Pleated cartridges provide increased baghouse capacity and improved filter performance

John Courtenay and Michael Bryant* describe the attributes of the Xtreme X650 pleated cartridge, a new concept in baghouse filter elements.

The Xtreme X650 pleated cartridge is a new concept in baghouse filter elements, capable of operating continuously at temperatures up to 280°C and offering significant improvements in baghouse capacity and filter performance, compared with standard filters. It has been developed by Sefar BDH, a Canadian company based in Chicoutimi, Quebec, specialising in both low-temperature and high-temperature filtration.

Benefits

The range of benefits from using the X650 can be summarised as:

- Increase baghouse capacity by up to 30%
- Up to 40% reduction in pressure drop
- Lower air to cloth ratio
- Improvement in filtration efficiency
- Longer life
- Reduced cleaning pulse rate
- Decrease in downtime
- Reduction in labour costs

The product

The unique design features of the X650 cartridge which bring about these performance improvements are the manner in which the joints between the filter media and the end caps are formed, using a liquid aluminium potting alloy and a doubling up of the available filter cloth area in each cartridge. (Fig 1 and 2)

1 X650 pleated cartridge showing metal end caps and heavy duty banding

2 X650 pleated cartridge showing high temperature aluminium joint between end caps and filter media

The X650 cartridge has:

- 100% metal end caps
- Unique high-temperature aluminium jointing of end caps to media
- Heavy-duty construction bands
- Fibre-glass or P84 polyimide fibre media
- Donaldson PTFE membrane as an option

Existing baghouse filter units can be upgraded to X650 pleated cartridges without any modifications being required, by simple retro-fitting of the new cartridges into the existing tube plates.

Industrial experience

The X650 pleated cartridge was first introduced at Quebec Iron and Titanium in Canada in 2004 and since November 2005 has been in continuous production use on all four 960-compartment baghouse filters, each treating 100,000 cu m per hr of waste gas. The industrial experience at QIT with rotary kiln calcinations and a microniser for reducing the particle size of TiO2 can be summarised as follows:

Case history 1 — rotary kiln calcination

Ore of TiO2 and Fe2 O3 iscalcined at 1,200°C in a rotary kiln at a rate of 100 tonnes per hour. At the outlet of the kiln, the gas is cooled to 240°C by mixing with ambient air and then passed into a bag house (Fig 3). The bags originally being used in the baghouse were fibreglass with E-PTFE membrane and

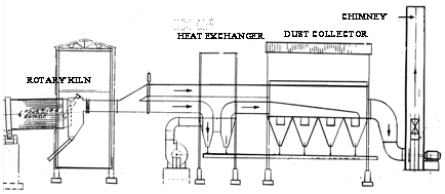
Table I Comparative data for rotary kiln dust collection

	Original bags of Fiberglass with PTEE membrane	*New fibreglass pleated cartridge elements (44 pleats of 25mm E-of pleat depth)*
Baghouse type	Pulse jet	Pulse jet
Bag dimensions	140 by 4,295 mm	140 by 1,640 mm
Surface of one bag	1.95 sq m	3.62 sq m
Number of bags	960	960
Air flow	100,000 cu m per hr	100,000 cu m per hr
Air-to-cloth ratio	0.89 m per min	0.48 m per min
ΔPressure	1.5-3.0 kPa	0.6-1.5 kPa
Temperature	220°C	220°C
Dust composition	TiO_2, Fe_2O_3, SiO_2	TiO_2, Fe_2O_3, SiO_2
Mean particle size	5μ	5μ
Gas composition	N2 CO2,CO, SO2 (1,000 ppm)	N_2 CO_2,CO, SO_2 (1,000 ppm)
Cleaning frequency	8 sec	1,800 sec (30 min)
Service time	3 – 12 months	> 18 months
Dust load (gm per cu m)	4	4

Table II: Comparative data for microniser dust collection

	Original bags of Nomex	*New fibreglass cartridge pleated elements X650, PTFE membrane (44 pleats of 25.4 mm pleat depth)*
Baghouse type	Pulse jet	Pulse jet
Bags dimensions	150 by 3048 mm	150 by 1,640 mm
Surface of one bag	1.44 sq m	3.62 sq m
Number of bags	135	135
Air flow	5,400 kg of steam per hr	5,400 kg of steam per hr
Air-to-cloth ratio	Not known	Not known
Δ Pressure	2.0 –3.7 kPa	0.2 –1.0 kPa
Temperature	170°C	170°C
Dust composition	TiO_2	TiO_2
Mean particle size	0.5-1.0 μ	0.5-1.0 μ
Gas composition	Air and water	Air and water
Cleaning frequency	4 sec	8 sec
Service time	6 weeks	>52 weeks (still in operation)
Dust load	2,800 kg per hr	2,800 kg per hr

there were problems with short life of the bags, lack of capacity for the rotary kilns, excessive emissions and abrasion damage to bags. The original bags were replaced with X650 pleated cartridges. Comparative operating data are shown in Table I. The overall objective of introducing X650 pleated cartridges was to reduce emissions to less than 15 kg per hr for the total of the four baghouses. This goal was satisfactorily achieved with emissions down to 7 kg per hr.



3 Flow outline of rotary kiln dust collectors at QIT* Limited and Michael Bryant is Marketing manager, MQP, Limited

Other major benefits were:

- Increased capacity of dust collectors
- Pressure drop reduced
- Life of baghouse filters increased to two years
- Pulse jet cleaning frequency reduced
- Capacity of rotary kiln operation increased

Case history II — micromiser for reducing particle size of TiO2

TiO_2, which is used as a pigment in paint, is obtained by treating an ore, containing TiO2, and

Fe_2O_3 and impurities, with chlorine which results in the production of $TiCl_4$ as a liquid that is easily separated form the impurities. The liquid is then evaporated and fed into an oxygen-rich flame at more than 1,500°. Some grades of finished product require finer TiO_2, particles. For these applications, the TiO_2, is projected at high velocity together with steam onto a steel plate. This reduces the particle size. This part of the plant is referred to as the microniser and the final ground product then is separated from the steam using a baghouse.

The bags originally being used in the baghouse for this process were Nomex. A major operating problem was short life of the bags which needed to be changed every six weeks at the plant, which has four baghouses. In an effort to overcome this problem, the original bags were replaced with X650 pleated cartridges, with a PTFE membrane. The principal objectives were to increase baghouse lifetime, decrease downtime and reduce cost of manpower for bags replacements.

Comparative operating data is shown in Table II

The target at the micromiser plant was to get a minimum of one year baghouse lifetime. The current installation of X650 cartridges has already been in operation for more than 12 months with no signs of deterioration.

A summary of benefits includes:

- Increase in baghouse life
- Reduction in labour costs
- Decrease in downtime
- Decrease in pressure drop
- Reduced pulse jet cleaning frequency

Since then, the X650 pleated cartridge has been utilised in a number of other industrial applications elsewhere, including an aluminium smelter anode bakehouse, waste incineration, soil desorption, and titania micronisation.

Evaluating pleated cartridges

Xtreme X650 cartridges, made by Sefar BDH, are exclusively marketed in Europe, the Middle East and South Africa by MQP, Limited, based in Knowle, West Midlands, B93 9EW, UK.

MQP can provide expert technical consultancy on any proposed application to assess performance and potential benefits. Once an application has been positively evaluated, then normally several X650 cartridges would be supplied for insertion into the existing baghouse tubeplate for an initial assessment over a period of three months. The cartridges would then be returned for a detailed assessment of wear and cleaning characteristics in the particular application environment. If performance had been satisfactory, then the next stage would be to equip one complete compartment of the baghouse and monitor all characteristics including pressure drop, life emissions and cleaning frequency.

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