EXCLUSIVE TEAM FOR
FABRIC FILTER SOLUTIONS

SOUTHERN environmental, INC

FLSmidth

UTILITY INDUSTRY
Southern Environmental, Inc. (SEI) and FLSmidth’s North American Air Pollution Control businesses have established a LONG-TERM TEAMING AGREEMENT to bring turn-key Fabric Filter Systems to the Utility Industry. Under this agreement FLSmidth and SEI will work closely together and collaborate in the areas of sales, marketing, design, engineering, fabrication, construction and project management to provide end-to-end custom designed, turn-key fabric filter systems. Based on the joint engineering philosophies focused on quality and high performance through modeled and scientifically controlled gas flow, SEI and FLSmidth will have a team of some of the best talent in the air pollution control market, unifying the highest level of integrity in the business. SEI has executed air pollution control projects as large as USD 100m. Meanwhile, FLSmidth has designed and built entire production facilities from the ground up.

Michael Johnson, SEI’s Director of Sales is proud to announce that Michael Wagner of FLSmidth, a long time colleague of the SEI organization, is a key team member for this association. Mr. Wagner stated this team brings to bear the talent of the organizations in a way that will benefit both companies as well as the utility market.

The world leading FLSmidth FabriClean™ technology, coupled with SEI’s execution experience and vertical integration, will provide utility owners with a supplier that has the financial strength, staying power and commitment to quality that is critical in this environment of ever increasing air pollution regulation.
FabriClean™ Fabric Filter
Introduction

The FLS AIRTECH FabriClean™ fabric filter design is unique to the field of barrier filtration technology. Both new installations and conversions of ESP’s to a fabric filter employ the same technology and field hardened components. This document serves as an introduction to the FabriClean™ as well as a technical reference for components common to either scenario.

The Filtration Process

FLS AIRTECH FabriClean™ Pulse Jet Fabric Filter contains an array of cylindrical filter bags suspended from a tube sheet separating the dirty and clean gas stream within a fabric filter compartment. Each bag has an internal wire cage supporting the filter bag preventing collapse of the filter media. Dust laden flue gas enters the filter inlet manifold through the process ductwork. Dust is collected on the outer surface of the filtration media allowing only clean gases to pass through and into the top section above the tube sheet and then on to the outlet ducting and stack. The dust is removed from the filter bags by pulses of compressed air. The cleaning is initiated by a differential pressure measurement when a predetermined level of resistance across the filter is obtained. During cleaning the dust falls into the hoppers to be taken away via the dust discharge system. The dust collection phase and bag cleaning phase are represented by the following graphic.

Bag cleaning is the result of disrupting the cake build up by flexing the membrane with a pulse of compressed air which aspirates cleaned process gases downward into the filter bag.
General Description of FabriClean™
The FLS AIRTECH FabriClean™ is a modern state-of-the-art, jet-pulse type, dust collector with on-line and off-line cleaning capabilities designed to minimize operating costs

- long bag life
- low differential pressure
- low consumption of compressed air
- while also minimizing capital costs
- low steel weight

- use of standard components
- minimization of manufacturing costs
- minimizing of transportation costs
- minimizing erection costs

The six compartment FabriClean™ collector shown below consists of two parallel trains of three compartments each. This is a compartmental design with an automatic self-cleaning system utilizing pulse jets of compressed air to provide efficient, thorough cleaning with no internal moving parts.

Typical Center Inlet FabriClean
The top access, top bag removal design provides the ability to remove the snap-in / snap-out filter bags from the clean side of the tube sheet through roof mounted lift-off gasketed doors.

**Typical Parallel Casing**  
*Center Inlet FabriClean*

**Gas and Dust Distribution**

In the FabriClean™ collector, dust laden gas enters the inlet manifold from the process equipment flowing through the inlet dampers into the individual compartments which contain the filter bag arrays.

The gas velocity is significantly lowered in the gas distribution chamber resulting in a large amount of dust drop out directly into the hoppers, reducing the dust load on the bags. Once the gases are distributed to the sides of the filter bag array the gases have a predominantly downward gas flow along the filter bags minimizing dust re-entrainment, improving the cleaning operation and extending filter bag life. This feature is unique to the FabriClean™ design and results in a true negative can velocity.

The gas distribution screen design for the FabriClean™ is the key to the proper distribution of the dust laden process gases over and around the filter bag array.
Flow Distribution for a single Filter Bag Array

FLS AIRTECH employs state-of-the-art computational fluid dynamics (CFD) technology to ensure the proper distribution of the gas and dust. The gas distribution screens are manufactured in the largest shippable subassemblies for field assembly and installation into the filter compartments. The following field installation photograph, taken from a recently completed Utility boiler project, shows the gas distribution screens for one-half of a compartment.
**Casing Design**

The FabriClean™ casing houses multiple isolatable compartments in either parallel or series trains. Each compartment of the two filter casing design schematics shown below is equipped with a gas distribution screen system. The FabriClean™ filter units including the casing, bag support cell plate and hoppers, are constructed from steel plate, stiffened and sealed to withstand up to ± 50 inches WC. Internal division plates are also stiffened to withstand the differential...
pressure when one compartment is open for maintenance / inspection or in "offline" cleaning mode.

The inlet and outlet manifolds are integrally designed with the gas distribution system. In most instances, the inlet and outlet manifolds are tapered and share a common center plate; hence the flow direction of the inlet gas and the cleaned outlet gas is parallel. However, in certain instances plant constraints require counter flow inlet and outlet manifolds.

The final configuration for a project’s inlet and outlet manifold is often times site specific, as is the requirement for a parallel or series casing arrangement.
Filter Bags

The essential component of a fabric filter is the filter bag. The bag material for any FLS AIRTECH project will be supplied by Advanced Filtration Technologies (AFT) in Evans, Georgia. A world class manufacturing facility and fabrication techniques ensure that AFT's aftermarket parts, components and filter bags offer the highest quality in the industry. With more than 50 years of experience in the manufacture, application and sale of filter bags, AFT's management team can handle project sizes from standard filter bag replacement to complete baghouse refurbishment / conversion, from evaluating collection systems to recommending solutions that reduce costs and increase system reliability.

AFT has a partnership with the Pristyne™ Division of W.L. Gore & Associates. The Pristyne™ product line is of the same quality and manufactured in the same process as the industry leading product sold as Gore-Tex®. End users can expect the same life and service from the Pristyne™ material that the industry has come to expect from the premium Gore-Tex® filter bag.

In a short period, AFT has become the number three supplier of dry filtration filter bags in the US eclipsing many older established suppliers. The following highlights demonstrate the marquee success and growth of AFT:

- Provided filter bags to 58 Cement kilns in 27 countries consisting of 175,000 pulse jet filter bags.
- Successful supply agreement for aftermarket filter bag requirements with two global Cement producers
- Gained a 37% market share of US Cement and lime kiln filter bags.
- Provided over 100,000 PPS pulse jet filter bags to non FLS OEM’s for coal fired boiler applications.
- Provided over 20,000 woven fiberglass reverse air to non FLS OEM’s for coal fired boiler applications.
- Leading supplier of fiberglass membrane
reverse air filter bags to coal fired boiler application supplying over 50,000 large diameter bags.

- Supplier of 25,000 fiberglass membrane bags for utility boiler PJFF applications for FLS AIRTECH projects.
- Leading global supplier of Fiberglass filter bags to the Carbon black industry supplying over 50,000 bags annually.

AFT is a single source supplier for replacement filter bags and accessories for all applications. AFT’s technical support staff is available to evaluate end user dust collection system and recommend solutions to meet process requirements. AFT has the capability to fabricate from most filtration media.

- PRISTYNE™ Membrane Filter Media
- Polyester
- Fiberglass
- Huyglas®
- Aramid
- Polypropylene
- PPS
- Basalt
- P-84®
- Teflon® / PTFE
- Cotton
- Wool
- Acrylic
- Nylon

Filter bags commonly used for flyash applications are fabricated from 16 oz woven fiberglass, with an ePTFE membrane. The ePTFE membrane has the most cement kiln application experience in the world in using W.L. Gore technology. The fiberglass substrate with an ePTFE membrane is the most popular and affective media used for cement kiln gas applications. Woven fiberglass with an ePTFE uses a micro-porous membrane to enhance air flows, reduce media drag and enhance ash release. Fiberglass media has temperature resistance up to 500° F. The material has strong resistance to acids and alkali.

The bag will be sewn into a tubular form and sewn with fiberglass thread utilizing three rows of vertical stitching. The top cuff will be sewn as a separate piece using fiberglass material with a snap-band configuration for simple installation. The bottom cuff is also sewn from fiberglass and uses a double layered disc with a three inch wear strip for additional support.

**Filter Bag Cages**

A steel wire cage is required to support the fabric of the filter bag. The cage is designed to support the fabric evenly and restrict flexing and abrasion of the filter bag while allowing optimum dust release at the time of cleaning.

One key differentiation is that FLS AIRTECH utilizes star shaped horizontal rings when using fiberglass bags as the bag to cage fit is critical. Each cage consists of 16 vertical wires evenly spaced about its circumference which are, in turn, attached to horizontal bracing rings placed at appropriate intervals along it’s’ length.
The Star Cage wire minimizes fabric to cage rubbing as the fiberglass material only touches the outer angle of the rings. 18-gage carbon steel Metal-spun Pulse-jet Venturies are flange supported and fastened to the cage top collar.

Integral venturies are externally mounted to the cage. This design feature allows for a longer more efficient and effective venturi with improved cleaning characteristics for the filter bags with no lose off filter area as is the case with internally mounted venturi designs.

For applications requiring longer bags cages will be supplied with a split joint so the cage can be installed with minimum overhead room requirement.

The design aspects of the Star cage design and the Smooth ring cage design are contrasted in the following graphics.
**Top Box**

The fundamental component for the fabric filter design is the top box which serves as the clean gas chamber for each FabriClean™ compartment. A compartment may have multiple top boxes depending on the fabric filter’s particular design. The top box is a feature unique to the FabriClean™ design.

The cleaned process gas from each filter bag collects in the top box enclosure which houses the tube sheet for the filter bags array(s). The top box design incorporates generous dimensional clearances for the filter bag array. The removable cover design of the top box allows for easy access for filter bag maintenance requirements. Structurally the tube sheet design is robust ensuring longevity of service. The top boxes are
completely shop assembled to exacting tolerances and are shipped to the field ready for field installation.

The tube sheets are fabricated from 5 mm thick carbon steel with (135 mm) diameter bag support holes which are usually spaced on (180 mm) centerlines. Note the tube sheet comes pre-installed into top boxes, the top boxed are shop fabricated and assembled to include the tube sheet, outlet plenum walls, roof door and pulse pipe assembly. This is done as this section is the critical portion of the system (the dirty side to clean side) and therefore to ensure quality and they are shop fabricated. This allows for a more simplified and improved field construction as well. A soft rope type gasket seals the top box lid to the top box which serves as the pressure boundary. An insulation cover that comprises the walk surface is mounted over the top box lid acting as a thermal barrier for the process temperature.

Compresses Air Headers

Compessed Air Header Installed on a Top Box
Compressed air for each purge tube is supplied by the compressed air header assembly. These assemblies are shop assembled tested and shipped to the plant for assembly to the top box. In most instances the headers attached on the ground to expedite construction. The compressed air headers consist of a cylindrical header tank with fully integrated diaphragm valves. The
The diaphragm valve has been specifically designed to be mounded in the tank geometry. The design is exclusive to FLS AIRTECH’s supplier and enjoys a worldwide patent.

**Top Box Components**

**Design Features of the Top Box Assembly**
Typical Top Box Plan View

Typical Top Box Isometric View
The compressed air manifolds for each compartment will be fitted with 1 pressure switch (CE marked if required) to monitor the correct performance of the diaphragm valves. When the diaphragm valves are activated the pressure in the compressed air manifolds is detected to identify that the valve open and closes correctly. The signals from the compressed air pressure switches are wired into the local filter controller.
FabriClean Dampers

Each top box can be isolated from the clean gas duct system by a dedicated the multi-louver type outlet damper. The outlet damper will be used to isolate the filter compartments for maintenance periods. If the process requires, it is possible to close only the outlet damper in order to carry out off-Line cleaning. For personal safety, a mechanical locking device is supplied to lock the dampers in the closed position.

The dampers are a robust design. The dampers are fully welded sheet metal construction with stainless steel shaft and self adjusting shaft seals. Flanges are made according to EN (DIN) 24.193 T2. The damper design employs a maintenance free bearing with reinforced Graphite bushing. The dampers are prepared for 150 mm insulation. The damper operates with a sealing efficiency greater than 99.5 %.

Each compartment is isolated from the process by a single bladed of the two-bladed butterfly damper shown. This damper is mounted in the bottom surface of the inlet manifold and is connected to the filter compartment by a duct work elbow. Both the inlet butterfly damper and the outlet louver damper are supplied with lockout tag out capabilities to meet MSHA requirements.
In many situations, it may be advantageous to use a pendular support (column support). This support is a combination of vertical columns and cross diagonals, both made of square tubes. The Pendular type of support structure is normally very economical, and in areas with extreme wind and earthquake forces, offers technical advantages. Thermal expansion of the filter is absorbed in the individual columns by their angular movement in relation to the points of support on the foundations. One of the columns is fixed with cross diagonals in several directions, and the other columns move radially from this column. Columns are provided with diagonal bracing in one direction to compensate for wind and possible earthquake forces. At the top and bottom, each column has a semi spherical journal, which centralizes the loads from the filter and at the same time prevents the occurrence of undesired bending moments in the columns. Supports provide 25.25’ (7.7 meters) clearance under discharge hopper flange designed to withstand loads based upon UBC specifications.
SMART PULSE CONTROLLER

The SPC is a modern control logic based control system specifically designed to control jet pulse fabric filters. The SPC control system is designed to operate the collector at a minimum cost with diagnostic features included to ensure effective operation. One SPC control panel housed in a NEMA 12 enclosure is included in any of the fabric filter scenarios. Controls are provided to open and close the compartment outlet dampers, adjust the length of time between the pulse valves being energized, the length of time that the pulse valve is energized, and the time between cleaning of the compartments.

The dust collector can be cleaned by a time cycle or by pressure drop across the dust collector. The cleaning system is based on on-line or off-line or semi-off-line cleaning.

The control panel is designed to control the cleaning cycle only, and does not operate or indicate any other instrumentation, controls, motors, etc.
The SPC is designed for both serial and parallel interface to the plant control system and the collector components. The standard SPC has serial communication (the most commonly used and most cost effective system) and can communicate with the plant DCS via Profibus DP or Modbus RS485. Communication using Modbus TCP/IP is available as an option. The cleaning system is based on on-line or off-line or semi-off-line cleaning. The SPC when coupled with the compartment instrumentation provides a process analytical tool unique to the industry in its ability to analyze the performance of the fabric filter. For example, when coupled with a burst bag detector the SPC can detect and isolate the location of a failed bag down to the specific header and row containing the failed bag.

Interconnecting wiring is pre-wire in the shop and delivered to the field fully tested virtually eliminating field wiring errors and debugging time, thus optimizing immunizing start up.
Weather Enclosure

A penthouse with equipment and personnel access doors and trolley with hoist is also provided for weather protected access to the bags, cages, air headers, instrumentation and other components. The hoist is also utilized for lifting supplies to the penthouse level from grade. Self-supporting cages and venturi nozzles allow for inspection and replacement without tools or clamping mechanisms.
FLS FILTER MEDIA Supplied - Pulse Jet Fabric Filters
Partial List

<table>
<thead>
<tr>
<th>Bag Length</th>
<th>AFT Vendor Supply</th>
<th>FLS OEM Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0 m</td>
<td>20,000</td>
<td>269,490</td>
</tr>
<tr>
<td>6.5 m</td>
<td>32,000</td>
<td></td>
</tr>
<tr>
<td>7.0 m</td>
<td>153,699</td>
<td>87,480</td>
</tr>
<tr>
<td>7.5 m</td>
<td></td>
<td>3,220</td>
</tr>
<tr>
<td>8.0 m</td>
<td></td>
<td>99,640</td>
</tr>
<tr>
<td>9.0 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0 m</td>
<td></td>
<td>51,877</td>
</tr>
</tbody>
</table>

Bag Count
<table>
<thead>
<tr>
<th>Client</th>
<th>Process</th>
<th>Country</th>
<th>Year</th>
<th>FF Type</th>
<th>Bag length</th>
<th>Media Type</th>
<th>GaS flow Am3/h</th>
<th>Temp °C</th>
<th>Emission mg/Nm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vectren Culley 3, South 125 Mwe</td>
<td>Boiler, Coal</td>
<td>USA</td>
<td>2005</td>
<td>FabriClean</td>
<td>6.6</td>
<td>ePTFE membrane/Woven Glass</td>
<td>1,048,440</td>
<td>160</td>
<td>10</td>
</tr>
<tr>
<td>Vectren Culley, North 125 Mwe</td>
<td>Boiler, Coal</td>
<td>USA</td>
<td>2005</td>
<td>FabriClean</td>
<td>6.6</td>
<td>ePTFE membrane/Woven Glass</td>
<td>1,048,440</td>
<td>160</td>
<td>10</td>
</tr>
<tr>
<td>Vectren AB Brown 1 200-Mwe</td>
<td>Boiler, Coal</td>
<td>USA</td>
<td>2003</td>
<td>FabriClean</td>
<td>6.6</td>
<td>ePTFE membrane/Woven Glass</td>
<td>1,776,000</td>
<td>165</td>
<td>15</td>
</tr>
<tr>
<td>Pennsylvania Power &amp; Light Brunner Island #2 (400 Mwe)</td>
<td>Boiler</td>
<td>USA</td>
<td>1979</td>
<td>Reverse Air</td>
<td>9.1</td>
<td>J3Tb</td>
<td>399,000</td>
<td>149</td>
<td></td>
</tr>
<tr>
<td>Public Util Municipal Pwr P</td>
<td>Stoker boiler</td>
<td>USA</td>
<td>1988</td>
<td>Pulse Jet</td>
<td>J30</td>
<td>8,000</td>
<td>204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utah State Corr Facility</td>
<td>Stoker boiler</td>
<td>USA</td>
<td>1989</td>
<td>Pulse Jet</td>
<td>J31</td>
<td>30,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stone Container Corp</td>
<td>Boiler wood</td>
<td>USA</td>
<td>1987</td>
<td>Pulse Jet</td>
<td>J31</td>
<td>25,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stone Container Corp</td>
<td>Boiler wood</td>
<td>USA</td>
<td>1987</td>
<td>Pulse Jet</td>
<td>J31</td>
<td>25,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwest Forest Ind</td>
<td>Boiler wood</td>
<td>USA</td>
<td>1987</td>
<td>Pulse Jet</td>
<td>J31</td>
<td>34,000</td>
<td>214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simmons Juv Products</td>
<td>Boiler wood</td>
<td>USA</td>
<td>1986</td>
<td>Other</td>
<td>J30</td>
<td>34,000</td>
<td>214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simmons Juv Products</td>
<td>Boiler wood</td>
<td>USA</td>
<td>1986</td>
<td>Pulse Jet</td>
<td>J30</td>
<td>51,000</td>
<td>204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penna Glass Sand</td>
<td>Boiler</td>
<td>USA</td>
<td>1971</td>
<td>Pulse Jet</td>
<td>Ff80</td>
<td>53,000</td>
<td>210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olympia Brewing Co</td>
<td>Stoker boiler</td>
<td>USA</td>
<td>1980</td>
<td>Reverse Air</td>
<td>J10 Tef</td>
<td>31,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohio Edison</td>
<td>Boiler</td>
<td>USA</td>
<td>1986</td>
<td>Pulse Jet</td>
<td>J30</td>
<td>7,000</td>
<td>288</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid West Carbide Corp</td>
<td>Stoker boiler</td>
<td>USA</td>
<td>1977</td>
<td>Pulse Jet</td>
<td>J80</td>
<td>69,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lds Hospital</td>
<td>Stoker boiler</td>
<td>USA</td>
<td>1988</td>
<td>Pulse Jet</td>
<td>J31</td>
<td>192,000</td>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lauhoff Grain Co</td>
<td>Fluid bed boiler</td>
<td>USA</td>
<td>1987</td>
<td>Pulse Jet</td>
<td>J30Tb</td>
<td>208,000</td>
<td>190</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firestone Tire &amp; Rubber Co</td>
<td>Stoker boiler</td>
<td>USA</td>
<td>1985</td>
<td>Pulse Jet</td>
<td>Gtex-Gla</td>
<td>208,000</td>
<td>190</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dept Of Energy Power Syst</td>
<td>Boiler</td>
<td>USA</td>
<td>1995</td>
<td>Pulse Jet</td>
<td>Ryton</td>
<td>3,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custom Truck Sales</td>
<td>Stoker boiler</td>
<td>USA</td>
<td>1987</td>
<td>Pulse Jet</td>
<td>J30</td>
<td>48,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cargill Inc</td>
<td>Boiler</td>
<td>USA</td>
<td>1984</td>
<td>Pulse Jet</td>
<td>J160Z</td>
<td>48,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broyhill Furniture</td>
<td>Boiler</td>
<td>USA</td>
<td>1993</td>
<td>Pulse Jet</td>
<td>Ryton</td>
<td>48,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broyhill Furniture</td>
<td>Boiler</td>
<td>USA</td>
<td>1993</td>
<td>Pulse Jet</td>
<td>Ryton</td>
<td>48,000</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Babcock &amp; Wilcox</td>
<td>Fluid bed boiler</td>
<td>USA</td>
<td>1979</td>
<td>Pulse Jet</td>
<td>Jhyuck</td>
<td>20,000</td>
<td>204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrilectric Power</td>
<td>Fluid bed boiler</td>
<td>USA</td>
<td>1994</td>
<td>Pulse Jet</td>
<td>Ryton</td>
<td>16,000</td>
<td>163</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glanford PS</td>
<td>Boiler, Meat &amp; Bone Meal</td>
<td>UK</td>
<td>1999</td>
<td>FabriClean</td>
<td>6.0</td>
<td>ePTFE membrane/Woven Glass</td>
<td>288,000</td>
<td>135</td>
<td>30</td>
</tr>
<tr>
<td>Elean Power Station</td>
<td>Boiler, Straw</td>
<td>UK</td>
<td>1999</td>
<td>FabriClean</td>
<td>6.0</td>
<td>P84/P84</td>
<td>220,000</td>
<td>135</td>
<td>20</td>
</tr>
<tr>
<td>EHN Sanguesa</td>
<td>Boiler, Straw</td>
<td>Spain</td>
<td>2000</td>
<td>FabriClean</td>
<td>6.0</td>
<td>P84/P84</td>
<td>240 TA 12</td>
<td>28,820</td>
<td></td>
</tr>
<tr>
<td>Gethar Vessels Ltd.</td>
<td>Lignite Fired Boiler</td>
<td>India</td>
<td>2000</td>
<td>Pulse Jet</td>
<td>J31</td>
<td>173,000</td>
<td>180</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>St. Gaudens</td>
<td>Boiler, Bark</td>
<td>France</td>
<td>2003</td>
<td>FabriClean</td>
<td>6.0</td>
<td>ePTFE membrane/Woven Glass</td>
<td>120,000</td>
<td>240</td>
<td></td>
</tr>
</tbody>
</table>