REINHOLD ENVIRONMENTAL Ltd.

2016 APC-Wastewater Round Table & Expo Presentation

July 18 & 19, 2016 in Dearborn, MI / Hosted by DTE Energy

Reinhold Technical Conference

Filtration Solutions

Gas Turbine Inlet

Gas Turbine Inlet systems and filters for Power Generation and Oil & Gas customers.

Industrial Filtration

Baghouse filters and solutions for Industrial customers.

Membranes

Specialty fabrics and microfiltration products.

Manufacturing in Slater, MO

Manufacturing and Warehousing of Fabric Filters, Components

1975

Manufacturing Facility

Over 40 years Mfg Bags
500K Sq. Ft. PLUS Production Floor
250 plus operators
12 Sewing Lines
20,000 bag drawings
2+ million bags/Year

CLARCOR Industrial Air

Review of Recent Power Plant Applications in the U.S.

Case 1-Coal Fired Utility, Upper East Coast

Original Equipment Data

- 750 MW boiler with PJFF Baghouse
- 21,504 filters, 6X396, 18 oz PPS with P84 included as a surface “treatment”
- PRB Coal
- SCR with PJFF and Wet Scrubber After

Issues

- 2 years and 1 months life, with very low permeability. 1 cfm was common in the bag testing, although the spec was 15-30 cfm new.

Changes Made

- Developed a specification with customer with the goal of 5 year life using 15 oz PPS with ePTFE membrane. Came back online in March, 2015.

  Performance guarantee provided

Case 2 – Midwestern Coal Fired Utility

Original Equipment Data

- 500 MW boiler with PJFF Baghouse
- 12,000 filters, 6.25X395, 16 oz P84
- PRB Coal
- SDA prior to PJFF, with Wet Scrubber after.

Issues

- 3 year life, with high DPs

Changes Made

- Developed a specification with Utility to get 5 year life using 15 oz PPS with ePTFE membrane with performance guarantee. Came back online in May, 2015.

  Performance guarantee provided

Case 3 – Midwest Coal Fired Utility

Original Equipment Data

- Unit 1 500 MW, Unit 2 850 MW – both with PJFF baghouses
- 23,520 filters total, 2 collectors, 6.25X319.125, 18 oz PPS
- PRB Coal
- SCR with PJFF and wet scrubber after

Issues

- 3 year life, with emissions becoming common towards the beginning of the 3rd year

Changes Made

- Developed a specification with Utility with the goal to get 5 year life.
  --Replaced with 15 oz PPS with ePTFE membrane - Unit 1spring of 2013
  --Replaced with 15 oz PPS with ePTFE membrane - Unit 2 spring of 2014

  Performance guarantee provided

Case 4 – Midwest Coal Fired Utility

Original Equipment Data

- 575 MW boiler with PJFF Baghouse
- 13,220 filters, 6X316, 18 oz PPS, with Teflon® spray
- PRB Coal
- SDA and SCR with PJFF

Issues

- 3 year life, with upsets and high differential pressure leading to early filter bag failures

Changes Made

- Developed a specification with Utility with a goal of 5 year filter bag life. Replaced with 15 oz PPS with ePTFE membrane in late 2005. Second set of BHA filter bags installed in 2010. First set of filter bags lasted 5+ years. Current set of filter bags going into year 6.

Performance guarantee provided

Case 5 – Midwest Utility

Original Equipment Data

- 850 MW boiler with PJFF Baghouse
- 18,270 filters, 6X316, 16 oz PPS when commercialized
- PRB Coal
- SDA with PJFF

Issues

- 3 year life, with high DPs

Changes Made

- Developed a specification with Utility to get 5 year life with performance guarantee. They were at 4 years on 5 year performance guarantee, but changed early with major outage for SDA work needing to be done in mid 2014. They are now on their 2nd set. Replaced with 15 oz PPS with ePTFE membrane.

Performance guarantee provided

Case 6 – Large Utility, West Coast

Original Equipment Data

- 900MW boiler with PJFF Baghouse
- 32,000 filters, 7.625X316, 16 oz PPS
- PRB Coal
- SDA, SCR with PJFF

Issues

- 3 year life, with very low permeability. Moisture in OEM design, filter manufacturing quality of original filters led APS to look at alternatives

Changes Made

- Developed a specification with Utility with a goal to get 5 year life. Replaced Unit 3 with 15 oz PPS with ePTFE membrane. Standardized this change to Unit 2 (smaller reverse air Alstom with 4500 filters, but fiberglass with ePTFE) based on the success.

Performance guarantee provided

Case 7 – Upper East Coast Utility-Toxecon filtration

Original Equipment Data

- 600 MW boiler with PJFF Baghouse
- 16,000 filters, 2 collectors, 5.25X281.5, 16 oz PPS
- PRB Coal
- Precipitator, SCR and SDA with PJFF

Issues

- 2 + year life, fine particulate from fine carbon/flyash injection bled through the PPS filters due to precipitator efficiency.

Changes Made

- Developed a specification with Utility with a goal of 5 year life. Replaced with 15 oz PPS with ePTFE membrane in January 2012.

Performance guarantee provided

Case 8 – Coal Fired Utility, Southwest US

Original Equipment Data

- 595 MW boiler with PJFF Baghouse
- 12,600 filters, 5.25X316.25, 16 oz P84
- PRB Coal
- PJFF

Issues

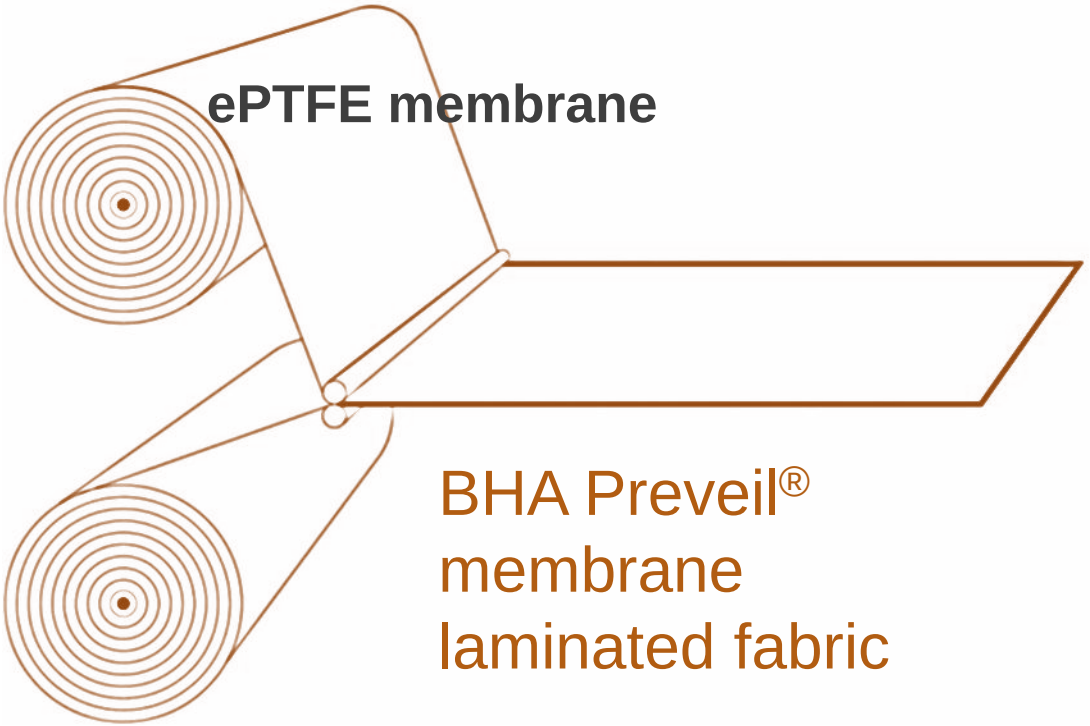
- 2 year life, with inlet abrasion and NOX degradation due to fabric choice and equipment design.

Changes Made

- Developed a specification with Utility with a goal of 5 year life. Replaced with 22 oz Fiberglass with ePTFE membrane after same type of failure with PPS. They also made some inlet and baffling changes at our recommendation to decrease abrasion. Came back online in April, 2015.

Performance guarantee provided

Membrane + base fabric are permanently bonded



Case 9 – Midwestern Public Utility

Original Equipment Data

- 625 MW boiler with PJFF Baghouse
- 16,800 filters, 5.25X316.25, 16 oz PPS
- PRB Coal
- SDA and SCR with PJFF

Issues

- 2 + year life, with abrasion at inlet

Changes Made

- In February 2013, The first 2 rows of each module had Thermopleats installed to create an artificial dropout zone. With the Utility a specification was developed with a goal of 5 year life. 16,800 High Temp Thermopleats in February 2015. The decision was based upon life expectancy and a major SDA outage timing.

Performance guarantee provided

BHA ThermoPleat Filters

- Top-load or bottom-load filter tops
- Customized pleat depth and spacing
- Perforated metal core (standard)
- Straps strategically placed for strength
- Metal bottom pan (standard)

BHA PulsePleat Filters

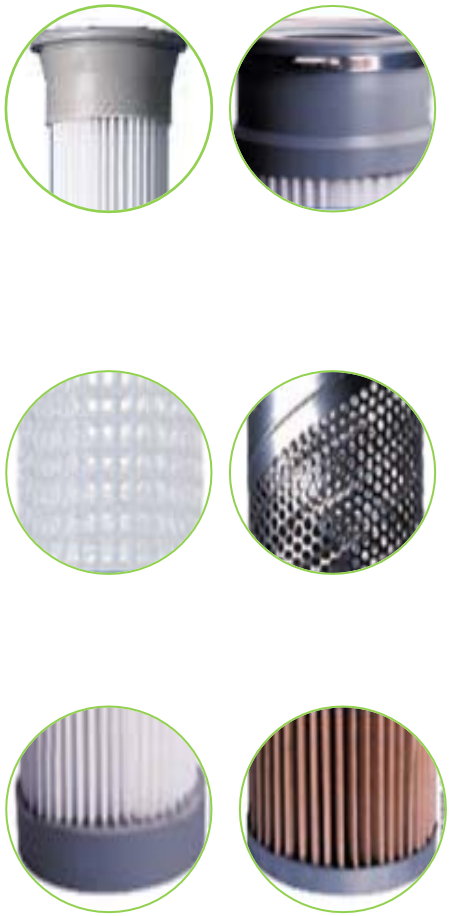
Top-load or bottom-load filter tops

Customized pleat depth and spacing

Polypropylene or metal core

Straps strategically placed for strength

Polyurethane or metal bottom pan



Thank you