrofitting older equipment to meet today’s emission standards. We have extensive experience with equipment built by other manufacturers; many of whom no longer service equipment.

Our parts and service team is a group of air pollution control veterans with the single mission of keeping your air pollution control systems functioning. No matter the complexity of your problem, these men and women can help you with trouble shooting, inspections, component replacement, rebuild or upgrade challenges. They understand the need for rapid support and timely execution.

We look forward to working with you,
Southern Environmental, Inc.

Michael R. Johnson
Director

TABLE OF CONTENTS

About SEI	4
Purchase Options	6
Upgrade Services	7
Inspections	8
Repair & Maintenance	9
Fabrication Facility	10
ESP Replacement Parts: Wet & Dry	11
• Discharge Electrodes	12
• Collecting Surfaces	17
• Electronics & Controls	19
• Rappers	20
• Rapper Components	21
• Insulators	23
• Purge Air Systems	25
• Access	27
• Dampers & Expansion Joints	29
• Process Instrumentation	30
• Water Recycle System	31
Fabric Filter Replacement Parts	33
• Bags & Cages	34
• Baghouse Parts	36
• Evaporative Cooler Parts	42
• Gas Stream Components	43
• Reagent Storage	44
Case Histories	45



ABOUT SEI



DESIGN • BUILD • MECHANICAL CONTRACTOR

Serving the Following Industries

Power Generation • Pulp and Paper • Cement • Iron and Steel • Mining
Petro Chemical • Non-Ferrous Metal • Fiberglass

Founded in 1973, SEI has served the Power, Recovery, Refinery, Steel, and Cement markets heavily for much of these past 40 years. The SEI-Group is comprised of three operating units: Southern Environmental, Inc., Southern Erectors, Inc. and Thermal Systems Group. These business units are integrated into a tightly knit group who self-perform vertically integrated Design and Erect Air Pollution Control Projects.

Operating throughout the Americas, SEI's focus is on particulate and acid gas control. Design, manufacture and construction of Electrostatic Precipitators (ESP) and Fabric Filters with sorbent injection systems represents SEI's core product lines. Over the past 10 years the EPA has continued its regulatory tightening of air pollution emission standards, and SEI's design team has responded with the highest quality products in the marketplace to address these needs. Specifically, SEI's S³ electrostatic precipitator design collects particulate and added sorbent loads with less specific collecting area than any other ESP available.

With the tightening restrictions on acid gas pollutants, SEI's fabric filter team in Westerville, Ohio specializes in fabric filter systems that are designed around acid gas scrubbing requirements. All baghouses are not created equally and the SEI team specializes in custom engineered solutions to provide the best fabric filter design to meet a particular customer's process and facility requirements. Media selection, air-to-cloth ratio, gas flow and materials of construction all play important roles in final fabric filter design.



Maintenance and service represents a significant portion of SEI's contribution to our customers. SEI has an active replacement parts team that works very closely with

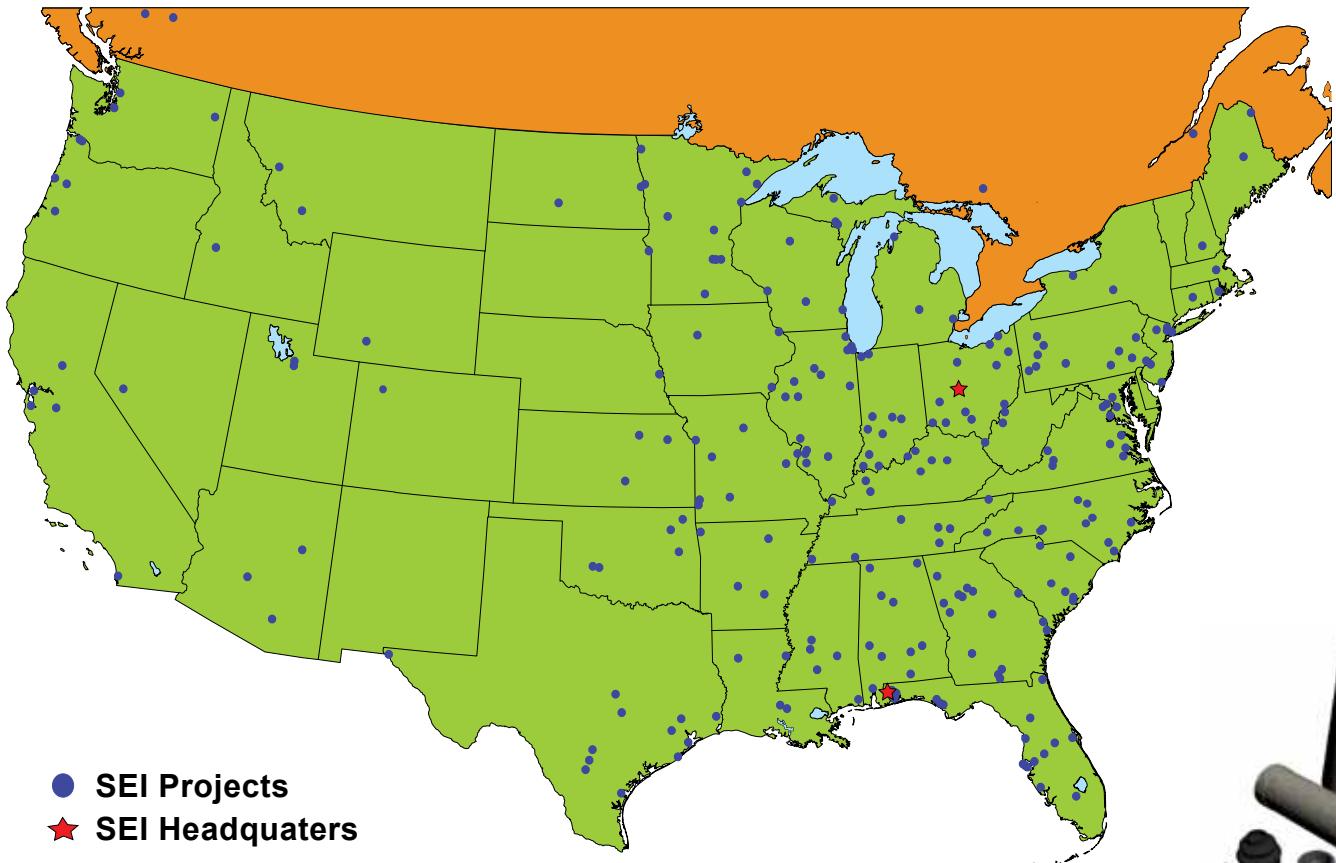
ABOUT SEI



our application engineers to ensure that our customers receive the correct replacement component for any given process. In addition, our maintenance crews travel throughout the United States, providing inspection, repair and replacement services on baghouses and both wet and dry electrostatic precipitators. This team within the SEI-Group actively supports our customers as they plan and budget for their scheduled outage activities. If SEI is not an active supplier for your maintenance team, then your company is not taking full advantage of a highly skilled resource.



SEI maintains offices in Pensacola, Florida and Westerville, Ohio. The Pensacola campus serves as the corporate headquarters for the SEI-Group and houses our fabrication facility, as well as the leadership for our ESP engineering and construction management teams. The Westerville, Ohio office houses our Fabric Filter Specialists, who focus on baghouse design and acid gas scrubbing solutions. Both of SEI's offices interact as a cohesive unit to bring vertically integrated Design and Erect solutions to our client base.



Internationally, SEI-Group has performed projects in Antarctica, Argentina, Brazil, Canada, China, India, Mexico, Qatar, Russia, Singapore, South Korea, Sweden, Taiwan and Thailand.



PURCHASE OPTIONS

EASY PAYMENT OPTIONS

We strive to offer you more benefits in order to assist in keeping your Air Pollution Control systems operating at peak efficiency and in compliance. One of those ways is to make acquiring replacement parts as effortless as possible.

We have the ability to process: Visa, American Express and MasterCard. Purchase Orders are also accepted.

PURCHASE PARTS ONLINE

Our innovative web based computer program makes ordering parts for your ESP or Fabric Filter simple, quick and cost effective. SEI's Parts Online System may be beneficial to your company in different ways.

HOW IT WORKS

This system allows our customers to access their specific parts information via username and password. You can review a listing of your spare parts by unit and plant and purchase them as you see fit. The purchase can be completed using a purchase order or credit card.

When you access the Parts Online System you can:

1. View Parts previously purchased
2. View recommended Parts
3. Purchase Parts
4. View your order status information

BENEFITS

This program is designed specifically for your plant and is available to you free of charge. Many of our customers have seen this as a great benefit for the following reasons:

- Information at your fingertips.
- Helps users to share information, such as order history.
- Makes the process of pricing and ordering straightforward and uncomplicated.
- Saves time and effort. Time spent for:
 - Figuring out part information (part number and description)
 - Contacting people within and outside the company
 - Receiving quotes
 - Placing orders
 - Follow-up



PURCHASE PARTS ONLINE
www.southernenvironmental.com

PURCHASE ORDER

- ▶ Replacement parts for all ESP and Fabric Filter types
- ▶ Installation of Replacement parts

UPGRADE SERVICES

Southern Environmental (SEI) can upgrade the performance of most fabric filters and precipitators. Recent changes to the U.S. emission standards are driving all companies to evaluate replacement or modification of their existing equipment. SEI is a custom solution provider and has devoted the last 40 years to applying its knowledge base to custom engineered upgrade or retrofit solutions. Performance upgrades and enhancement may include the following:

Fabric Filter Systems

- Gas distribution modifications
- Filter media change
- Controls upgrade
- Compartmental expansion
- Ash removal system modifications
- Sorbent change – for acid gas scrubbing solutions

Electrostatic Precipitator Systems

- Gas distribution modifications
- Substitution of SEI/ELEX rigid discharge electrodes
- Sectionalization modifications
- Increase collecting electrode spacing
- Rapping system upgrade
- Controls upgrade
- Ash removal system modifications
- Increase collecting area vertically or in the direction of gas flow
- Power supply upgrades
- Module expansion – Wet ESP



Each system is unique and requires our engineers to evaluate each unit's particular challenges. There is never a question as to whether we make it better. SEI can always make the equipment operate better. The question remains: "What is the best approach that meets our customer's operating, maintenance and economic objectives?"



INSPECTIONS

Periodic inspections are a fundamental aspect of any routine maintenance program. Particulate Control Equipment is specialized and requires technicians with a specific experience base to identify and troubleshoot problem areas.

SEI employs engineers and technicians experienced with the equipment we manufacture and service every day. SEI has built its reputation retrofitting older equipment and also has a working knowledge of other manufacturers' components.

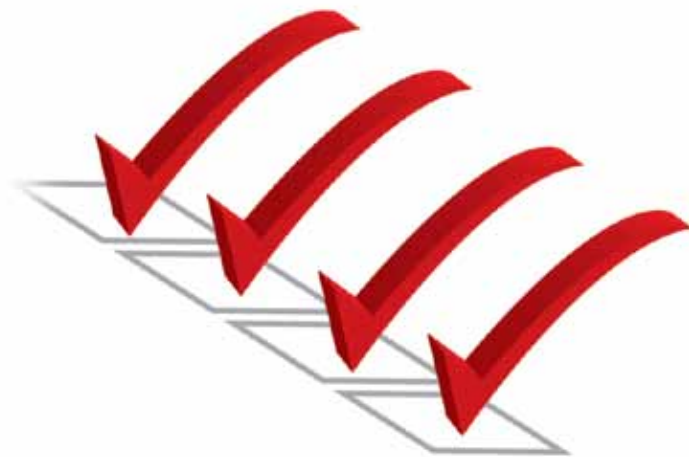
SEI's staff is technically proficient at inspecting a variety of equipment:

- Fabric Filter Systems
- Dry Electrostatic Precipitators
- Wet Electrostatic Precipitators
- Dry Sorbent Injection Systems

Each system identified has a multitude of subsystems requiring structural, mechanical and electrical expertise. Our engineers and technicians are available to assist you with scheduled inspections or specific troubleshooting to correct a known problem.

Typical items of interest are as follows:

- Excessive corrosion
 - *Casing, hopper and duct leaks*
- Bag failures
- High spark rate issues – ESP
- Internal equipment alignment problems
- Gas distribution problems
- Auxiliary fan failures
- Heater failures
- Controls calibration
- Grounding problems
- Ash and dust removal problems
- Specific material handling failures
- Power supply failures
- Damper failures
- Evaluation of process changes to system



REPAIR & MAINTENANCE

SEI has been providing our customers with engineers, service technicians and specialized craft labor for 40 years. SEI's maintenance crews travel throughout the contiguous United States serving the power generation, pulp and paper, refinery, cement and other markets. Our specialty is maintaining electrostatic precipitator and fabric filter systems.

With over 500,000 craft-hours annually, our field crews are supported by technical staff in Pensacola, Florida and Westerville, Ohio. In addition, our steel fabrication facility can manufacture most any steel component needed on an emergency basis in support of our traveling maintenance teams. Thereby preserving our motto:

If we do not have it, we will find it

If we cannot find it, we will make it.



Since beginning business in 1973, SEI has had numerous long-term maintenance contracts whereby our personnel were stationed at a particular facility permanently. Some of these long term maintenance relationships spanned more than 20 years. SEI has supported full time maintenance teams in Florida, and in two Virginia locations in the past.

Most recently SEI supports its customer base with both long-term contracts and annual firm proposals in support of our clients' maintenance needs. SEI is proud to note that its specialty in the maintenance arena centers on fixed price, fixed schedule contracts. We believe that we

bring the most value to many of our clients by arriving on time, doing quality work on a defined scope and leaving on time. Most of our clients need maximum production uptime and minimum downtime.

We believe that it is our job to keep the plant's equipment running with minimum disruption in contract management. SEI's field crews are supported by a full-time safety team and field quality control personnel.



FABRICATION FACILITY

SEI is a complete in-house design build mechanical contractor, providing domestic and international industrial metal fabrication and erection work. Our 100,000 ft² office and fabrication facility houses the equipment needed to do virtually any type of metal fabrication. SEI has a completely enclosed sandblast and paint building as well as a 10,000 ft² warehouse. Our 10-acre campus facilitates storage of large fabrication orders. Company trucks allow us to remain in complete control of quality from time of purchase to final installation. When a project is awarded, your company can be assured it will receive the highest quality of service at each phase of design, fabrication, shipping and installation.

Listed below is some of our fabrication equipment:

Shears

- 1 – 12' – 10 gauge capacity
- 1 – 10' – 1/4" capacity
- 1 – 10' – 1/2" capacity; 3/8" SS capacity

Hand Brake

- 1 – 16 gauge capacity

Automated Hole Puncher

- 1 – 100 ton capacity

Cut-off Saw

- 1 – 14" diameter blade

Power Brake – 200 ton

- 12' – 1/4" plate capacity
- 8' – 3/8" plate capacity
- 6' – 1/2" plate capacity
- 1 Powerbrake 10' – 16 gauge capacity

Power Roller

- 1 – 8' wide – 1/4" capacity
- 1 – 5' wide – 1/4" plate capacity
- 1 – 4' wide – 16 gauge capacity
- 1 – 5' wide – 16 gauge capacity

Lock Former

- 1 – 16 gauge capacity
- 60" wide automated coil line
- 1 – 14 gauge maximum

Band Saw

- 20" throat

Forklifts

- 1 – 15,500 pound lift
- 1 – 12,000 pound lift – new
- 1 – 6,000 pound lift
- 7 – 5 ton capacity overhead shop cranes

Plasma cutters Table 10'x43' (Extreme 3100 Cutting Machine)

- 1 – up to 2" SS plate
- 1 – up to 2-1/2" CS plate
- 10 – Oxyacetylene

Welding Machines

- 24 MIG Systems
- 2 DC Power Sources (SMAW)
- 5 TIG Systems



ESP Replacement Parts: Wet & Dry



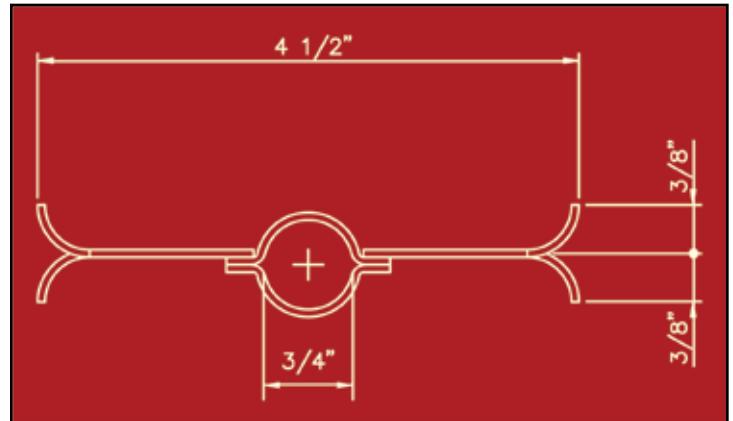
DISCHARGE ELECTRODES

RIGID DISCHARGE ELECTRODES (RDEs)

SEI / ELEX Discharge Electrode

For more than 20 years SEI/ELEX electrostatic precipitators have been equipped with our patented RS Discharge Electrodes.

The RS Discharge Electrode consists of a rigid tubular mast to which emitter points are positively attached by spot welding. The RS Discharge Electrode is, in turn, firmly connected to its own suspension system.



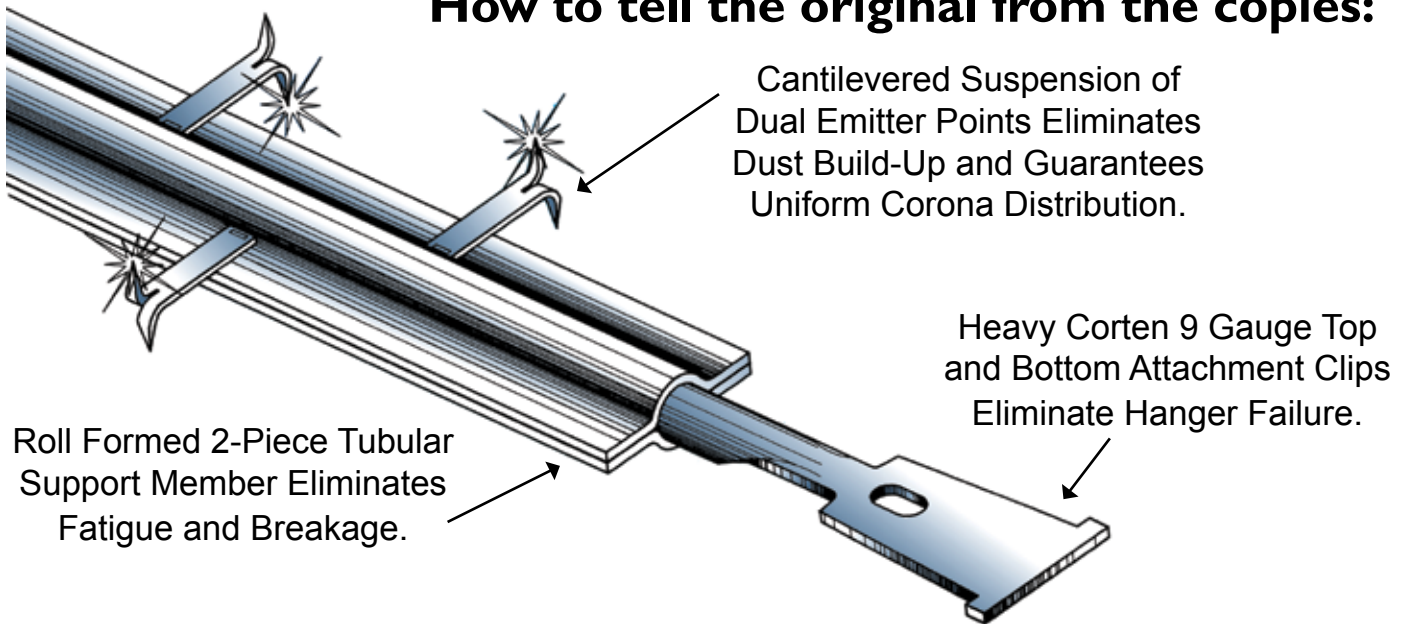
This unique electrode is incorporated in over 1,000 SEI/ELEX precipitators with more than 500,000,000 linear feet of installed electrodes worldwide.

- It is unbreakable and not susceptible to electrical erosion or mechanical wear, which are the principal causes of discharge electrode failure.
- **Improved Cleaning Effects.** The vibrations set up by the rapping systems are transmitted over the entire length of each and every electrode.
- **Optimum Corona Effect.** The corona discharge is guaranteed at every point because the points are geometrically disposed throughout the whole effective column of the precipitator. The excellent corona distribution ensures optimum charging of particles; therefore, a superior and constant cleaning efficiency is achieved.
- **No Bending or Distorting.** The provisions of suitable guides ensure that the RS Electrode will not bend or deform, even when it is subjected to excessive variations of temperature in the precipitator.
- Easy and quick installation of the RS Electrode in gas passages spaced from 8" to 16".
- The RS Discharge Electrode is essential to the high efficiency and reliability required of the precipitator.



DISCHARGE ELECTRODES

How to tell the original from the copies:



Do not settle for a copy – Insist on the original!

Why are so many precipitator manufacturers copying the SEI style Rigid Discharge Electrode? There is bound to be confusion, but it is easy to tell the original – SEI's RS Electrode.

- Look for equally spaced dual emitter sources. They assure equal corona over the entire length of the electrode.
- Look for cantilevered suspension of the emitter arms away from the center support. It is a design feature that makes sure dust cannot build up and cover the discharge points.

The SEI Rigid Electrode has been retrofitted into 8", 9", 10", 11", 12" and 16" spaced units replacing weighted wires.

- More installations than any other manufacturer
- Over 20 years installed experience
- Over 1,000 precipitator installations worldwide
- Over 500,000,000 linear feet in service



DISCHARGE ELECTRODES

REPLACEMENT WIRES AND SHROUDS

When properly designed and manufactured, weighted wires can provide you with years of reliable cost effective service.



Smooth Round Wire



Barbed Wire



Dual Strand Wire



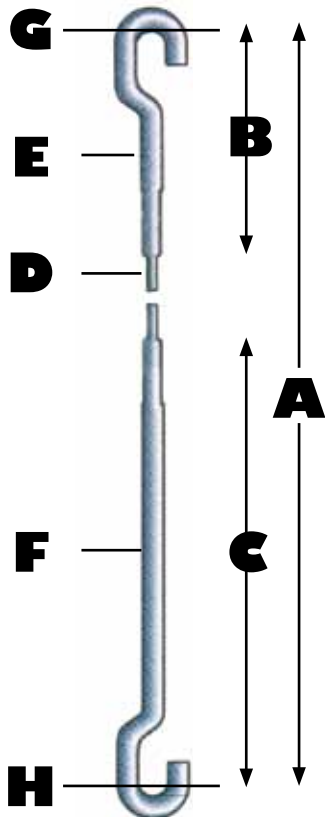
Square Wire



Ribbon Wire

Choose the shroud style that best suits your needs from the illustrations on the following page.

Be sure to record the required dimensions listed below.



A – Overall length

B – Top shroud length

C – Bottom shroud length

D – Wire Diameter

E – Top shroud diameter

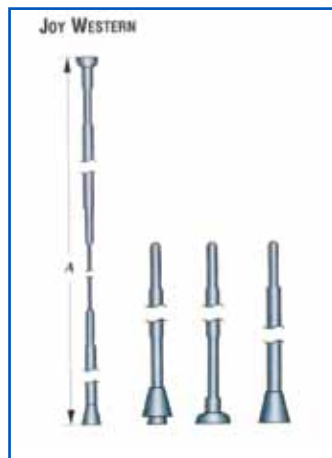
F – Bottom shroud diameter

G – Electrode hanger style (see next page)

H – Weight hanger style (see next page)



DISCHARGE ELECTRODES



DISCHARGE ELECTRODES

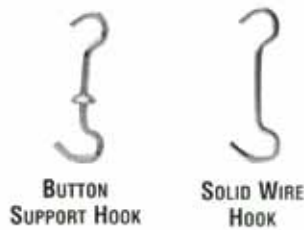
WEIGHTS

Weights are used on rigid discharge electrodes and weighted wire systems. The weights are designed to keep the RDE's and wires straight and aligned, also to deter any swaying which could lead to breakage through arcing and fatigue.

We offer a designed weight for our unique RDE's and can provide a direct replacement casting for most weighted wire OEM weights.



SEI Standard Rigid Discharge Electrode Weights



COLLECTING SURFACES

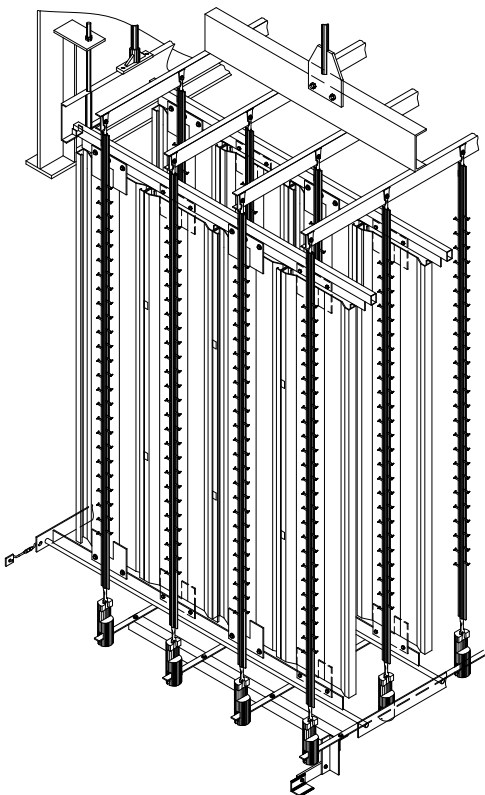
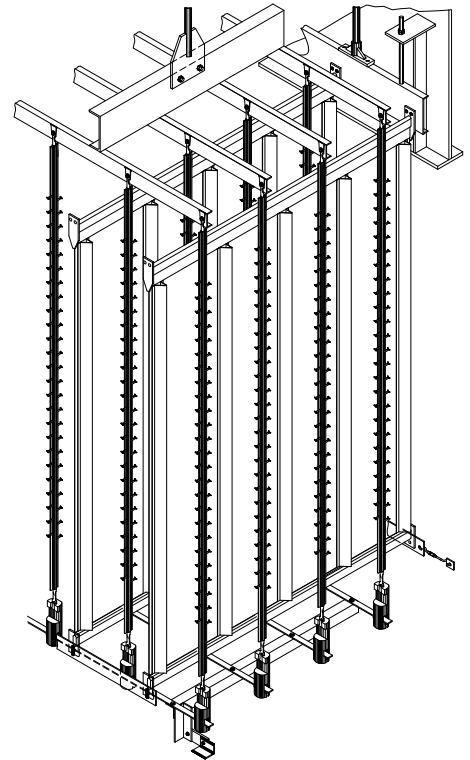
COLLECTING PLATES

Solid Collecting Plates

Solid collecting surfaces are roll-formed surfaces that are factory assembled to form a single-piece baffled structure, providing maximum stiffness, optimum gas exposure, uniformity of profile and require no field assembly.

The smooth curving geometry of the top and bottom edges of the collecting surfaces prevent edge effect arc-over where the discharge electrodes enter and leave the collecting field.

The arrangement of the collecting plate baffles are specifically designed to match the discharge electrode arrangement for your application. This design flexibility ensures the optimum relationship between the collecting plates and the discharge electrodes.



Segmented Plates

This type of collecting surface is comprised of roll-formed segmented steel collecting surfaces.

The roll-formed ribbed design resists bowing and resulting misalignment due to temperature excursions and rapping forces. Aerodynamically, when properly rapped, the collected dust particles are effectively sheared from the entire length of the plate segment with minimum re-entrainment.

The supporting “tadpoles” are designed to prevent edge effect arc-over where the discharge electrodes enter and leave the collecting field.



COLLECTING SURFACES



PLATE STRAIGHTENERS

Having problems with bowed collecting plates?

Plate straighteners are designed to keep the collecting plates apart and in their original positions.

Whether you need replacement plate straighteners or you would like to install new ones, we can supply you with what you need.

COLLECTING PATCH PLATES

Intact collecting plates are vital to maintaining the efficiency of your precipitator. Plates that are damaged could decrease the rapping effectiveness, gas flow distribution and cause reduction in corona generation. The corrosion of the plates decreases the amount of available collecting surface and the rough, jagged edges could cause arcing. SEI can offer a designed patch plate to attach to the existing collecting plate to help eliminate these potential problems.



ELECTRONICS & CONTROLS

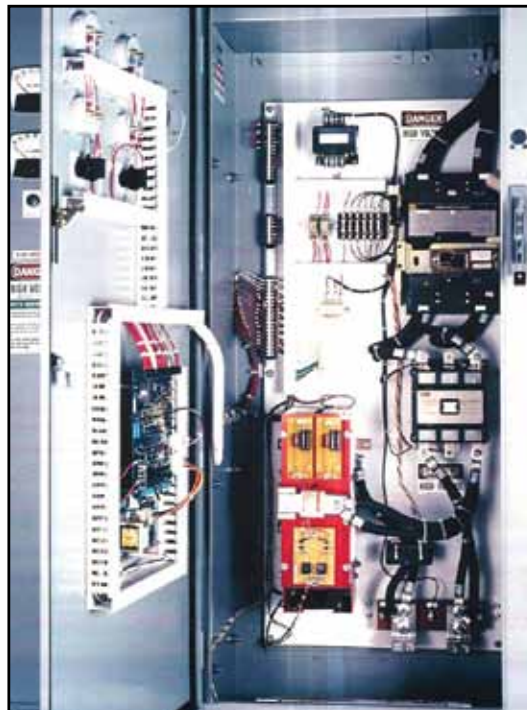
ELECTRONICS & CONTROLS

Electrostatic precipitators require various electronic components to function optimally:

- The transformer/rectifier set is specifically designed to provide the high voltage DC necessary for electrostatic precipitation.
- T/R Controls - The control units contain all components necessary for controlling and protecting a T/R set. Serial data ports are included for transmitting and receiving data from a central control system.
- Microprocessor-based controls are used to manage and control the rapping of the precipitator for proper cleaning of the collecting plates and discharge electrodes.
- A computer program monitors, predicts and troubleshoots electrostatic precipitator performance.

- **T/R Controls**
- **Rapper Controls**
- **Current Limiting Reactors**
- **Electronic Components**
- **Transformer / Rectifier Sets**
- **Switchmode Power Supplies**

Whether you need a transformer/rectifier set, controls or current limiting reactor, we can facilitate your order. We provide AVC's and T/R's for any requested manufacturer.



Photos courtesy of NWL and Stock Equipment

RAPPERS

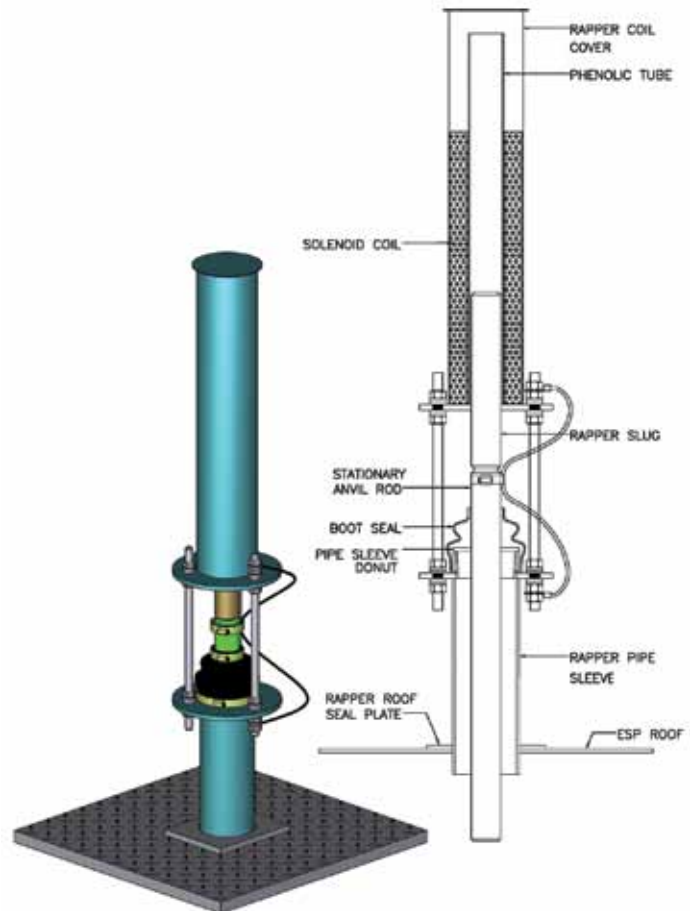
ELECTROMAGNETIC RAPPERS

The acceptable balance of rapping intensity, frequency and duration is vital for optimum precipitator performance.

Southern Environmental supplies rappers for dependability and minimal maintenance.

Some of the rapper features include:

- The rappers are “solenoid-driven,” meaning an electric solenoid lifts the plunger which is then returned by gravity to impact the rapper.
- 20 pound plungers with stainless steel laminated ends eliminate magnetizing.
- Coils are available in 120v DC or 240v DC.
- Shaft mounted or roof mounted
- Pigtail or junction box electrical connections.



PNEUMATIC RAPPERS

Inexpensive and reliable pneumatic rappers successfully remove persistent deposits.

The air-cushioned pistons lessen stress on plate heads.

The mounting design is tapered to fit most metal and insulated shafts.



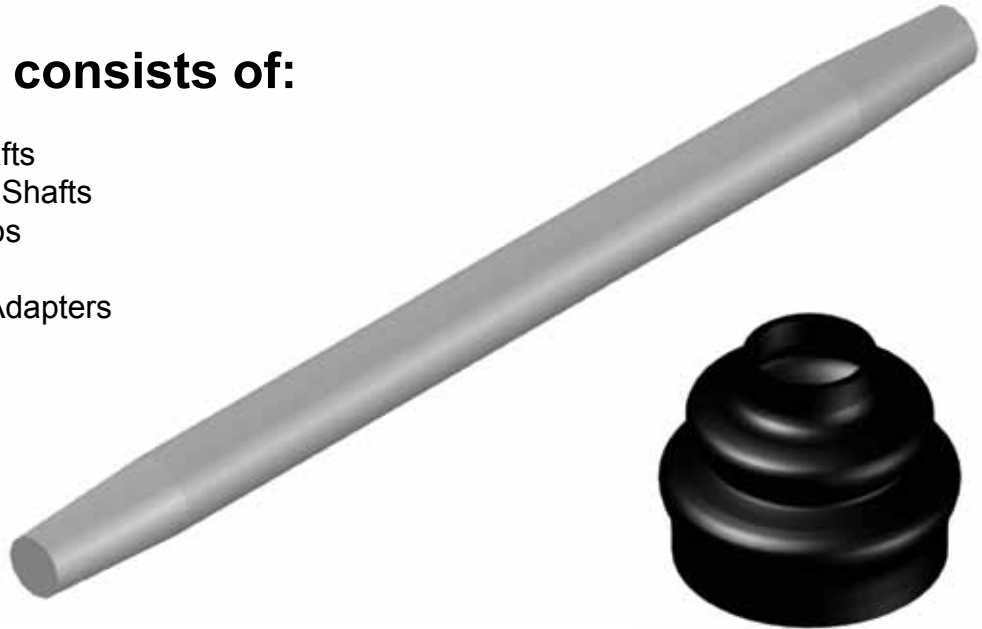
RAPPER COMPONENTS

RAPPER COMPONENTS

Our rapper components are available individually or as custom-engineered systems that specifically suit your needs.

Our inventory consists of:

- Steel Rapper Shafts
- Insulated Rapper Shafts
- Boot Seals/Clamps
- Impact Caps
- Double-Tapered Adapters
- Ground Straps
- Rapper Sockets
- Rapper Donuts



GROUND STRAPS



Ground straps insure electrical bonding of the rapper, the stationary anvil rod, and the ESP casing to prevent electrostatic build up, which can result in damage to the rapper controller due to electrostatic discharge.



RAPPER COMPONENTS

BOOT SEALS

Boot seals ensure that atmospheric elements such as rain and cold air do not enter the ESP.

Leakage of gasses and corrosion of rapper shafts is prevented by the positive seal between the rapper shafts and nipple guides.

Rapper sleeves that are too small can cause various problems including corrosion, particulate buildup and binding of the rapper shaft, which ultimately can lead to rapping of the roof instead of the plates or discharge electrodes.

We offer an assortment of boot seals in various styles and materials suitable for your particular application.



RAPPER CAGES

Electromagnetic rappers are designed to drop a piston from their housing for both the collecting and high voltage systems. These pistons can weigh anywhere from eight (8) pounds to twenty (20) pounds. To prevent safety mishaps, rapper cages are used as a safety guard on the rapper at the area of the exposed piston. SEI can offer a designed rapper cage to attach to the existing collecting plate and high voltage rappers to deter safety incidents.

RAPPER INSULATORS

Rapper insulators electrically isolate the discharge electrode rappers while dispersing the mechanical forces required to generate vibration or shock in the high voltage system.



INSULATORS

The ceramic material of choice for discharge electrode system support insulators, rapping system insulators and feed-through bushing insulators is 85% alumina ceramic. These insulators are engineered to perform in hostile electrostatic precipitator environments.

This material has been shown to considerably reduce the costs associated with repeated system repairs and plant downtime. Replacement insulators are available for any OEM.

Material Temperature Limitations

Teflon – Up to 450 degrees

FRP – 250 to 400 degrees

Alumina – Up to 1,400 degrees



SEI CAN SUPPLY THE FOLLOWING INSULATOR PARTS:

- Support Insulators
- Anti-Sway Bars
 - Alumina
 - Teflon
- Rapper Shafts
 - Alumina
 - Fiberglass
 - Porcelain
- Wall Bushings
- Stand-Off Insulators
- Bus Duct Insulators
- Feed-Through Insulators
- Insulator Gaskets
- Drive Shaft Insulators



INSULATORS



SUPPORT INSULATORS

Support insulators physically support and electrically isolate the high voltage system from ground. The support insulators are designed to support compressive strength loads generated by the high voltage electrodes and frames.

ANTI-SWAY INSULATORS

Anti-sway insulators are connected to the high voltage guide frame to sustain alignment and stability. The anti-sway insulators are used to prevent the high voltage system from swaying. One end of the insulator is attached to a grounded portion of the ESP while the other end is attached to the lower high voltage frame. The material of choice is either Alumina or Teflon. The Alumina insulator is available in a flat bar or a solid round bar. The flat bar is also available in Teflon.

COMPRESSION SPRINGS

A component of the high voltage suspension system is compression springs. They are used to support and distribute the weight of the system. There are varying sizes to choose from which are dependent on the weight and frame size of the high voltage system.



INSULATOR HEATERS

Rapid temperature changes or the introduction of moisture can cause tracking and cracking of insulators. Heaters should be utilized to prevent condensation and ash build up by warming the insulators prior to start up.



PURGE AIR SYSTEMS

PURGE AIR SYSTEMS

Purge Air Systems protect high-voltage support insulators from moisture and dust that could accumulate on their surfaces and cause them to fail.

Support insulators provide many years of use when properly maintained, such as preheating prior to start-up. The constant flow of dry heated air prevents condensation and prevents flue gas from entering.

Volume, temperature and pressure of the purge air are critical design parameters that vary significantly. Southern Environmental designs each purge air system to satisfy the specific requirements of each application.

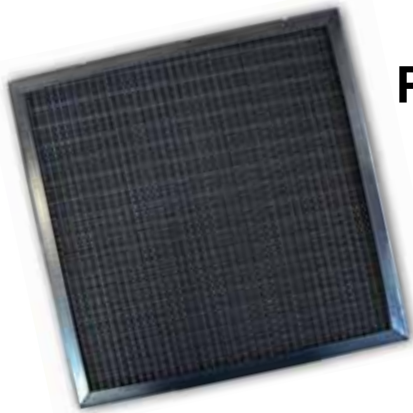


Purge Air System Components:

- Heaters
- Filters
- Fans
- Heater Box
- Purge Air Controller
- Heater Controller



PURGE AIR SYSTEMS



PURGE AIR FILTERS

Filters are utilized on the Purge Air to prevent foreign matter from entering the system. Filters should be changed or cleaned on a routine basis.

INSULATOR COMPARTMENT

Insulator compartments provide heated purge air to keep the high voltage insulator of a WESP free from dirt and moisture that can accumulate on their surfaces and cause them to fail.

The insulator compartment shown is a low purge flow design with an integral heating element that uses a very low flow of air (or inert gas for combustible gas applications). These units can be designed to permit use on any WESP unit. Engineering support is available to allow an exact match for any application.



Insulator Compartment Components:

- Heating elements
- Temperature controls
- Sight glasses
- Purge flow controls
(complete with flow alarms)



DOORS

Southern Environmental can provide all types of doors for precipitators, fabric filters and ductwork.

Our standard carbon steel doors resist harsh environments and hard wear, providing years of leak-free service.

We offer round and rectangular doors in various standard and custom sizes for your specific application. Stainless steel doors are also available.



DOOR SEALS

Door seals require regular inspection and replacement. Over time, seals may shift, deform, become brittle or fail to seal properly due to warping of the door itself.

Stock material consists of a variety of quality door seals to meet the specific needs of any application.

High and low temperature caulking material is also available.

One tube of caulking material can cover a length of 25 feet. (Expect to use an additional 10% on corners and splices.)



ACCESS

GROUND STICKS

Ground sticks are used to positively de-energize/ground the precipitator before entering the door. They are a critical safety component to have at each access point to an ESP.



KEY INTERLOCK SYSTEMS

A functioning key interlock system provides protection for your precipitator and for your operators. The interlocking system ensures the voltage has been locked out and the equipment rendered safe before entry is permitted.

LADDERS & PLATFORMS

Would improved ladders, stairs and platforms make your ESP maintenance easier and more efficient? If you are in need of ladders or platforms, Southern Environmental can help.

We custom design, fabricate and install ladders and platforms to suit your specific needs. Access can be fabricated in carbon steel, stainless steel or fiberglass. Coating options can be provided by SEI or we can coat the equipment to your specifications.



DAMPERS & EXPANSION JOINTS

PROCESS DAMPERS

Most air pollution control systems incorporate process dampers for flow control, compartment isolation or bypass. Dampers can be actuated manually, electrically or pneumatically. SEI can provide replacement parts, such as actuators, solenoids, limit switches, bearings, seals or linkage, for your existing dampers. We can also supply complete replacement dampers to match your existing damper specifications, including size, flange, bolt pattern, pressure, temperature, flow and actuation. Damper styles include butterfly (wafer), multi-blade louver, poppet and guillotine.



Poppet



Butterfly



Louver



Guillotine

Damper Components

- Seals
- Actuators (pneumatic and hydraulic cylinders)
- Control Solenoid valves
- Limit Switches



EXPANSION JOINTS

Expansion joints are utilized on both process gas duct and in process liquid (irrigation and flushing fluid) systems. Expansion joints can be tailored to the application as required to exceed the original process conditions, thereby providing an equal or superior replacement to original equipment. SEI's engineering department can assist in determining failure modes to offer the optimum materials and construction in the full range of expansion joints to restore or improve the overall system performance.



PROCESS INSTRUMENTATION

PROCESS INSTRUMENTATION

Various process instrumentation is available to replace and upgrade an assortment of critical operational parameters.

- Pressure transmitters (gauge and differential)
- Temperature transmitters
- Thermocouples
- Flowmeters (magnetic flowmeters, turbine meters, rotameters and totalizers)
- Flow switches
- pH analyzers/transmitters
- Level transmitters
- Level switches
- Conductivity, turbidity and specific ion analyzers and transmitters

All popular communication and data handling protocols are available. Process control equipment that can be smoothly integrated to existing DCS or PLC is available.



WATER RECYCLE SYSTEM



PUMPS

Pumps utilized to supply irrigation and flushing water are essential to the optimum operation of any WESP.

Pump Components

- Seals
- Impellers
- O-rings
- Motors
- Couplings
- Complete pumps

SPRAY NOZZLES

Proper operation of a WESP requires aggressive cleaning of the internal components on varying frequencies to remove material buildup that is inherent in the operation of any WESP system. Spray nozzles are available to cover the range of potential requirements. SEI can offer direct replacement components or engineer a retrofit to enhance the cleaning effectiveness of your existing equipment. Two-fluid nozzles are available to ensure 100% saturation of the flue gas.



WATER RECYCLE SYSTEM



FILTERS

Process fluids utilized in WESP systems contain varying amounts of entrained suspended solids that require removal from the process fluid streams in order to achieve the optimum design performance of a WESP. We provide an extensive selection of filter equipment to replace existing filter systems or, when the application demands have changed, upgrade the filtration equipment to address changing performance requirements in the fluid system.

Filter Components

- O-rings
- Seals
- Filter media (bags, cartridges, screens, etc.)
- All related controls
- Complete filtration systems

VALVES

Valves are utilized in a variety of WESP support equipment. Valves are available for all liquid systems for process fluid isolation as well as flow control in the full range of available materials to suit any process requirements. Actuators are also available for on/off service as well as modulating service as either direct replacements or add-on equipment where an enhanced level of automated process control is required. Isolation and control valves for purge air and water are available to ensure optimum WESP operation. Check valves in all materials are available.



Fabric Filter Replacement Parts



BAGS & CAGES

Bags and cages are the heart of any fabric filter system. Proper material selection, based on process conditions and emission guarantees, bag to cage fit and bag to tubesheet fit is essential for a system to operate properly. If you are having short bag life, high pressure drop or not meeting emission limits then our technical experts can recommend the appropriate bag material.



BAGS

Southern Environmental, Inc. can provide you with bags that ensure maximum filtration efficiency, cake release and durability.

Many variables affect the type of fabric needed for a specific system. These variables include:

- Temperature
- Moisture Level
- Particulate Size
- Gas Stream Chemistry
- Air-to-Cloth Ratio
- Particulate Abrasiveness
- Mechanical Factors, such as cleaning style, installation etc.

Use the chart below to assist in selecting the appropriate bag to meet your filtration system needs.

Fabric	Construction	Tensile Strength	Abrasion Resistance	Acid Resistance	Alkali Resistance	Support Combustion	Continuous*	Surge*
Cotton	Woven	Good	Good	Poor	Good	Yes	180	200
Polypropylene	Woven / Felted	Excellent	Excellent	Excellent	Excellent	Yes	200	200
Nylon	Woven	Excellent	Excellent	Poor	Excellent	Yes	200	250
Wool	Woven / Felted	Poor	Fair	Good	Poor	No	200	230
Homopolymer Acrylic	Woven / Felted	Good	Good	Very Good	Fair	Yes	260	284
Copolymer Acrylic	Woven / Felted	Average	Fair	Good	Fair	Yes	230	248
Polyester	Woven / Felted	Excellent	Excellent	Fair	Fair	Yes	275	300
Aramid	Woven / Felted	Very Good	Excellent	Fair	Good	No	375	425
Teflon®	Woven / Felted	Average	Fair	Excellent	Excellent	No	500	550
Fiberglass	Woven / Felted	Excellent	Fair	Good	Fair	No	500	550
PPS	Woven / Felted	Very Good	Excellent	Excellent	Very Good	No	375	425
P84	Woven / Felted	Very Good	Excellent	Very Good	Fair	No	500	550

*Maximum Recommended Operating Temperature °F



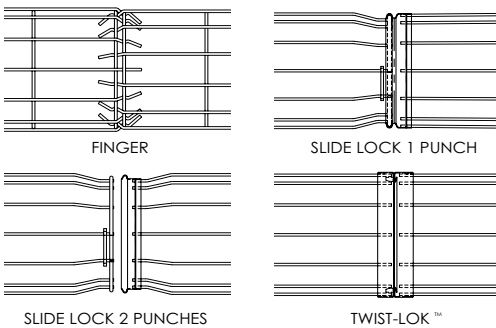
CAGES

Proper support of your filter bags is critical for efficient cleaning and long bag life. Over time, cages become corroded, which can cause wear and premature bag failure. We can assist you in selecting the proper cage design, material and fit.

Filter cages are available in mild steel, galvanized steel, epoxy coated or stainless steel. If designing for a corrosive environment, multiple piece cages can be provided with dissimilar metals at the connecting point.



2 PIECE ROUND
CAGE CONNECTIONS



MULTIPLE PIECE CAGES

The recent advances in long bag technology necessitate the use of multiple piece cages. The connection between cage pieces must be designed to withstand the rigors of installation and everyday operation without becoming a maintenance burden. SEI offers several cage connection options. We can replace your existing cages in-kind or assist you with an upgrade to the latest technology.

RIGID WIRE CAGES

These cages are manufactured by pulling wire off a coil, through a straightening die and cutting it to precise lengths. These individual stringer wires are then loaded into a magazine which maintains the exact spacing of the wire. They are fed to the welding mandril and welded to the inside of the bottom pan. Spacer rings are then attached using digitally controlled resistance welding. The top component is fixture welded to the tube to maintain finished cage length and assure proper alignment and installation.

The cage spacer rings are automatically manufactured by pulling wire off a coil, through a cutting die and around a coiling pin which forms the wire into an open ring. Welding jaws grasp the ring and close the ends, applying pressure and introducing a precisely controlled pulsing current which fuses the ends into a continuous ring. Statistical process control techniques monitor quality. Standard and specialty cage tops are available. Crimped bottom pans are available for mesh and welded bottom pans are available for rigid wire cages.



BAGHOUSE PARTS

VENTURI

A venturi is an integral component of some pulse-jet collectors. It directs the blast of compressed air into the center of the filter bag to prevent abrasion caused by misaligned blowpipes and turbulent airflows. If venturis become damaged or worn, compressed air doesn't gain the velocity required to effectively clean the filter bags.



CLAMPS



Clamps are a necessary part of proper bag installation and are designed to increase bag life by decreasing the chances of clamp failure. Clamps are manufactured in many sizes and are designed for use with raw edge top bags or cord bottom bags fitted on a thimble.

Before purchasing, you should consider the many reasons why clamps can fail: misapplication, misplacement, overtorquing and reuse of old clamps.

PULSE VALVE

Pulse cleaning of the fabric filter bags is critical to maintain system pressure and facilitate smooth system operation. Additionally, this cleaning extends the life of the bags by clearing the material from the bags prior to idling the system. Replacement pulse valves are available as total units, rebuild kits or coil only. Although other sizes are also available, typical pulse valve sizes range from 1.5 to 3". 120 VAC or 24 VDC are the standard voltages supplied; however, other voltages are also available. Various diaphragm materials are available as required for your process.



PULSE VALVE REBUILD KITS AND COILS

Pulse valve rebuild kits are available in various materials based on your process requirements.

Replacement pulse valve coils can be purchased separately. 120 VAC or 24 VDC are the standard voltages supplied; however, other voltages are also available.



BAGHOUSE PARTS

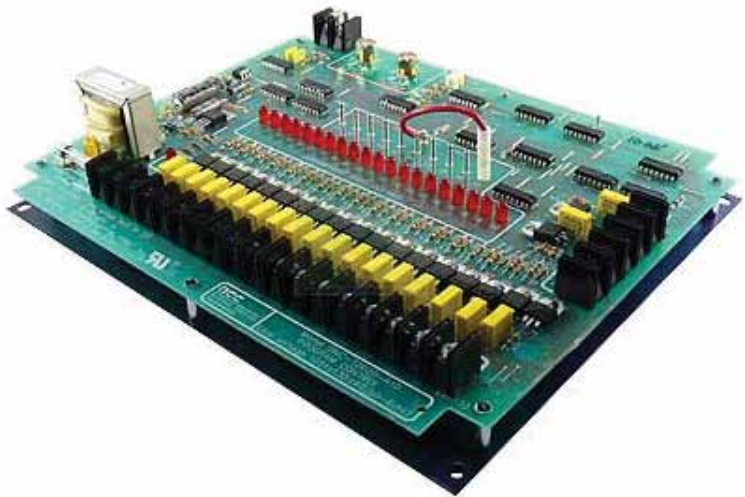


PULSE HOSES

Pulse valve hoses and hose clamps are available. Standard hoses are 4" long with a maximum operating temperature of 200°F. Hoses are constructed of aramid polyester wrapped Neoprene and have a working pressure of 178 psig. Other lengths and specifications are available.

PULSE TIMER BOARD

The pulse timer board is an integral part of the bag pulsing system. Pulse timer boards ensure proper cleaning of your baghouse. The operation times are adjustable and the number of outputs are 3, 10, 20 and 32. The standard voltage is 120 VAC, other voltages are available.



TUBESHEETS

The connection between the filter bag and tubesheet is critical to both environmental performance and bag life. The integrity of this connection depends on tight tolerances for the bag, cage and tubesheet hole. Corrosive flue gas will attack the tubesheet and, over time, the hole diameter tolerance will be lost. SEI can supply and install replacement tubesheets that meet or exceed the original manufacturers specifications and tolerances.

AUTOMATIC PURGE VALVE

Automatic purge valves are designed to eliminate moisture buildup in the compressed air header before entering the unit, causing corrosion and dustcaking on the top of bags. This valve is located at the bottom of the air header assembly and connected to a pulse valve. When the pulse valve fires, the valve opens a discharge port on the air header assembly, removing excess moisture.



BAGHOUSE PARTS

BAG LEAK DETECTION

Quickly finding and replacing broken or leaking bags is critical to maintaining compliance with today's strict emission standards. It is also important to locate a broken bag before the dust can contaminate the clean side of adjacent bags, thereby causing premature failure.

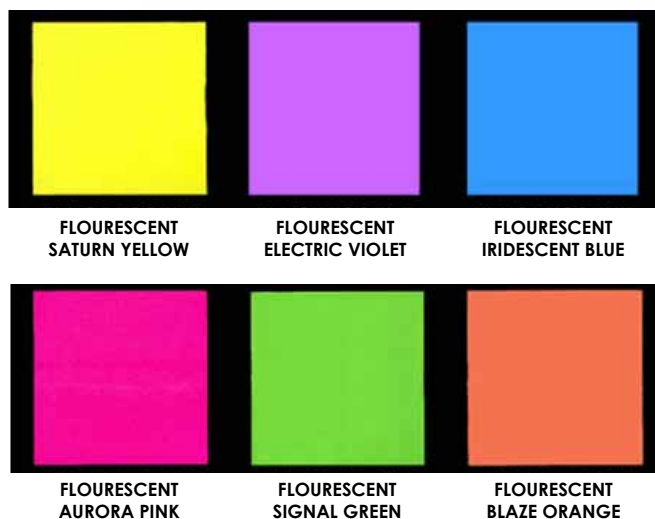
SEI can provide fluorescent powder to be injected upstream of the baghouse. The powder will take the path of least resistance and find its way to the source of the leak. Some of the fluorescent powder will accumulate around the top of the leaking bag where the velocity is reduced, allowing fallout.

A blacklight is then used to locate the areas of accumulated powder. The fluorescent powder glows brightly under the blacklight. Once leaks are found and repaired, a second leak test can be performed using a different color powder to verify that all leaks have been eliminated.

Leak detection powder is available in a variety of colors. It is important to select an appropriate color for your specific application and it is best to alternate colors for each round of testing. One pound of leak detection powder is recommended for every 1000 square feet of filter cloth.

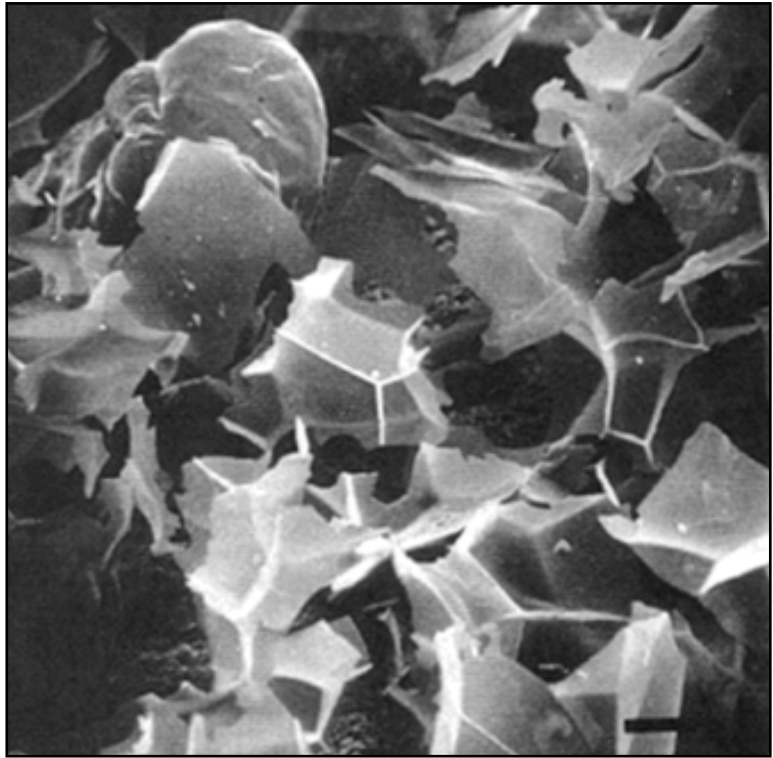
- **Pink** - Appropriate for all industries
- **Orange** - Should not be used where iron oxide is present.
- **Green** - Generally good for all industries.
- **Yellow** - Good for all industries except where high sulfur concentrations are present.

SEI can provide a complete leak detection kit, including powder, black light, charger and UV protection glasses. SEI can also send one of our trained professionals to perform the leak check for you.



BAG PRECOAT

Precoat material is a dry, inert powder. When introduced into the gas stream at the inlet of your baghouse it coats and conditions the fabric filters promoting maximum particulate collection efficiency and effectiveness. Precoat material can be used as an initial control layer for start-ups to precondition fabric filters. It can also be continuously injected into the gas stream to blend with the process dust to help collection efficiency. The precoat material forms a uniform three-dimensional, porous dust cake that is ideal for efficient and effective baghouse operation. Due to its multi-walled, curved structure of varying sizes and shapes, precoat material provides a naturally well balanced particle size distribution that promotes increased air flow, thus reducing differential pressure and energy costs for your baghouse.



Benefits:

- Aids in collection efficiency while optimizing airflow.
- Protects against blinding and plugging your fabric filters.
- Inhibits sparks in the airstream due to its high melting point.
- Absorbs damaging moisture, oils and hydrocarbons due to its chemically inert and neutral pH nature.

One pound of precoat material will cover over 22 ft² of cloth with a 1/16" coating; compared with lime and flyash that will only cover up to 5 ft² of cloth per pound.



BAGHOUSE PARTS

DOORS

Southern Environmental can provide all types of doors for fabric filters, precipitators and ductwork.

Our standard carbon steel doors resist harsh environments and hard wear, providing years of leak-free service.

We offer round and rectangular doors in various standard and custom sizes for your specific application. Stainless steel doors are also available.



DOOR SEALS

Door seals require regular inspection and replacement. Over time, seals may shift, deform, become brittle or fail to seal properly due to warping of the door itself.

Stock material consists of a variety of quality door seals to meet the specific needs of any application.

High and low temperature caulking material is also available.

One tube of caulking material can cover a length of 25 feet. (Expect to use an additional 10% on corners and splices.)



REMOVABLE TOP LIDS

Southern Environmental's removable top lid design incorporates the pulse header, pulse valves and blow pipes into the lid. This allows for fast and safe maintenance, as the entire tubesheet is exposed and bags and cages can be immediately accessed without removing individual blow pipes once the lid has been lifted. Our design also incorporates integral stacking legs so that the removed lid can be placed on top of an adjacent compartment without risk of damage to the pulse system.



SEI can repair or replace damaged top lids as well as retrofit them onto existing fabric filters.



LEVEL PROBE

Single point vibrating level probes (*pictured left*) are installed in the system to monitor reagent storage levels, material flow and hopper level. These level probes are available for standard temperature duty (300°F) and higher temperature applications. (One is used in the baghouse and one is used in the Ash Removal system).

HOPPER VIBRATOR

To aid in moving the material out of the compartment hoppers, electro-mechanical and pneumatic vibrators are installed. We can offer replacement units for use on your equipment.



EVAPORATIVE COOLER PARTS

SPRAY NOZZLES AND LANCES

Proper spray atomization is key to successful evaporative cooler operation. Over time, nozzles can wear due to erosion and/or corrosion. SEI can supply replacement nozzle tips, nozzles or entire spray lances to restore the evaporative cooler performance to its original design specifications. The SEI spray lance design allows for in-place adjustment to ensure proper nozzle placement and spray direction. Standard configurations are available in 316L stainless steel and 440 stainless steel. Other materials such as Hastelloy C276 and Inconel 600 are also available.



HOSES

SEI can supply replacement hoses for connecting spray lances to the supply header. Hose materials are selected to meet your site specific temperature, pressure and environmental requirements.

PUMP SYSTEMS

SEI can provide replacement pumps, control valves and actuators for your evaporative cooler pump system. SEI also designs and builds our own pump skids and can provide an entire new pump skid designed to reliably supply the water and atomizing air required for optimum evaporative cooler performance.



GAS STREAM COMPONENTS

PROCESS DAMPERS

Most air pollution control systems incorporate process dampers for flow control, compartment isolation or bypass. Dampers can be actuated manually, electrically or pneumatically. SEI can provide replacement parts, such as actuators, solenoids, limit switches, bearings, seals or linkage, for your existing dampers. We can also supply complete replacement dampers to match your existing damper specifications, including size, flange, bolt pattern, pressure, temperature, flow and actuation. Damper styles include butterfly (wafer), multi-blade louver, poppet and guillotine.



Poppet



Butterfly



Louver



Guillotine

EXPANSION JOINTS

Expansion joints are utilized on both process gas duct and in process liquid (irrigation and flushing fluid) systems. Expansion joints can be tailored to the application as required to exceed the original process conditions, thereby providing an equal or superior replacement to original equipment. SEI's engineering department can assist in determining failure modes to offer the optimum materials and construction in the full range of expansion joints to restore or improve the overall system performance.



ID FAN COMPONENTS

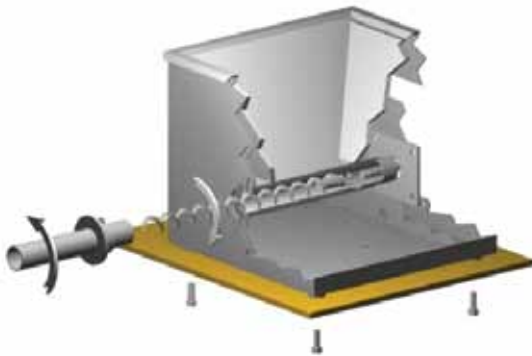
Should your system fan require a replacement coupling, belts, bearings, shaft or other parts, our spare parts specialists can assist you in the supply of OEM replacement parts. If your entire fan needs to be replaced or upgraded, our engineers can help you be sure that you are getting the right fan for the job.



REAGENT STORAGE

REAGENT BLOWER AIR INTAKE FILTER ELEMENT

For systems pneumatically conveying reagent for process gas conditioning, it is imperative the conveying air supply remain constant. To protect your conveying air equipment, replace your inlet air filter. We offer replacement filter elements for your specific equipment.



REAGENT FEEDER SCREW / AUGER AND FEED TUBE

Our reagent feeders offer optimum flexibility should you require adjusting your reagent feed rates outside of the VFD range. This can be achieved by swapping out the feeder screw and auger by a simple 1/4 turn of the auger and feed tube.

REAGENT FEEDER BEARING

To keep your reagent feeder operating smoothly, replacement auger drive cartridges are available through our spare parts department.

DOWNSPOUT FILTER

A clear reagent injection line is critical for maintaining dependable reagent injection. Ambient air is pulled through the downspout filter and through the injection line. Replacement air inlet filter elements are available through our spare parts department.



Case Histories



CASE HISTORIES

Canfor Pulp Limited Partnership

Northwood Pulp Mill
5353 Northwood Pulp Mill Road
Prince George, British Columbia, Canada

Challenge:

Existing recovery ESP was old and undersized for new emission standards.

Southern Environmental's Solution:

Southern Environmental, Inc. provided a new state-of-the-art Recovery ESP with POWER PLUS transformer technology, using SEI-ELEX electrodes. The ESP is designed with a dry bottom conveyor system and heated shell. The SEI design utilizing the high frequency transformers is cutting edge application for recovery boiler ESPs. SEI has been on the forefront utilizing this technology in other applications since 2002.



Project Duration:

- PO Received 6/4/10
- Materials delivered to site by 2/28/11
- Start-up 10/1/11

Detailed Engineering in the following disciplines:

- Structural
- Mechanical
- Electrical
- 1/12 Physical Scale Model Study

Fabrication and Erection Services:

- ESP Fabrication
- Field Technical Support



CASE HISTORIES



Scope of Work:

SEI provided detailed engineering, material supply, fabrication, construction management and 1/12 physical model study, inlet flange to outlet flange, conveyor systems, slide plates to weather enclosure. The ESP is a two chamber, five mechanical field (in direction of gas flow) recovery precipitator.



SEI provided a climate controlled building at the cold roof level that contains rapper controllers, PLCs, MCC equipment, PCAMS communication and drag scraper controls.

Application / Operating Conditions:		
Inlet design flue gas temperature:	421°F	
Design flue gas flow:	435,000 acfm	
Design flue gas moisture:	22.5% (by vol)	
Design flue gas O ₂ (dry):	4.0% (by vol)	
Maximum inlet loading:	8.7 grains/dscf	(Corr. To 8% O ₂)
Flue Gas Distribution @ ESP Inlet:	ICAC EP-7 or better	
Virgin Black Liquor Solids firing rate:	3.75 MM lb/day	
Virgin Black Liquor Solids conc.:	76.5%	
Performance Guarantee:		
When operated at the operating conditions noted above the ESP will perform well below the guaranteed outlet emission levels noted below:		
Both Chambers Operating:		
Guaranteed Outlet Emissions:	0.021 grains/dscf	(Corr. To 8% O ₂)
	60 mg/dscm	(Corr. To 8% O ₂)
Guaranteed Efficiency:	99.7%	
One (1) Chamber Offline (50% Boiler Load):		
Guaranteed Outlet Emissions:	0.021 grains/dscf	(Corr. To 8% O ₂)
	60 mg/dscm	(Corr. To 8% O ₂)
Guaranteed Efficiency:	99.7%	



CASE HISTORIES

Hoosier Energy

Merom Generating Station
5500 W. Old 54, Sullivan, IN 47882

Challenge: The advent of MATS requires greater acid gas and particulate control. SEI was tasked with designing an ESP retrofit solution that addresses greater particulate capture with the addition of dry sorbents upstream of the ESP. The solution had to be implemented during an eight week outage subject to limited work area.

Southern Environmental's Solution:

Southern Environmental, Inc. provided 2 new 500 MW state-of-the-art S³ ESPs with high frequency power supplies using SEI-ELEX electrodes. The ESP is designed with wide plate spacing, top rapped systems, seven foot penthouse and new hoppers. The SEI design allowed for reuse of the existing structural steel and construction of a new ESP above the ash handling system during an eight week outage. SEI achieved far lower emissions within the same footprint and with a much larger inlet loading due to DSI/ACI injection for SO³ control.



Project Duration:

- PO Received: November 2010
- 8 week outage on each unit
- Unit #2 Spring 2012
- Unit #1 Spring 2013

Detailed Engineering in the following disciplines:

- Structural
- Mechanical
- Electrical
- Civil

Fabrication and Erection Services:

- ESP Fabrication
- Field Technical Support
- Mechanical Construction
- Insulation Installation
- Electrical Installation



CASE HISTORIES



Scope of Work:

Southern Environmental, Inc. provided detail engineering, material supply, fabrication, construction and start-up services to retrofit the ESPs for Units #1 and #2. The first unit was installed in the Spring of 2012. The second unit will be installed during the Spring 2013 outage. Each unit was designed and built from the hopper support steel up including new hoppers, structural modifications, casing, internals, roof and power equipment. SEI's S³ technology was utilized to achieve increased collection efficiency. In addition to the ESP retrofit work, SEI also performed several SCR catalyst layer replacements.



Application / Operating Conditions:

	Bituminous Coal (Min. HHV-10,500 Btu/lb, Max. Ash - 15%)
Nominal Rating, MW	540
Draft Type	Balanced
Maximum Boiler heat input, MBtu/h	5,088
Flue gas inlet temperature, °F	340
Flue gas volumetric flow, ACFM (wet)	2,400,000
Flue gas inlet pressure, in. wc	-13
Maximum Economizer Oxygen, % w	4.5
Maximum Air Heater In-leakage, %	15
Maximum Inlet particulate loading, gr/acf	4
Fly Ash, LOI, %	Under 10
Uncontrolled H ₂ SO ₄ content, ppm	20-60
Controlled H ₂ SO ₄ content, ppm	~1
Reagent to be used for H ₂ SO ₄ control	Trona or Sodium Carbonate
Approximate Trona Loading, lb/hr	3,700 (45% Na ₂ SO ₄ , 54% Na ₂ CO ₃)
Approximate Sodium Carbonate Loading, lb/hr	3,000 (50% Na ₂ SO ₄ , 50% Na ₂ CO ₃)
Maximum Limekiln dust loading to the boiler, % weight of coal	0.35
Stack exit inside diameter, ft	19'-0"

Performance Guarantee: With the boiler in operation at the conditions noted and the precipitator operated in accordance with the instructions provided, the filterable particulate emissions from the revised particulate collection system will not exceed 0.015 lb/mmBTU while all SMPS' in service and, 0.02 lb/mmBTU while one SMPS per ESP chamber is out of service.



CASE HISTORIES

Westar Energy, Inc.

Jeffrey Energy Center
25905 Jeffrey Rd.
St. Marys, KS 66536

Scope of Work:

Southern Environmental, Inc. provided detailed engineering, material supply, fabrication, construction and start-up services. SEI/ELEX rigid discharge electrodes and High Frequency Switch-Mode Power Supplies were utilized to achieve increased collection efficiency within the same footprint. In addition to the rebuilds, SEI also performed several structural studies for Westar, as well as designed and installed the proper reinforcement needed to accommodate the higher draft system pressures requested.

Application:

- 3 Units - 750 MW Coal Fired Power Boiler

Project Duration:

- 8 week outage on each unit

Detailed Engineering in the following disciplines:

- Structural
- Mechanical
- Electrical
- Civil

Fabrication and Erection Services:

- ESP Fabrication
- Field Technical Support
- Mechanical Construction
- Insulation Installation
- Electrical Installation



Performance Guarantee:

- Emissions guarantee: 0.015 lb/mmBTU Inlet Gas Flow: 3,706,000 ACFM at 350F per unit



CASE HISTORIES

Climax Molybdenum, Inc.

2598 Hwy 61
Fort Madison, IA 52627

Scope of Work:

Southern Environmental, Inc., provided detail design engineering, material supply, fabrication, construction supervision, and start-up services for two FRP casing upflow Membrane Wet ESPs. The units are in series and are collecting primarily Sulfuric Acid mist.

Application:

- Molybdenum Roaster Off-Gas Sulfuric Acid Mist Collection

Project Duration:

- 1st Materials PO Received: 2/12/08
- 1st Unit online: 11/6/08
- 2nd Materials PO Received: 6/17/09
- 2nd Unit Online: 1/29/10

Detailed Engineering in the following disciplines:

- Structural
- Mechanical
- Electrical
- Civil

Fabrication and Erection Services:

- ESP Fabrication
- Field Technical Support
- Insulation Installation
- Electrical Installation

Performance Guarantee

- H₂S₄ outlet loading <10ppmv wet Inlet
Gas Flow: 48,500 ACFM



CASE HISTORIES

Duke Power Company

Marshall Steam Station
8320 East Hwy 150
Terrell, NC 28682



Scope of Work:

Southern Environmental, Inc. provided detailed engineering, material supply, fabrication, construction management, a 1/12 scale physical model study, electrical wiring, foundation, field construction, insulation and lagging, painting and start-up services for the Marshall Steam Station Unit #3 & Unit #4 Electrostatic Precipitator Project Replacement.

The new precipitator is upstream of a new FGD. The unique construction approach allowed for the addition of a future SCR to be located upstream of the ESP and reduced projected outage time by 50%.

Application:

- 2 - 700 MW Coal Fired Power Boiler Unit #3 & #4

Project Duration:

- PO Received: October 2004
- Mobilize: April 2005
- Demobilize: May 2007
- 12 week outage

Detailed Engineering in the following Disciplines:

- Civil Engineering
- Structural Engineering
- Mechanical Engineering
- Electrical Engineering
- 1/12th Scale Physical Model Study

Fabrication and Erection Services:

- Caisson Installation
- Structural Steel Fabrication and Erection
- ESP Fabrication and Erection
- Electrical Construction
- Ductwork Fabrication and Erection
- Project Management
- Site Management
- Insulation and Lagging
- Painting
- Lead Abatement

Performance Guarantee

- SEI provided a broad range of guarantees for twenty-five coals. Outlet Emissions: Ranging between 0.04 #/mmBtu and 0.05 #/mmBtu Opacities: Ranging between 12% Opacity and 10% Opacity Inlet Gas Flow: 2,512,000 ACFM at 320 F



CASE HISTORIES

Associated Electric Cooperative, Inc.

Thomas Hill Energy Center
5693 Hwy F
Clifton Hill, MO 65244

Scope of Work:

Southern Environmental, Inc. provided detailed engineering, material supply, fabrication, construction technical assistance and start-up services. This project was unique in the approach taken by making the ESP modular in design. This approach allowed for the modules to be constructed with the unit still online. The ESP was then shutdown, demolished and the modules were set individually making a shorter outage time possible.



75 Ton Module Lift

Application:

- Unit #3 - 715 MW Coal Fired Power Boiler

Project Duration:

- Materials PO Received: 7/27/06
- Deliveries Completed: 09/10/07
- Startup: 02/28/08

Detailed Engineering in the following Disciplines

- Mechanical
- Electrical
- Structural
- Civil
- Flue Gas Conditioning
- Gas Flow Modeling

Fabrication and Erection Design Concepts

- Complete pre-outage module assembly
- Pre-wired modules for quick installation
- Unique connection design at nozzles to save structural steel

Performance Guarantee

- SEI Guaranteed Efficiency with one field out of service at: 0.055 lb/MBtu and 11.5% opacity Inlet Gas Flow: 1,357,500 ACFM at 313 F



CASE HISTORIES

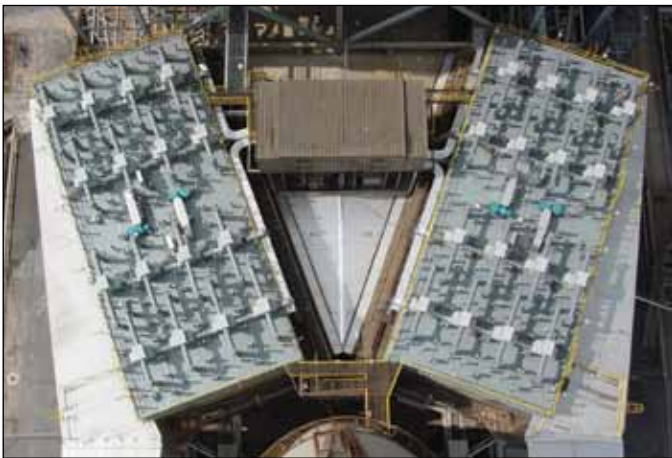
Duke Power Company

Cliffside Steam Station
573 Duke Power Road
Cliffside, North Carolina 28114

Scope of Work:

Southern Environmental, Inc. provided detailed engineering, material supply, fabrication, construction management, a 1/12 scale physical model study, electrical wiring, foundation, field construction, insulation and lagging, painting and start-up services for the Cliffside Unit #5 Electrostatic Precipitator Project Rebuild. The rehabilitated precipitator is downstream of a new SCR.

Phase I consisted of rehabilitating the inlet Chevron duct including stiffening for - 32 inwc pressure, roof replacement, and structural penetrations for SCR columns. In Phase II the existing precipitator was retrofitted with new internals utilizing customized SEI/ELEX rigid discharge electrodes and Opzel collecting plates. The lower 8' of the existing twenty-four hoppers were also replaced. The existing casing was stiffened for increased pressure requirements added by the SCR. A new SEI outlet field, including foundations, support steel, casing, hoppers and Chevron outlet plenum, was added to both precipitator casings. The precipitator was re-sectionalized and new transformers, electromagnetic rappers and controls were added for increased performance.



Application:

- 592 MW Coal Fired Power Boiler

Project Duration:

- PO Received: January 2001
- Phase I: Inlet Duct Rehabilitation Mobilize: March 2001
- Demobilize: May 2001 - Five week outage
- Phase II: Electrostatic Precipitator Rehabilitation Mobilize: October 2002
- Demobilize: May 2002 - Eight week outage

Performance Guarantee:

- SEI provided a broad range of guarantees for twenty-two coals
- ESP Efficiency: 99.7% at 15% opacity and at 10% opacity depending upon fuel
- Inlet Gas Flow: 1,950,000 ACFM at 280°F



CASE HISTORIES

DuPont Washington Works

8480 DuPont Road
Washington, WV 26181

Scope of Work:

With the coming demands of the Boiler MACT requirements, and the baghouses showing their age, DuPont decided to implement a major revision and upgrade of the entire power house air pollution control system. Two of the existing baghouses were retained, but one was ducted to a different (previously uncontrolled) boiler, two baghouses were replaced, and a new baghouse was added to replace the re-ducted system. All systems included individual lime injection systems.



One of the challenges of the project was to fit the new larger baghouse systems in the space available and also use the existing support steel and foundations as the area is quite congested and has significant underground utilities. The design chosen included three baghouse systems under a common penthouse. The penthouse incorporated a bridge crane to remove the baghouse top lids. This crane also can be used to bring material to the top of the baghouse from grade through an open area at the end of one of the baghouses.

Two lime silos were supplied with five lime feed and transfer systems to the five boilers. The lime feed systems are set up with crossover capability to provide operational flexibility.

Scope of Supply:

- Three new baghouse systems totaling eighteen modules
- Common penthouse with bridge crane to service all three baghouse systems
- Inlet and outlet manifolds for new baghouse systems
- Inlet and outlet isolation valves for new baghouse modules
- Two lime silos
- Five lime feed and conveying systems
- Sorbent injection systems for new and existing baghouses
- PLC based controls for lime systems
- Building to house lime blowers and controls

Project Duration:

- System upgrade ordered: August 2006
- Baghouse modules shipped: July 2007
- Boiler 4 operation: November 2007
- Boiler 5 operation: October 2007
- Boiler 6 operation: February 2008



CASE HISTORIES

Kimberly Clark (Scott Paper)

2600 Federal Avenue
Everett, WA 98201

Scope of Work

The boiler location is in the middle of an aging plant and severe space limitations had dictated that an unconventional ductwork layout be used on the original system. With the new boiler replacement, there were still many interferences, and any significant duct and manifold revisions would require excessive down time. This was not acceptable, and the new ductwork design had to accommodate the site limitations. A significant contract responsibility was to perform a scale model study of the entire system from the inlet duct connection at the boiler discharge, through the manifolds, baghouse modules, fan and stack discharge.



The baghouse system size was increased by adding two modules, and changing the current bag and cage design to increase the cloth area in each module. The woven fiberglass bags were replaced with a unique felted bag that can operate at a higher air-to-cloth ratio and still meet the new, much more stringent emission limitations.

Scope of Supply

- Scale model study for flue gas distribution and pressure drop determination
- New baghouse modules with pulse jet bag cleaning and hopper accessories
- Inlet and outlet isolation valves for new modules
- Modifications to system ductwork and manifolds, penthouse, access and structural to accommodate the new modules
- Complete replacement of the existing bags and cages
- Construction: mechanical erection, field piping and insulation

Project Duration:

- Original system start-up: April 1979
- System expansion ordered: December 1993
- Model study complete: July 1994
- Construction start: March 1995
- Start operation: July 1995





Corporate Headquarters
6690 West Nine Mile Road
Pensacola, FL 32526
850-944-4475
apcsales@sei-group.com
www.sei-group.com

Fabric Filter Engineering Office
921 Eastwind Drive, Suite 115
Westerville, OH 43081
614-259-6505
apcsales@sei-group.com
www.sei-group.com