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Retrofitting Cartridge Pulse-Jet Dust Collectors

95% of all existing dust collectors are retrofit candidates

- **Increase efficiency** and **lowers the particulate emissions** coming from the dust collector. Meet legal and process requirements.
- **Increase cartridge life 3 to 10 times**.
- **Lower Operating cost by 30-60%.** Use ½ the current number of filter cartridges**.**
- A very **attractive payback**, future servicing costs can be 1/4 of the current cost.
- **Lower power consumption by 20-40%** by lowering the operating pressure of the collector.
- Upgrade to the **best available technology**.
- **Increase collector capacity** up to 75% by keeping current number of cartridges and upgrading the pulse cleaning system.
- **Most economical approach;** usually purchased in operating rather than capital budgets to make project approval very fast.
- **No risk.** Modifications installed and running before invoice is due. No special requirements or training required. Modifications are performed by your own maintenance or bag changing crews. No permanent changes to the collector; it can be restored to original state.

Symptoms to look for:

A. Operating pressure drop more than 3 inches water column and high compressed air usage.
B. On tandem cartridge sets dust piles up on upper sections of cartridges.
C. Cartridge life less than 12 months.
D. Pressure drop increases in increments of less than 0.1 inches regularly. Increased pressure drop may be due to refrigeration cycle of compressed air as it expands.
E. Operating weight of cartridge more than four pounds over the weight of a new cartridge filter.
F. Leakage through filters hard to detect since pressure drop is normal. Results in short filter life.
G. Noisy Cleaning System especially on metal fumes.
H. Dust build up in horizontal duct runs.

The Problem: There are serious flaws in equipment design by all major cartridge dust collector suppliers. Certain basic laws of physics and air dynamics were not considered in their product development. The main design flaw of continuous cleaning collectors is that it is believed by designers that volume (flow in CFM) per filter element is solely a function of filter area. The truth is that it is related to cleaned filter area.

The Solution: QAM's exclusive Retrofit Service and apply ten year old proven advanced technology to the conventionally designed dust collectors. There are over retrofitted 500 units in service. Alternatively, purchase one of the very few well designed advanced technology dust collector systems available today.

Problems to Correct:

- Poor Performance; dust penetration through cartridges, high pressure drop, frequent filter replacements.
- Poor cartridge filter design; leaking, plugging (or blinding), excessive bridging, tears and ruptures.
- Poor inlet position and air distribution; inefficient cleaning of cartridges, abrasion problems, excessive dust loading.
- Poor air volume or pressure to the pulse pipe; air-jet does not properly clean the cartridge, as little as only 10% of the filter gets cleaned.
- Excessive use of compressed air to properly clean the cartridges.
- Condensation in the filter cake; caused by cooling of cleaning air jet, which adversely affects media permeability.
- Dust hanging up in the cartridges.

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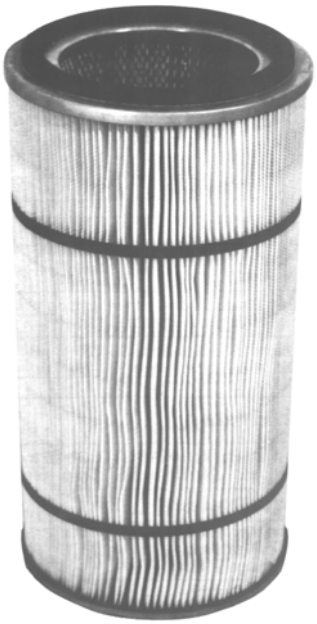
CARTRIDGE DUST COLLECTOR

OPTIMUM PERFORMANCE



LOWER PRESSURE DROP

LOWER DUST PENETRATION

LONGER CARTRIDGE LIFE

WITH HI-TECH OPERATION AND DESIGN

CARTRIDGE DUST COLLECTOR MODIFICATIONS
For Best Performance

Improved Seals, better media selection
Increased Adhesive Strength for stronger joints
Change cleaning sequence to eliminate dust build up
Special procedures to initiate cleaning

Modifications allow filter elements to operate more efficiently. The main problem is that only a small portion of the media in most cartridge collectors is cleaned. This percentage varies with the following factors:

1) Pleat spacing too close for most applications.
2) Cleaning sequence is badly selected.
3) Volume of reverse cleaning flow is inadequate to clean available filter media.
4) Some modern media are too flexible to maintain pleat integrity.

Figure A illustrates **the most common flaw in the operation of pleated cartridge collectors.**

The bottom of the pleat gets partially filled with dust. Once the dust bridges across the pleat, the cleaning air takes the easiest path over the top of the bridge. After this bridge is formed, the media below the top of the bridge is rendered useless for the filtering process.

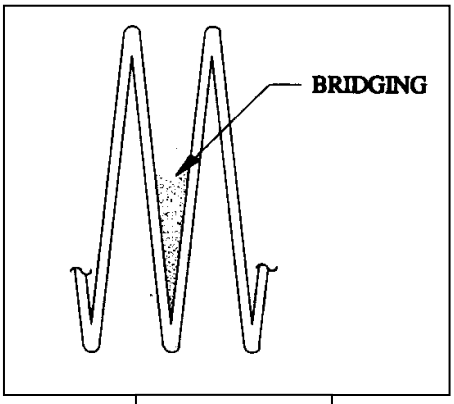


Figure A

These bridges are formed because of one or more of the following causes:
a) The initiation of the cleaning cycle is incorrect. The cleaning cycle should be initiated before the bridge is formed. Often the cleaning cycle is initiated by a pressure drop signal. The pressure drop across the dust cake, before the cake is formed is almost impossible to predict. The correct pressure drop can be from 0.5 to 2.5 inches of water column. If there are surges in dust loading, the pressure drop can rise too slowly to respond. These causes of bridge formation can be remedied by changing the cleaning actuation controls.
b) The cleaning sequence is poor. Figure B illustrates the most prevalent design. It has some very apparent advantages. The cartridges can be changed from outside the collector. The cartridges are cleaned by horizontal rows. Row A followed by row B, or C. During cleaning, the dust from the bottom of row A falls to the top of row B, and bridges the pleats as described previously. The correct design is to clean rows 1, 2, 3, 4 and 5 in any sequence. The dust is forced to the vertical slot between the cartridges and falls into the hopper below.

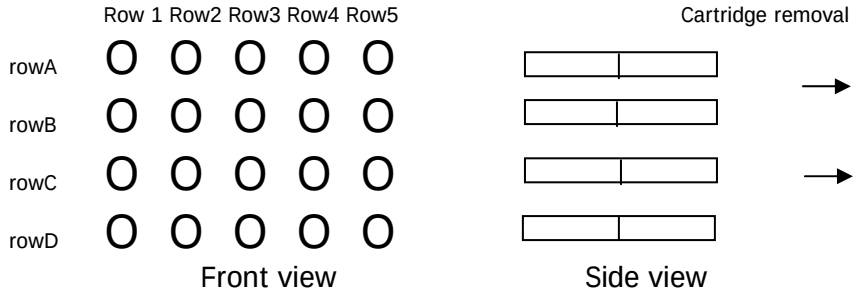


Figure B

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c) The cleaning system can only clean a small portion of the filter media.
The prevalent design, with cellulose media, has two cartridges in tandem with 200 to 275 square foot of media with a permeability around 20 cfm per square foot at ½ inch w.c. pressure drop when clean. Since the pleats are so close, only about 60% or 120-150 sq. ft. is available to be cleaned by the reverse jet flow jet. This tandem set is usually cleaned by a single ¾ inch diaphragm valve. The valve can only clean 50-60 sq. ft. of the media. This means that the collector if properly designed can operate at 1-2 inches pressure drop. The rest of the media will plug and the operating weights of the cartridges are usually 25-30 lbs higher than a new cartridge. This can be verified by weighing a clean cartridge and an operating cartridge and subtracting the difference. This extra weight increases loads on the mounting and adhesives as well as putting uneven loads on the sealing surfaces.

LEVEL 1

Will lower pressure drop by 30-50 %, lower compressed air usage by 25-89 % and reduce operating weight by 30-70 %.

Provide new cartridges with the following specifications:

Pleat spacing of 7-8 pleats per inch based on inner core diameter. This will increase cleanable media area but reduce initial filter ratio.

High strength adhesive joints that are 50% deeper than conventional construction. The wider pleat spacing insures penetration on the periphery of the media in bonding to the cartridge end plates.

Premium seal designs that will allow proper sealing pressure on the sealing faces of the cartridges. A seal can leak if the pressure is inadequate and it can leak if the pressure is uneven. Premium seal designs will control these pressures.

Provide only one new cartridge and one spacer cartridge per tandem set of cartridges. See figure C

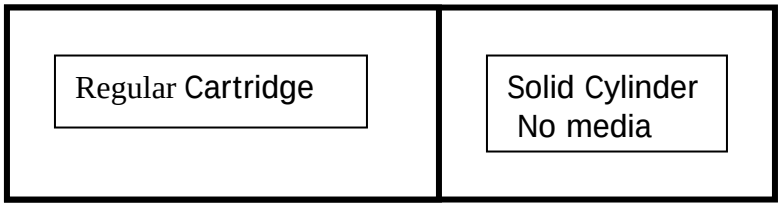

FIGURE C

These proprietary spacer cartridges are reusable. It will provide improved flow characteristics of the dirty air entering the filter compartment and allow dust to fall into the hopper more easily. The collector will now be rated at 750-800 CFM per cartridge.

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Level 2

Increase capacity of collector by 30%

Cartridges and spacers with the same specifications as level 1 except for the length of the cartridges and spacers and a modification to the pulse pipe on the existing collector.

Nozzle assemblies (exclusive to QAM) will be clamped on the end of the existing pulse-pipe. These nozzle assemblies will evasé the expansion section which will increase reverse jet flow by 30% and increase flow through the collector by the same percentage.

The cartridge length will be increased to accommodate the new flow level in the cartridge.

The spacer cartridges will be shorter than those applied in level I described above.

Level 3

Level 3 is combined with a variation of levels 1 and 2. Special media such as spun bond, felted or woven media can be provided. Some of these medias are washable and can provide indefinite life.

The limitations of contemporary offerings is that they are often very flexible. When the pressure drop reaches certain levels the pleats pinch and the top of the pleat is squeezed together so that only the bottom 10 to30% of the media in the pleat is actually cleaning.

There are three options available :
Keep pressure drop low by cleaning systems control.
Use combination “on line “ and “off line “ cleaning.
Provide cartridges with proprietary pleat spacers on the inside of the pleats.

Level 3A

Increase header capacities so that the collector can be cleaned in vertical rather than horizontal rows (by installing parallel headers).

Cartridge Retrofit Procedure

Eligibility

Like all retrofit projects, we must select those that offer at least a 98% chance of success. The requirements are the following:

1) Applications where the dust loading is uniform and the dust is granular. Typical are metal burning, welding, metal grinding, dry machining, etc.
2) Where the exhaust does not contain condensable hydrocarbons.
3) The cartridges and/or pulsing nozzles must be accessible.

Problems that can be solved

a) Leakage around seals because of over compression or wrong seal material selection. In this case the seals are replaced and new cartridges installed. Generally, the dimensions of the new and old cartridges are identical. The cartridges will have considerably wider pleat spacing than the original cartridge.
b) Bridging If the seals are properly designed, the retrofit can consist of the same steps as in (a) above.If the bridging is due to bad selection for the application when collectors are applied to processes with widely varying loads, the cartridges must be changed to pleats with wide spacing and operated with pressure drops that do not pinch the pleats and collapse the tops of the pleats on the dirty side. This requires adjusting the pulsing controller to the fastest cleaning frequency, adjusted to the highest loading level rather than to the average loading level.
c) Increased flow or decreased pressure drop Sometimes proper design of gasket and stops will solve both of these problems in (a) and (b) above. Sometimes, addition of converging diverging nozzles, single or multiple nozzle assemblies will be required to increase flow rate by 40% at lower pressure through the collector. This requires easy access to the pulse pipes.
d) Conversion to equivalent of cylindrical bag performance. New rigid media cartridges will soon be available to handle some non granular dusts . For some applications modifications outlined in (a) may be indicated.
e) The sequencing control and duration of the pulse often needs to be altered.
f) In some cases, external changes in the accumulators may be required to vary the sequencing order. Most horizontal cartridge collectors pulse in horizontal or diagonal rows. The change to cleaning in vertical planes is usually required.
g) Vertical cartridges with top access usually can be remedied easily by wider spaced pleats and new pulse pipes if increased capacity is required.
h) Baffles may need to be altered, replaced or removed to allow dust to fall into the collection hopper.
i) Venturi type inserts are usually not changed.

In all cases a spent cartridge must be inspected and a report issued before new cartridges are supplied. The non refundable inspection charge is $250 plus return charges fee for the spent cartridge, if the collected dust requires special disposal.

LAB TESTING: QAM's test facility will examine the cartridge for bridging, presence of moisture or condensation, evidence of dust leaking to the clean side, oil in the media, permeability of the media, strength tested, type of dust in that application and it's characteristics.

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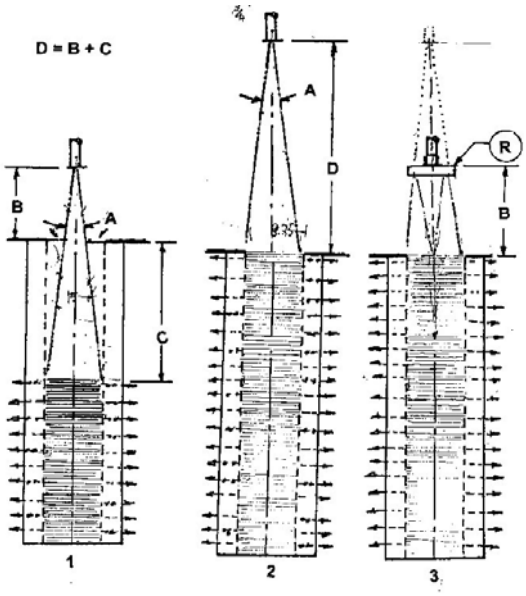
Modify the pulse-pipe design:

- Figure 1 shows the typical blow-pipe arrangement. It will be noted that only half the media is cleaned by this pulse-jet.
- Figure 2 shows the correct arrangement required to completely clean a cartridge filter. The distance of the pulse pipe from the opening of the cartridge "D" must be "B + C". This is not practical to achieve since it requires placing the pulse-pipe outside the collector because the clean air plenum is too small.
- Figure 3 shows QAM's exclusive Pulse Pipe Adapter "R". It is a custom designed multiple supersonic nozzle assembly. This device spreads the pulse-jet, thereby sealing the top cartridge opening, creating the desired compression wave for the entire length of the cartridge.

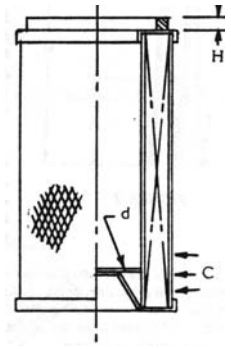


Result:

1. It also produces 3.6 times more HP of energy to power the cleaning jet.
2. Increases airflow volume per cartridge by up to 70%.
3. Filter life is at least doubled.
4. Optimize the operating pressure of compressed air to the cleaning system for the specific application.
5. Match the pulse pipe orifice to the valve diaphragm.

Cartridge Filter Element Upgrade:

- QAM's new "Premium" cartridge filter. These filters are no more costly than conventional cartridges.
- Correct leaks, using an advanced design of the gasketing system "H" which prevents lost resiliency of the seal.
- Modify cone-shaped "C" bottom end-cap. This corrects dust penetration to the clean side of the filter, a killer of cartridges.
- Cartridge outlets may be improved to reduce the dust collector pressure drop by as much as 50%.
- Pulse-pipe modifications, as described above, allow for increased pleat spacing. This prevents pleat-pinching, bridging, media plugging and improves clean ability.
- Cartridge filter life is increased up to 500%.
- New media selections; provide easier cleaning and are application specific.



Other Retrofit Strategies:

A. Usually requires new start-up and operating procedure.
B. The sequencing control and duration of the pulse often needs to be altered.
C. Prevent condensation in cleaning systems or process.
D. Noise suppression compounds can be fed into the collector to lower noise and enhance collection efficiency.
E. Add a "Manifold Heater" or "Automatic Manifold Drain" to prevent condensation on the cartridge filter due to the refrigeration cycle of the compressed air supply.
F. Pneumatic Pulsed Booster can be installed without removing or altering ductwork at minimal cost