

REINHOLD ENVIRONMENTAL[®]



2024 Reinhold/PCUG Round Table Presentation

Hosted by LG&E/KU and Co-hosted by Southern Co. and TVA
in The Marriott Resort Lexington Griffin Gate Hotel, Lexington,
KY on June 24-25, 2024

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Workshop 11: Improving Operational Efficiency of Baghouse

Reinhold Conference, 24th June 2024

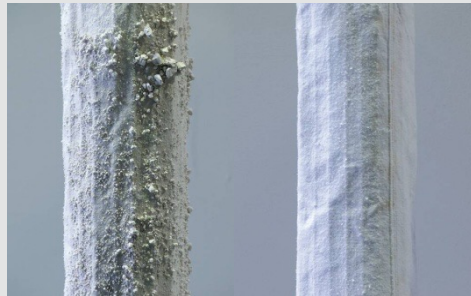


Everything from a single source!



F. Filter Elements

- In-house customized production of Pulse Jet, Reverse Air, Shaker bags with woven and non-woven filter media options
- Strict quality check as per ISO standards during filter media production and bag manufacturing
- Accessories for filters like supporting cages, cartridges, leak test powder etc.



O. On-Line Cleaning®

- Individual patented cleaning method for Pulse Jet bags and cartridges
- In-situ cleaning to extend bag life
- Reduction in DP and bags replacement costs



S. Service

- Removal and installation of filter bags
- Maintenance/ inspection / troubleshooting of baghouses

What are the main factors affecting bag house performance?

1. Filter bag material
2. Flue gas volume
3. Flue gas temperature
4. Inlet dust concentration/ PSD
5. Moisture in gas
6. Acid dew point of gas
7. Chemical composition of dust
8. Gas distribution
9. Cleaning system- PJBH and RABH



Filter bag material

The media selected for each application **must** achieve the lifetime and emission required.

It is important to track the following information on regular basis:

- Temp. at baghouse inlet- peak, continuous and frequency
- Starts / Stops –continuous operation –(acid-) dew point crossings
- Air to cloth ratio, special construction details of fabric filter
- Real or estimated flue gas-and dust composition (O_2 , NO_x , SO_x , H_2O , dust load)
- Flue gas cleaning system-Emission limits to be met, separation efficiency

Filter bag material

Fiber Type	Temperature Limit F/C	Resistance To Acids	Resistance To Alkalis	Resistance To Hydrolysis	Resistance To Oxidation
Cotton	180°/85°	Poor	Good	Good	Good
PVC	150° /65°	Excellent	Excellent	Excellent	Excellent
Polypropylene	190° /90°	Excellent	Excellent	Excellent	Poor
Nylon	230° /110°	Poor	Excellent	Good	Good
Homopolymer Acrylic	257° /125°	Good	Good	Good	Fair
Polyester	300° /150°	Good	Poor	Poor	Good
PPS	375° /190°	Excellent	Excellent	Excellent	Fair
Aramid	400° /205°	Poor	Excellent	Poor	Fair
Polyimide	450° /235°	Fair	Fair	Good	Good
PTFE	500° /260°	Excellent	Excellent	Excellent	Excellent
Fiberglass	550° /285°	Good	Fair	Excellent	Excellent

F: Fahrenheit, C: Celsius, PVC: Poly vinyl chloride, PTFE: Poly-tetra fluoro ethylene, PPS: P-phenylene sulfide

Flue Gas Volume

Flue gas volume above design

- Increase in pressure drop
 - Increase in filtering velocity
 - Increase in can velocity
 - High mechanical force on filter bags
 - Increase in outlet emission due to seepage
- A particle may get loose in the dust layer and passes through because of stretching of fabric due to increased pressure drop

Flue Gas Temperature

Increase in flue gas temperature leads to –

- Decrease in gas density leads to ineffective pulsing in pulse jet bag house
- Higher filtering velocity is needed for effective capture of dust in low gas density.

But cleaning is ineffective with higher filtering velocity.

- The structure of the fabric is disturbed causing material degradation and increased emissions/reduced bag life.

Inlet Dust Concentration

- Inlet dust concentration above design leads to higher pressure drop
- Increases outlet emission unproportionately
- Demands for frequent cleaning of filter bags which reduces bag life

Smaller particle size ranging between 0.1 micron to few microns leads to:

- Re-entrainment
- Higher pressure drop due to increase in residual resistance offered by the filter bags



Moisture in Flue Gas

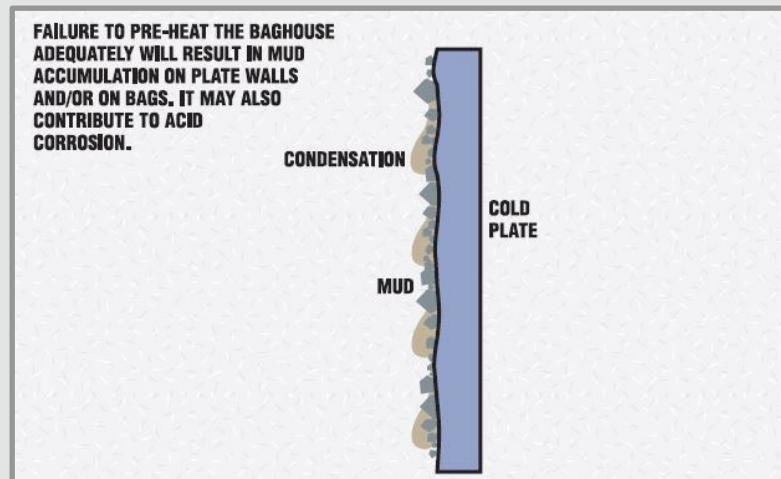
Moisture in flue gas leads to:

- Corrosion when presence of moisture is associated with elevated temperature
- Dust agglomeration on filter bags reducing effectiveness of cleaning
- Permanent blinding of filter bags
- Deterioration of hydrophobic fibers leading to reduced bag life

Acid dew point temperature of gas

Operation of bag house below moisture and acid dew point temperature of flue gas leads to :

- Pre-mature failure of bags
- Blinding of filter bags
- Can destroy casing wall of bag house



Chemical composition of dust

- Hygroscopic dusts attract moisture and agglomerates which reduces the effectiveness of cleaning
- Some dusts are cohesive in lower temperature but becomes tacky at higher temperature
- Using inappropriate fibers like PPS for high O₂ applications and PET for high H₂O applications results in fabric degradation and in turn reduced bag life



Gas distribution

Poor gas distribution leads to :

- Increased pressure drop
- Localized bag failure and short circuiting of the gases
- If baffle plates are improperly installed, it can induce high airflow regions that will abrade the duct or bag filters prematurely
- They also cause re-entrainment and induce high-dust-concentration regions that can produce uneven hopper loading and uneven filter bag dust cake.

For PJBH: Cleaning intensity & pulse frequency

Increased pulsing pressure & pulsing frequency leads to:

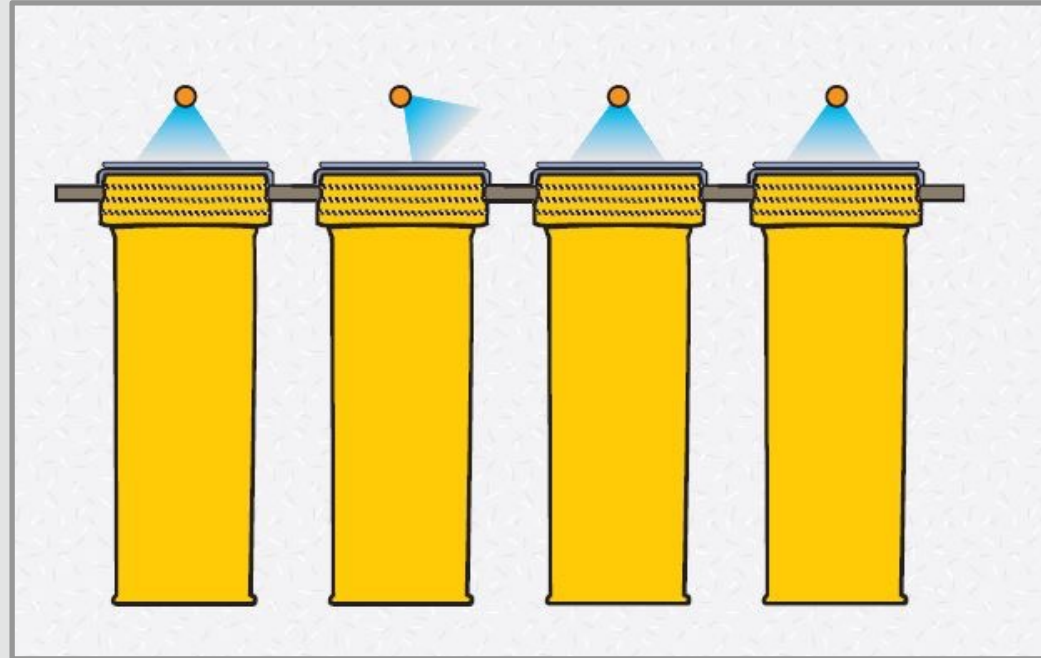
- Premature failure of filter bags
- Increases straight through penetration leading to outlet emission

Inadequate/Inconsistent- purging/cleaning air pressure

- In effective cleaning
- Increase in pressure drop



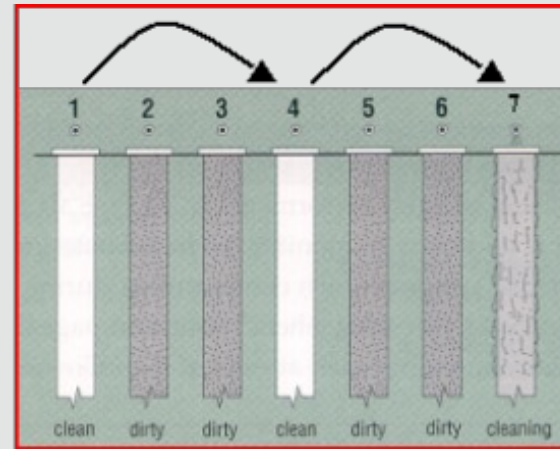
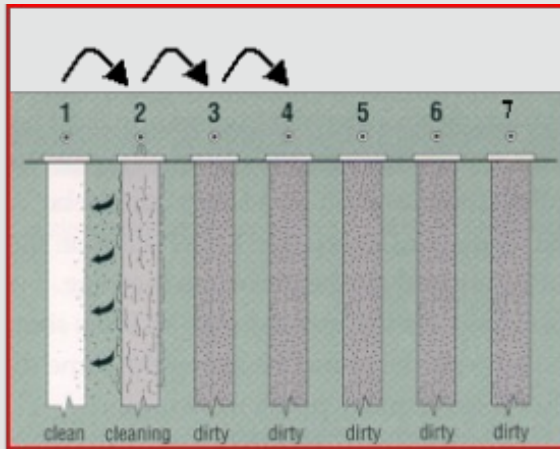
Position of the blow pipes



Pulsing pressure



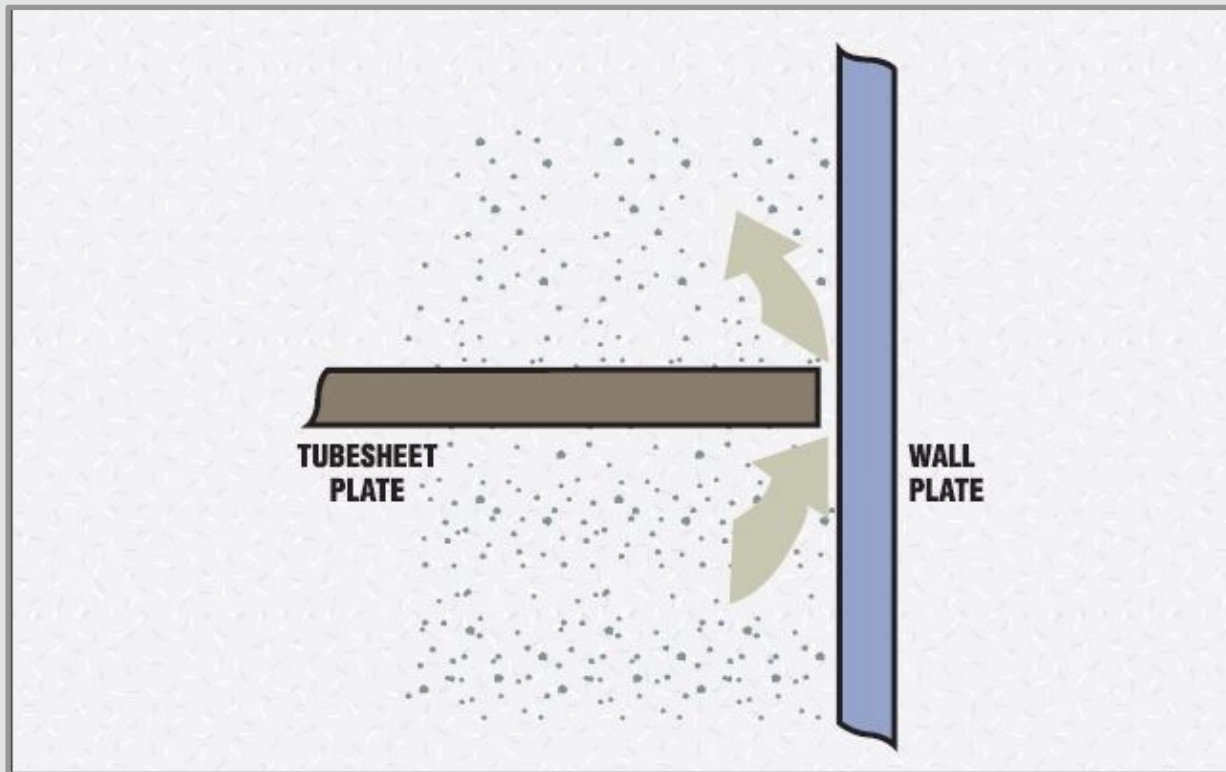
Recommended cleaning sequence



Example of recommended cleaning sequence for a dust collector with 17 bag-rows and 10 timer positions:

Timer Position	1	2	3	4	5	6	7	8	9	10
Valve Numb.	1	4	7	10	2	5	8	3	6	9
	11	14	17		12	15		13	16	

Support structures and welds



Reverse Air Bags

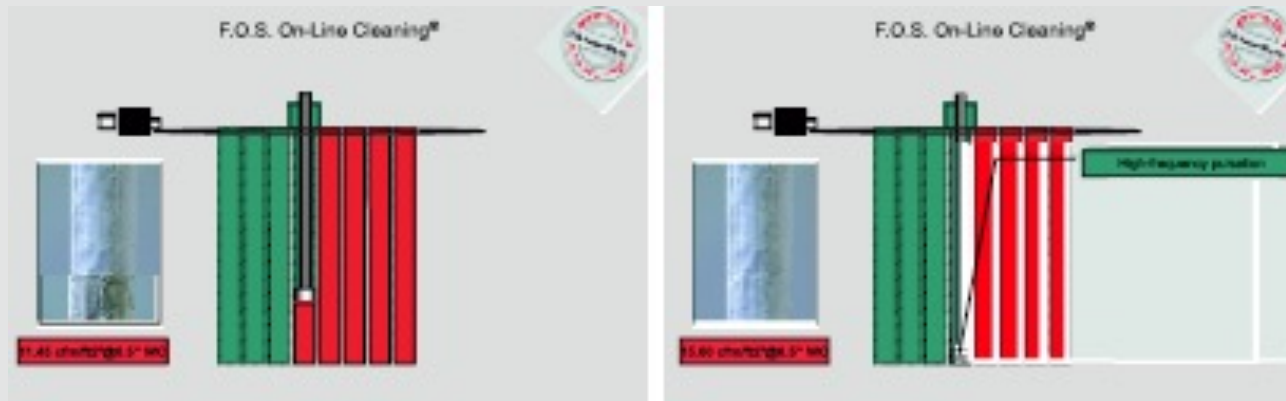
Problem	Possible Cause	Solution
Ring Failure	More DP during RA cleaning Loose tensioning	Reduce RA Fan speed / Reduce Damper opening. Bag damages due to friction, proper tensioning.
Clamp Failure – bottom or top at bag cap	Corrosion	Check & Repair Door Seals/ Welding Cracks
Clamp Failure	Mechanical Failure	Don't over-tighten Screws. Don't re-use clamp.

Reverse Air Bags



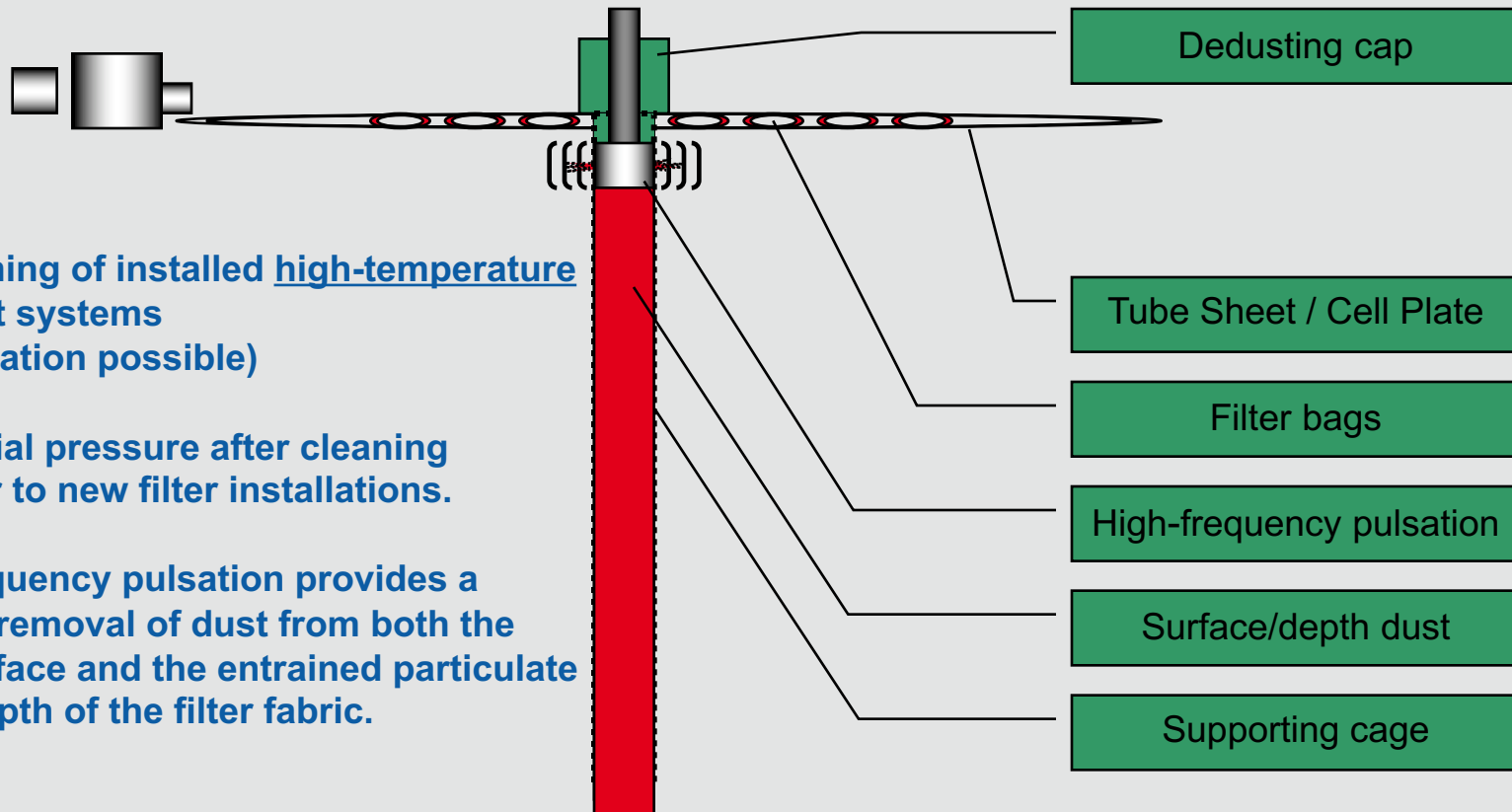
F.O.S. On-Line Cleaning® - Your partner to ecological and economical savings!

- The filters & cages are not removed from the baghouse
- No release of potentially hazardous dust, it remains in the system
- No loss of production (n-1), can be cleaned in online or offline mode
- Up to 80 % cost savings in comparison to replacement of new filter bags
- Flexible solution to meet your outage time deadline!
- Extends filter service life and reduction of differential air pressure by removal of surface filter cake and entrained particulate in filter media. Increased capacity of your baghouse!
- Lowers the system differential pressure which provides cost of operation savings as this affects the amp load of the fan





F.O.S. On-Line Cleaning[®]



- For cleaning of installed high-temperature Pulse-Jet systems (n-1 operation possible)
- Differential pressure after cleaning is similar to new filter installations.
- High-frequency pulsation provides a gentle removal of dust from both the filter surface and the entrained particulate in the depth of the filter fabric.

Comparison: New investment versus On-Line Cleaning

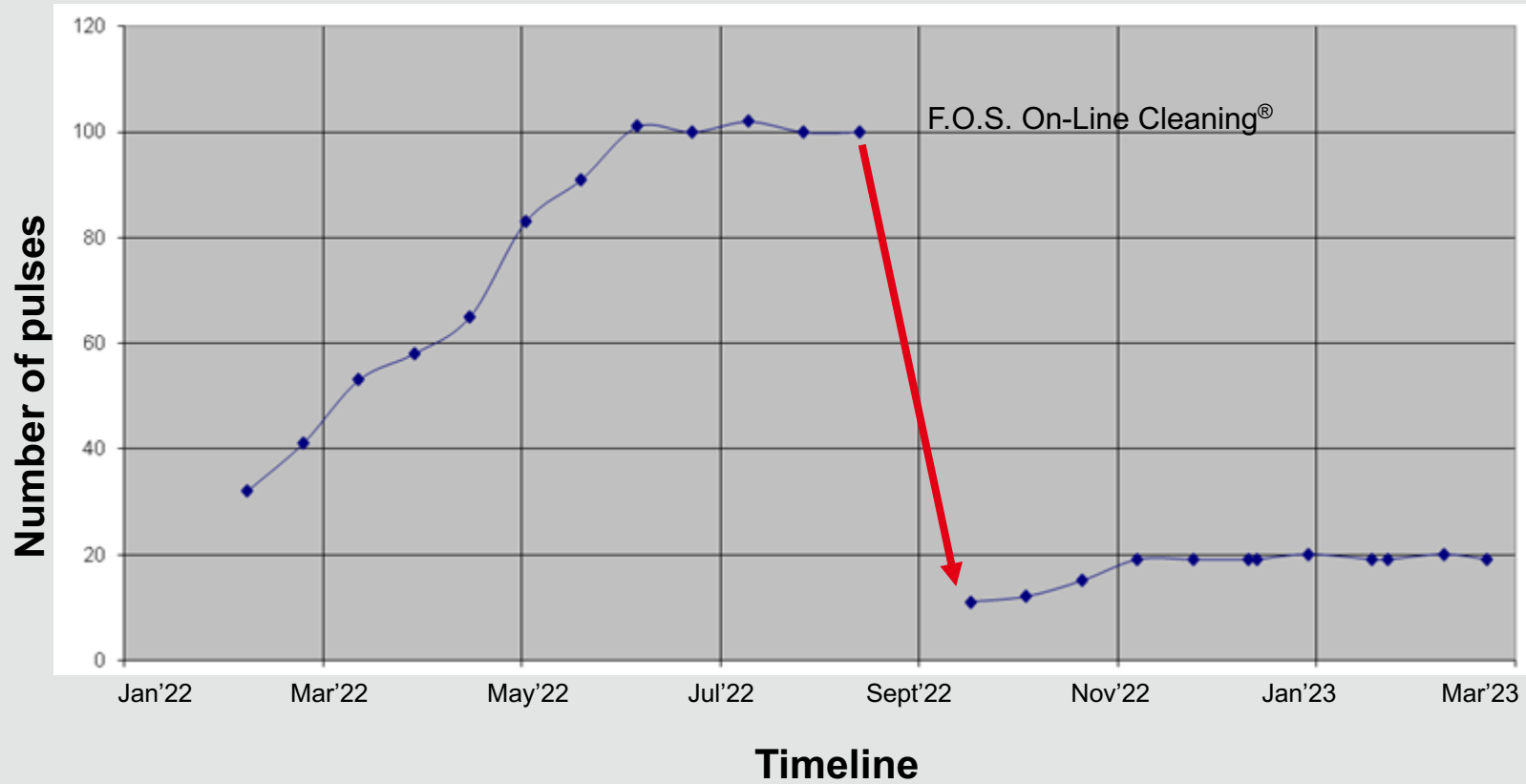
New investment

2,048 P84 filter bags @ \$81.00 / ea**	\$165,888.00
Costs for removal and installation**	\$ <u>40,000.00</u>
Overall costs for new investment**	\$205,888.00
Overall costs for F.O.S. On-Line Cleaning® **	\$ 45,000.00

Total Cost savings (78%): \$180,880.00

** All are approximate costs

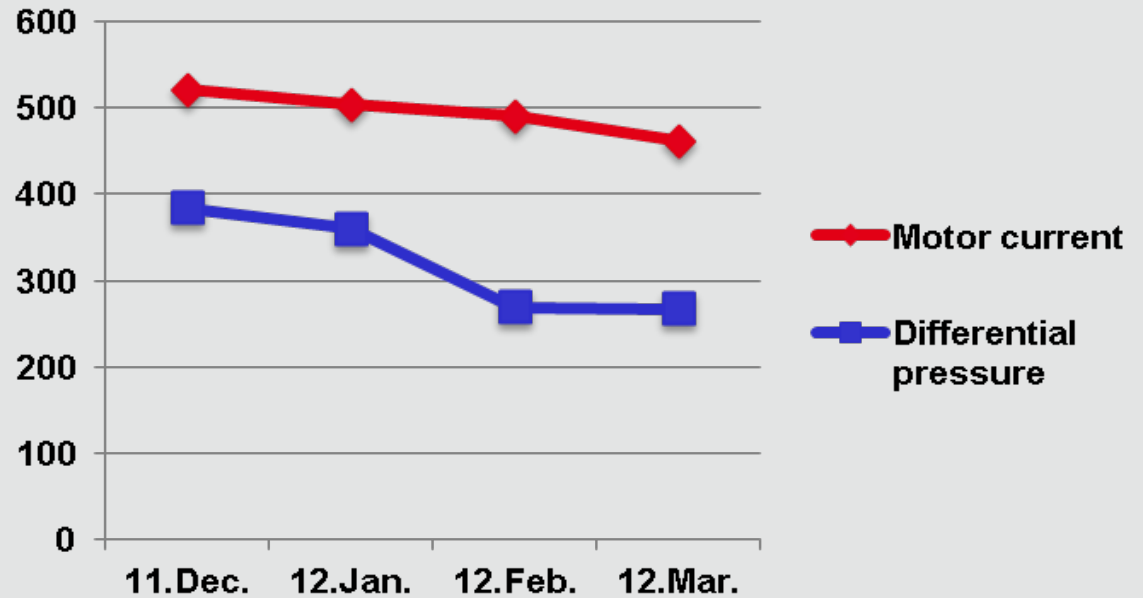
Number of pulses/day- WTE in France



Operational parameters comparison before/ after F.O.S. On-Line Cleaning[®]

Power plant in Spain

	Motor current vacuum fan A	Differential pressure filter mmWG
Prior (11.Dec)	522	384
Prior (12. Jan)	504	360
After (12.Feb)	491	269
After (12.Mar)	462	267
Difference	-36	- 207



Thank you for your time and interest!

Meet us # 22

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