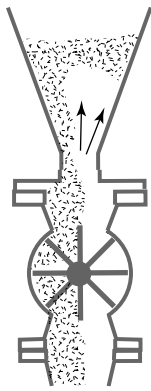
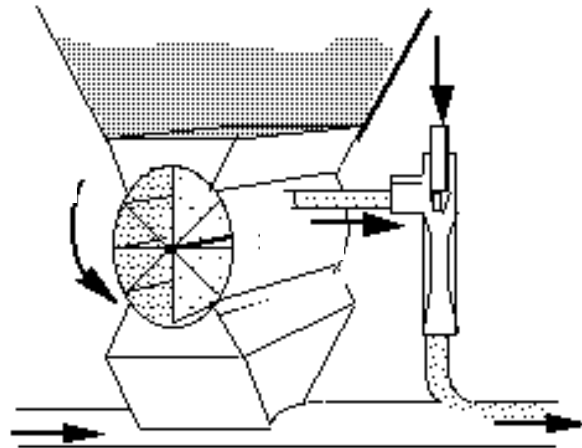


Fox Venturi Eductors for Venting Blowback from Rotary Valves

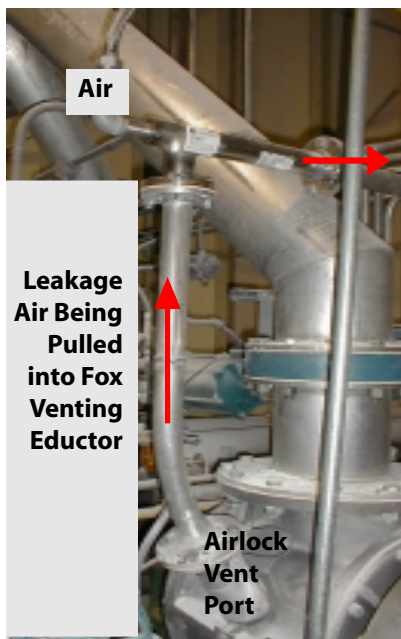


***Eliminate Low Feed
Rates and High Wear
Rates Due to
Blowback***



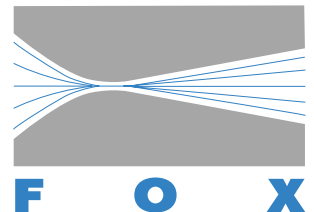
**Fox Eductors:
Venting & Replacing Airlocks,
and
Conveying Solids**

...since 1963



Bulletin 360C

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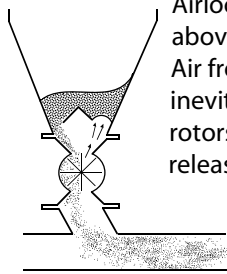


Venting Blowback from Rotary Valves

Airlocks, Airlocks, Airlocks.

Rotary airlocks are the most common means for introducing bulk solids into positive, pneumatic conveying systems. They've been specified for use in pneumatic conveying systems for decades. Airlocks represent the sweet spot of the comfort zone for many consultants and pneumatic conveying system designers who frequently specify airlocks for applications for which they are ill-suited, but who find it easiest to install familiar rotary valves, no matter what the application, rather than investigate venturi eductors instead.

What's Blowback?



Airlocks isolate and dose solids sitting above a positive pressure convey line. Air from the conveying system inevitably leaks past clearances in the rotors, as well as the pulses of air released as each empty 'pocket' is rotated upwards. This release of air is called **blowback**.

What's the problem?

Blowback causes a number of problems, ranging from minor nuisance, to bad, to very bad, to catastrophic:

• Reduced Feed Rates

Blowback up into the feed hopper can so severely disrupt bin flow that throughput from the airlock can be 30 - 70% below expectations

• Hammerring of Silo or Bin Outlets

Maintenance folks are known to damage outlets with hammers in an attempt to move powders hung-up or clogged by blowback.

• High Wear and Erosion

Blowback, particularly with abrasive powders, can be responsible for rapid wear to airlock seals, bearings, and housings, causing sudden failures and requiring frequent maintenance.



• Fugitive Dust, Leakage, Waste

Blowback results in dusty, dangerous work environments and when handling foods, housekeeping/pest problems.

• Degraded Effectiveness of Process Equipment

Leaking airlocks cannot be placed under screeners and sifters, which often turn sieves into fluid beds.

Aren't airlocks supplied with a vent line to avoid blowback problems?

Many airlocks are installed with a vent line that rises vertically to the bin above. However, since the air flow into this vent line is not controlled, any solids blown into this line may not be fluidized, and they may, therefore, settle and clog.

How do Fox Rotary Valve Venting Eductors help?

Fox Rotary Valve Venting Eductors (RVE's) are used to suck blowback air + suspended solids out of the airlock and pneumatically convey them to the destination of choice: bin above, convey line below, other.

What Results Can We Expect with a Retrofit?

It depends on how bad your blowback problem was in the first place. But over the last 25 years, we've seen the following widely varied results:

• Increase in Airlock Feed Rates

We've seen airlock throughput jump a small amount to as much as 50 - 80% with the elimination of the blowback bubble stopping the flow of material into the airlock.

• Decreased Wear, Increased Service Life

We've had customers who replaced airlocks every few months say they last many times longer after retrofit with Fox eductors.

• Fugitive Dust - Eliminated

• Leakage & Waste - Eliminated

• Blowback into Screeners - Eliminated

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Estimating Airlock Leakage

Obviously, the single most important parameter in specifying an RVE eductor is; just how much blowback is coming out of this airlock/ How much air+suspended solids must a Fox RVE Venting Eductor convey?

Unfortunately, this is not an easy matter. It is important to remember that, unless your airlock was installed yesterday, published leakage data from the airlock manufacturer is almost irrelevant to this analysis:

- 1) Published leakage data tends to understate leakage air flow rates
- 2) Any maintenance performed on the airlock, particularly involving dis-assembly, can and will affect leakage rates.
- 3) Operation - even of just a few weeks - with abrasive products can increase tip clearances. Airlocks that have been in service months or years can have leakage rates of 200 - 400% of published SCFM.

Fox Valve tries to be cooperative in helping our customers to address problems involving this unknown parameter. We often suggest trying a smaller eductor (1-1/2" minimum) to keep motive air requirements low, hoping to vent enough (if not all) blowback to solve the problem. However, a swap for a larger RVE may be necessary.

Injecting Back Into the Convey Line.

Of course, the neatest and simplest solution is for the Fox Venting Eductor to inject the blowback +suspended solids right back in the convey line. This certainly can be done. However, if the convey line is at 4 psig or 8 psig, the eductor must suck in blowback at 0 psig and compress this gas stream up to 4 or 8 psig - a serious bit of compression work.

For these applications, plant compressed air at 50+ psig is required. This is a very expensive solution that should be considered only for small leakage flow rates. Not only is the continuous power cost of the compressed air high, but the injection of additional air into the conveying system can increase transport velocities in the convey line, perhaps causing wear when handling abrasive powders.

Can't we just bleed some air from the main conveying blower, direct it to the venting eductor, and reinject back into the convey line?

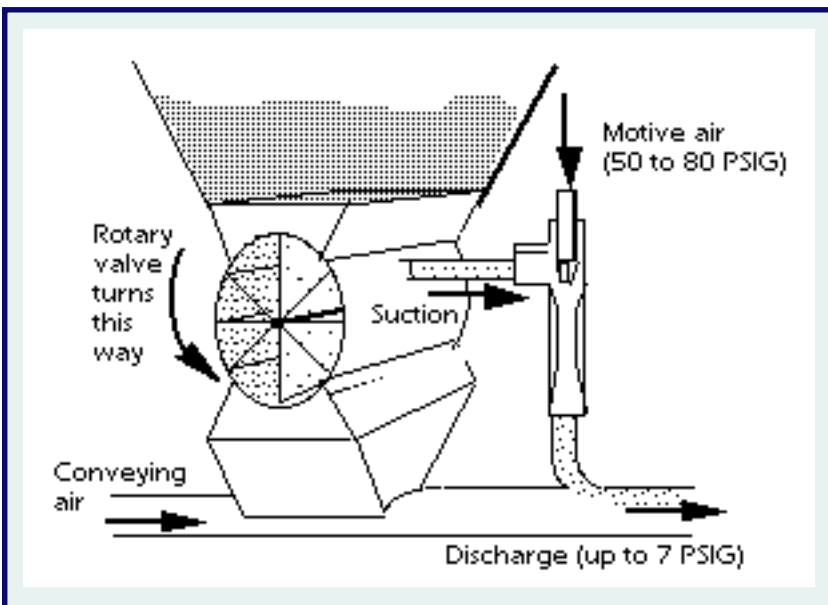
That sure would be swell if it worked! Unfortunately, driving an eductor with air at 10 psig, to suck in air at 0 psig, and then discharge back into 8 - 10 psig is not possible.

How much air do we need?

Except for very small leakage flow rates, usually more compressed air than most plants are willing to devote to this problem. Typically, more than twice as much compressed air is needed as the blowback flow to be vented; for example, to compress 20 SCFM of blowback and enable it's injection into a convey line at 7 psig, 40 - 50 SCFM of compressed air must be used. That a lot. By contrast, directing the

same 20 SCFM of blowback up to the top of the hopper/bin/silo with an RVE ejector takes only 10 - 15 SCFM of compressed air. That's a big difference!

Request **Fox Case Study #32** to learn about a specific application where retrofit with a Fox RVE Eductor made a huge difference!



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Avoiding Use of Compressed Air...

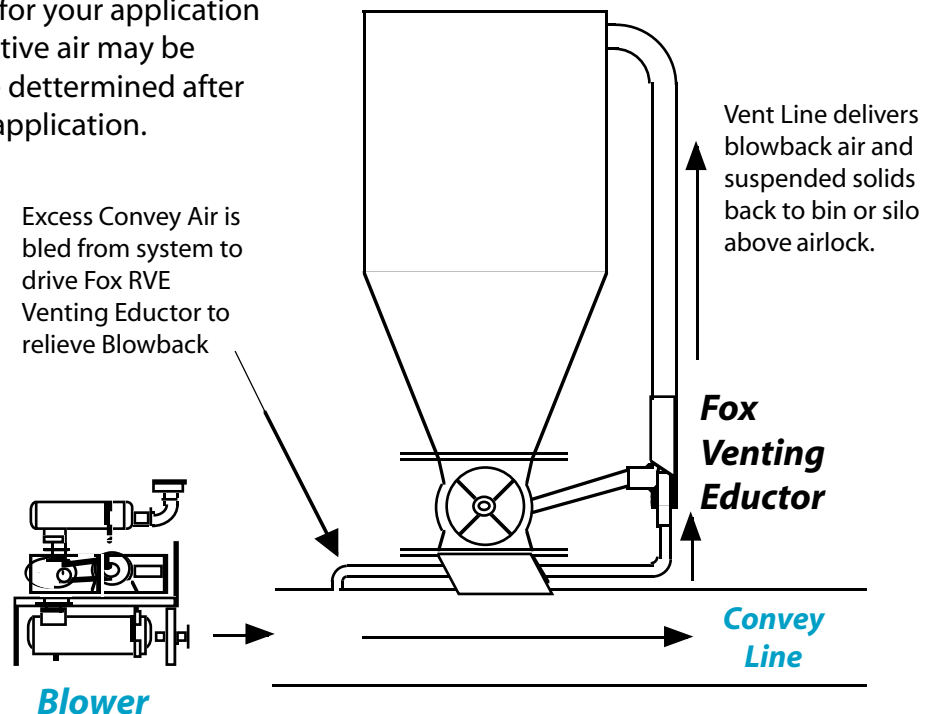
Injecting Back Up the Silo/Hopper/Bin.

Can We Bleed Excess Air from an Oversized Blower Driving the Conveying System?

Some airlock and blowback problems occur because the main blower has been oversized by overcautious designers. If at least 30 - 40 SCFM or more can be diverted from the from the convey line, with enough blower output remaining to drive the system, then this can be used to drive the smallest eductors Fox will provide in this mode of operation - a 1-1/2" RVE eductor discharging through a 1-1/2" line. (We consider attempting to use a smaller line, such as 1" (25 mm) as not prudent and too prone to clogging.) Please note that a 1-1/2" venting eductor may be too small for your application and significantly more motive air may be required. This can only be determined after Fox reviews your specific application.

The easiest place to vent blowback air and suspended solids is right back up into the silo or bin feeding the airlock, since this vessel is usually at atmospheric pressure. However, this line can be directed to any one of a number of places - a central dust collection line, the same final destination as the main convey line, or any vented vessel at 0 psig.

Required motive airflow rate is typically 50 - 75% of the leakage flow to be handled.



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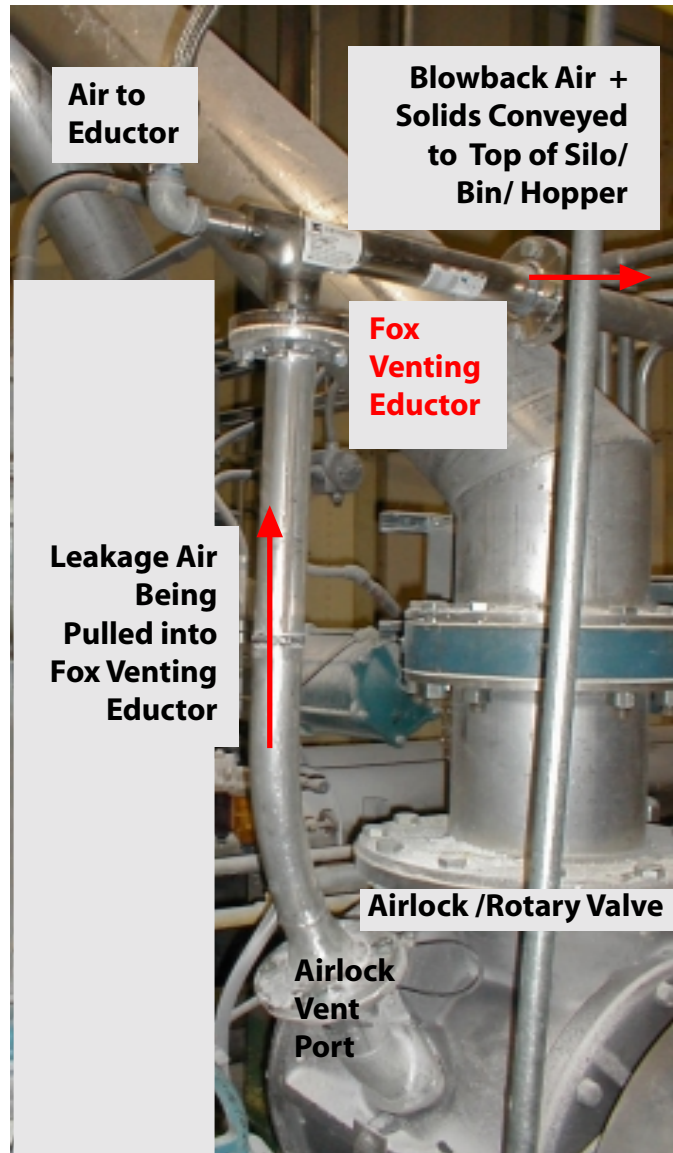
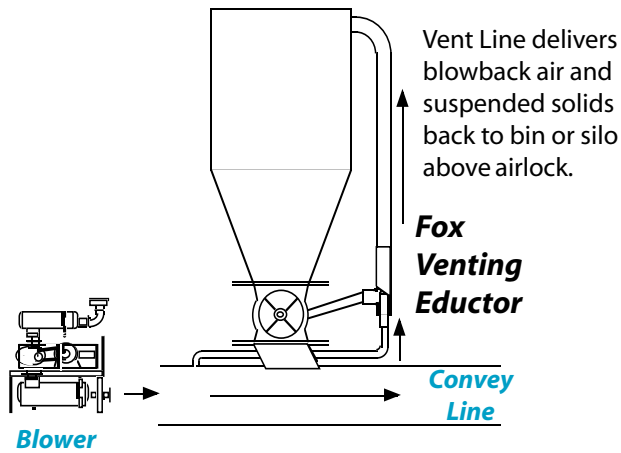
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Avoiding Use of Compressed Air...

Injecting Back Up the Silo/Hopper/Bin.

Photo at right illustrates an effective installation of a Fox venting eductor used to relieve severe blowback from a large rotary airlock.



Fox Venturi Eductors

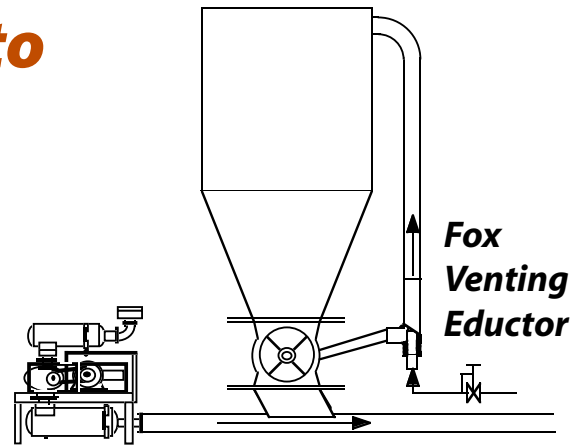
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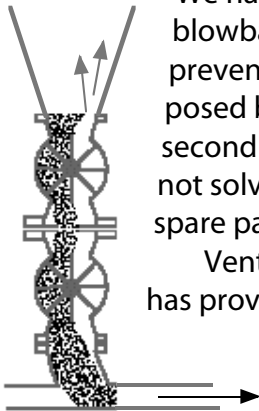
Using Compressed Air to Inject Blowback into Bin/Silo Above Airlock

In some applications, the existing main blower does not have excess capacity available to be used to help solve a catastrophic blowback problem by driving an RVE Fox Venting Eductor. In these cases, expensive compressed air can be used.



In certain applications, users prefer to use expensive compressed air to drive a venting eductor.

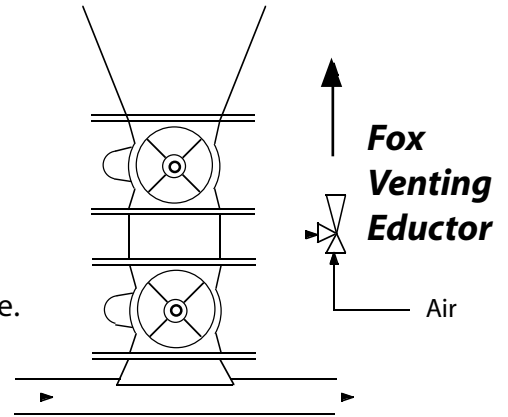
When Two Airlocks Aren't Better Than One!



We have seen many installations where severe blowback from an installation of one airlock prevented outflow of material. The solution proposed by the system designer is often to install a second airlock above the first, which usually does not solve the problem and creates even higher spare parts and maintenance costs.

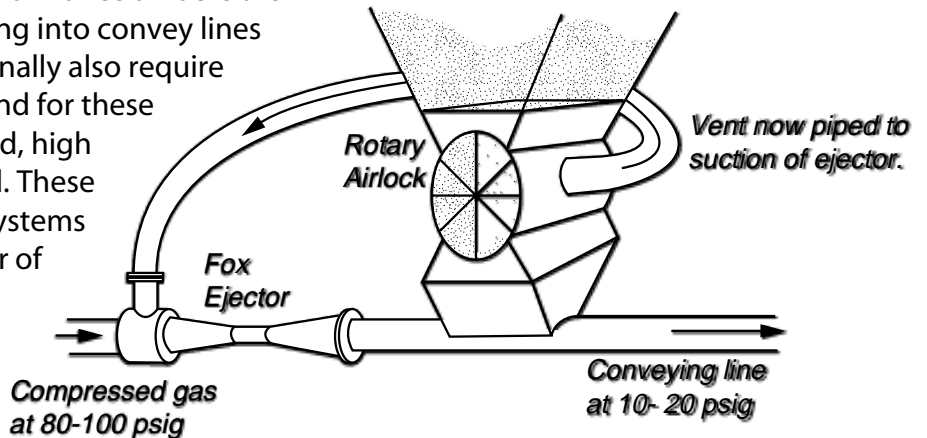
Venting the volume between the two airlocks has proven to make a big difference in performance.

Request **Case Study #18** to see a typical application.



Venting Intermediate-Phase Airlocks

A new generation of high-performance airlocks are designed for service discharging into convey lines at 15 or 20 psig. These occasionally also require venting of severe blowback, and for these installations, specially designed, high performance ejectors are used. These are typically applied in large systems handling more than 50 tons/hr of material.



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Application Data Sheet Fox Venturi Eductors for Rotary Valve Venting

Please provide the requested information so that Fox can prepare a quotation on a performance guaranteed venturi eductor.

Company Name & Address: _____

Contact: _____ Phone: _____ Fax: _____

Will the eductor Discharge into the Conveying Line? Yes No

If yes, at what pressure is the conveying line? _____ PSIG.

OR

Will the eductor Discharge into a vessel (or silo/bin/process)? Yes No

If yes, at what pressure is the vessel? _____ PSIG,

and, how long will the conveying line to the vessel be? _____ ft hor, _____ ft ver

OR

Other (please describe) _____

Estimated volume of "blow-back" air: _____ SCFM **(Must be completed)**

Estimated flow rate of "blow-back" solids _____ lbs/hr

Flange size of rotary valve: _____

Material Conveyed: _____

Bulk Density _____ Particle Size _____

Abrasive Characteristics _____

Req'd Material of Eductor: Stainless (304) Wear Treated (hardened carbon steel))

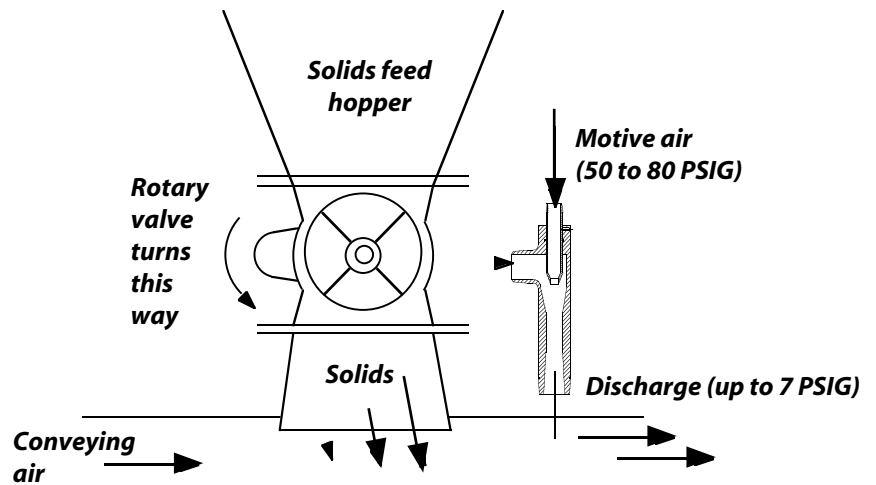
Motive Air Available: Pressure _____

Max. Flow Rate Available, SCFM _____ Temp. _____

Special Requirements: _____

Estimating Compressed Air Usage to Inject Blowback into Convey Lines

You will only know exactly how much motive air is required to drive a Fox RVE eductor after you have completed and submitted the data sheet On page 7. However, below is a rough guide to what motive air usage is required for a small group of typical venting application.



Eductor size:	Motive air consumption, SCFM		BLOWBACK Flow Rate to be Vented (air + solids), SCFM Discharging into 7 psig
	50 PSIG	80 PSIG	
1"	20 SCFM	20 SCFM	9 to 11 SCFM
1-1/2"	45 "	45 "	22 to 25 SCFM
2"	80 "	80 "	40 to 48 SCFM

The above is provided for estimating purposes only. Convey line pressure of below 7 psig will enable use of LESS motive compressed air; line pressure above 7 psig will require higher motive air flow rates.

To Receive a Quotation:

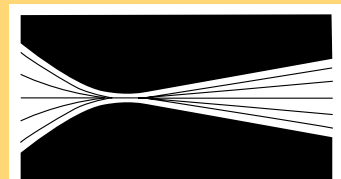
To receive a quotation on a Fox Venting Eductor, please simply request an Application Data Sheet for these applications: ADS-360. Estimating airlock leakage air flow is the critical sizing parameter, yet is somewhat difficult to predict.

Additional Technical Literature

The following Brochures are available upon request:

Bulletin Number:

- 301 — Solids Conveying Venturi Eductors/General Intro
- DataBase of 3400+ Existing Solids Conveying Installations
- 302 — Fox Blower/Eductor Conveying Systems
- 305 — Eductors for Conveying **Plastic**
- 350 — Eductors for Conveying **Foods**
- 307 — Eductors for Conveying **Cement**
- 305 — Eductors for Conveying **Act. Carbon/Limestone**
- 280 — Air Jet Ejectors
- Published Case Study: 10 Years of Conveying w/o Maintenance
- 052 — Fox Venturi Products - General Catalog (8 pages)
- 106 — Liquid Slurry Eductors for Mixing Solids with Liquids



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