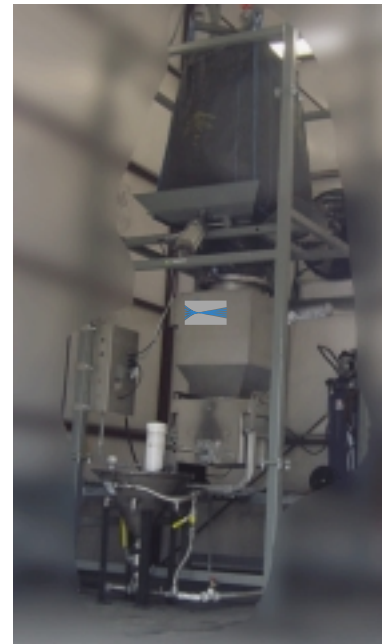
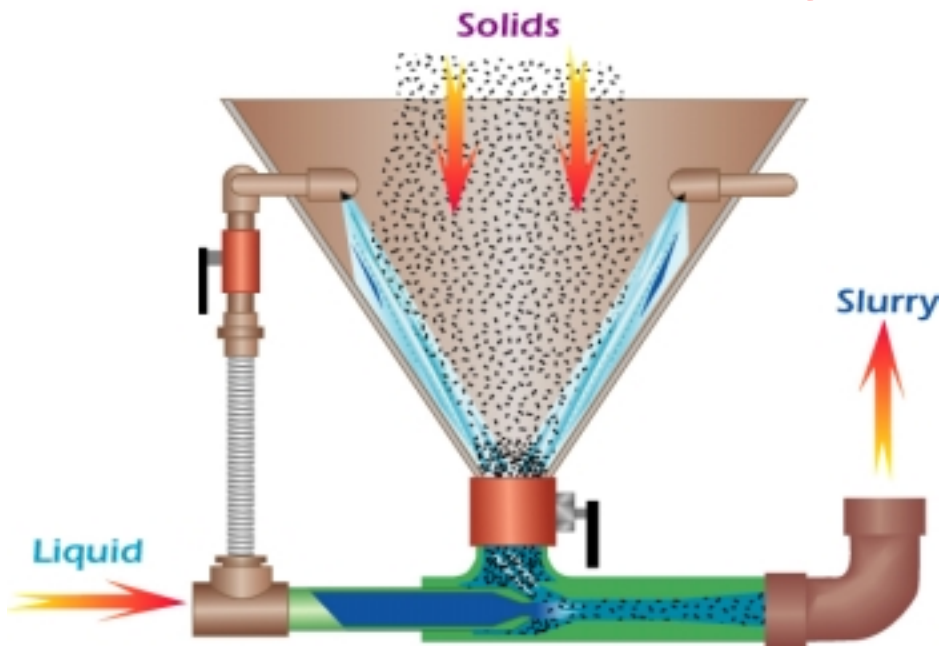
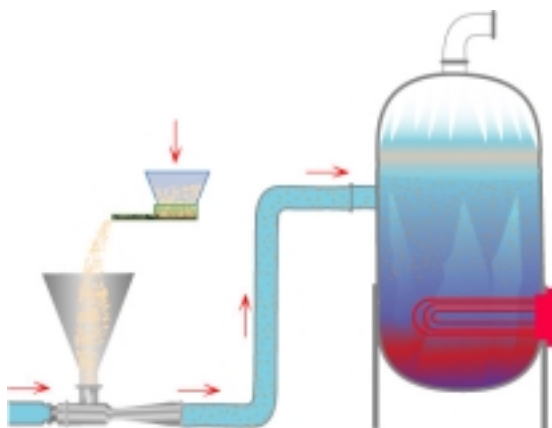


# Fox Slurry Eductors for Mixing Powders with Liquids



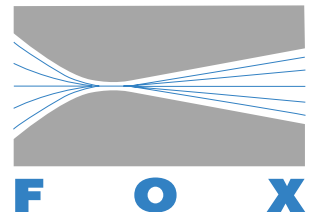
*A Fox Slurry Eductor is integrated with a bulk bag unloader and screw feeder for automated feed of activated carbon at a water treatment plant.*



*A USDA-Approved Slurry Eductor Blends Additives into Milk at a Dairy*

**Bulletin 106C**

**Fox Venturi Eductors**  
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# Fox Slurry Eductors

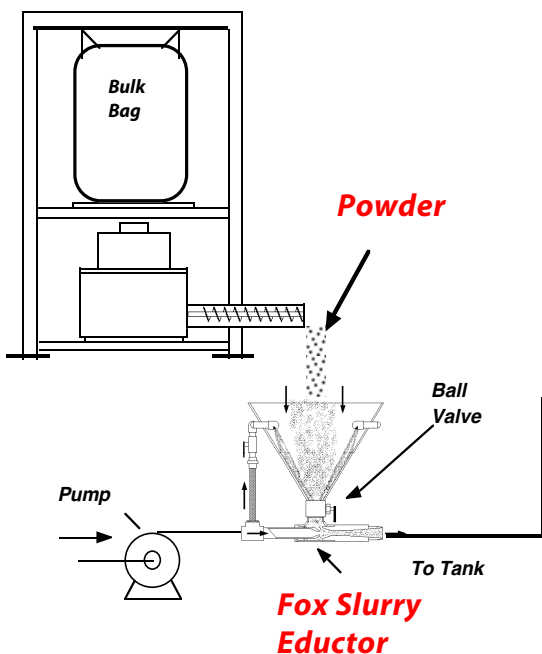
**Slurry Eductors** are used to introduce solids into liquids with no moving parts. They are an ideal way to continuously produce solutions or well blended slurries and are commonly used in chemical, food, power, pharmaceutical, and waste water applications. As with Fox solids conveying eductors, they have been installed with an enormously broad range of products. Applications of Fox slurry eductors range from adding a few pounds per hour of whey into a milk stream to transporting over 100 tons/hr of flyash at a power plant.

For handling hard-to-wet powders, often used as thickeners and stabilizers in emulsions and suspensions, **Fox Co-Axial Slurry Eductors** offer an extremely good solution. They provide almost instantaneous hydration and avoid clumps and 'fish-eyes'. They have been used with polymers, such as Carbopol, and foods such as guar gum and carageenan.

**Eliminate:**  
**Manual dump-**  
**ing of**  
**powders...**



**Replace manual with a continuous**  
**liquid/solids blending operation.**



**From Batch to Continuous Liquid/Solids**  
**Blending or**  
**To Automate Solids Feeding**

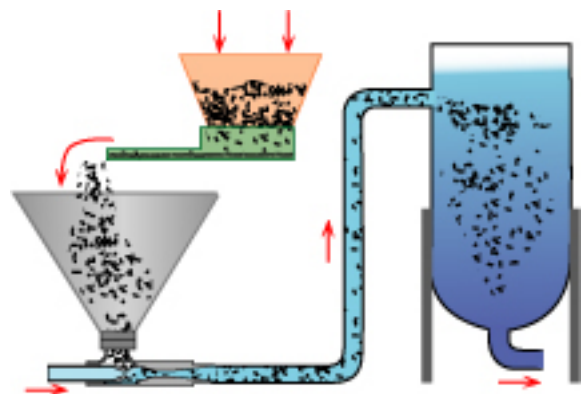
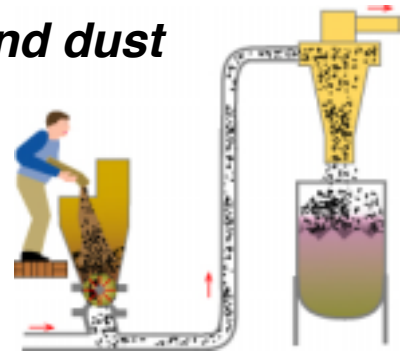
The addition of powdered products into tanks is often left as a manual operation even in otherwise highly automated plants. Scoops, buckets, bags - and their accompanying dust and spillage - still often surround tanks and mixers.

See Page 4 to see how this can be easily converted into a fully automated, highly reliable, continuous blending process.

**For a Quotation:**

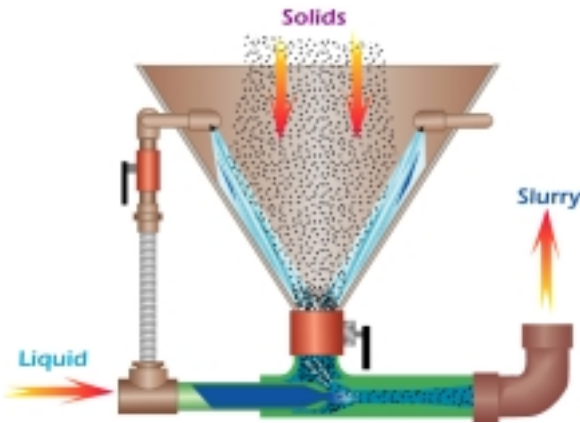
Simply print the data sheet on the last page of this document, and fax to Fox at 973-328-3651.

**Eliminate:**  
**Pneumatic transfer**  
**systems and dust**  
**collection.**



Please note that Fox slurry eductors require evenly metered feed. They cannot be flood fed beneath bag dumps, bulk bags, or bins.

Fox slurry eductors are available in carbon steel, stainless, and USDA-approved/ food-grade configurations. See the next page for [The Ten Most Commonly Asked Questions about Slurry Eductors.](#)

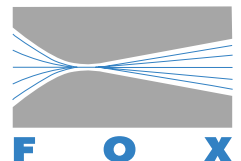
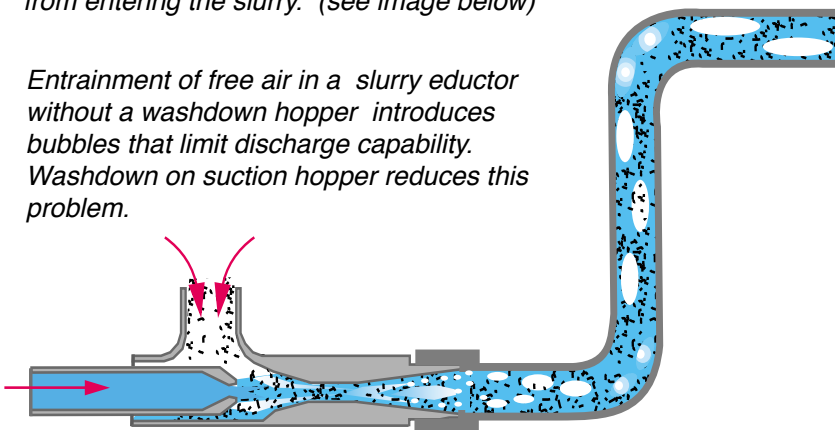


# Fox Slurry Eductors

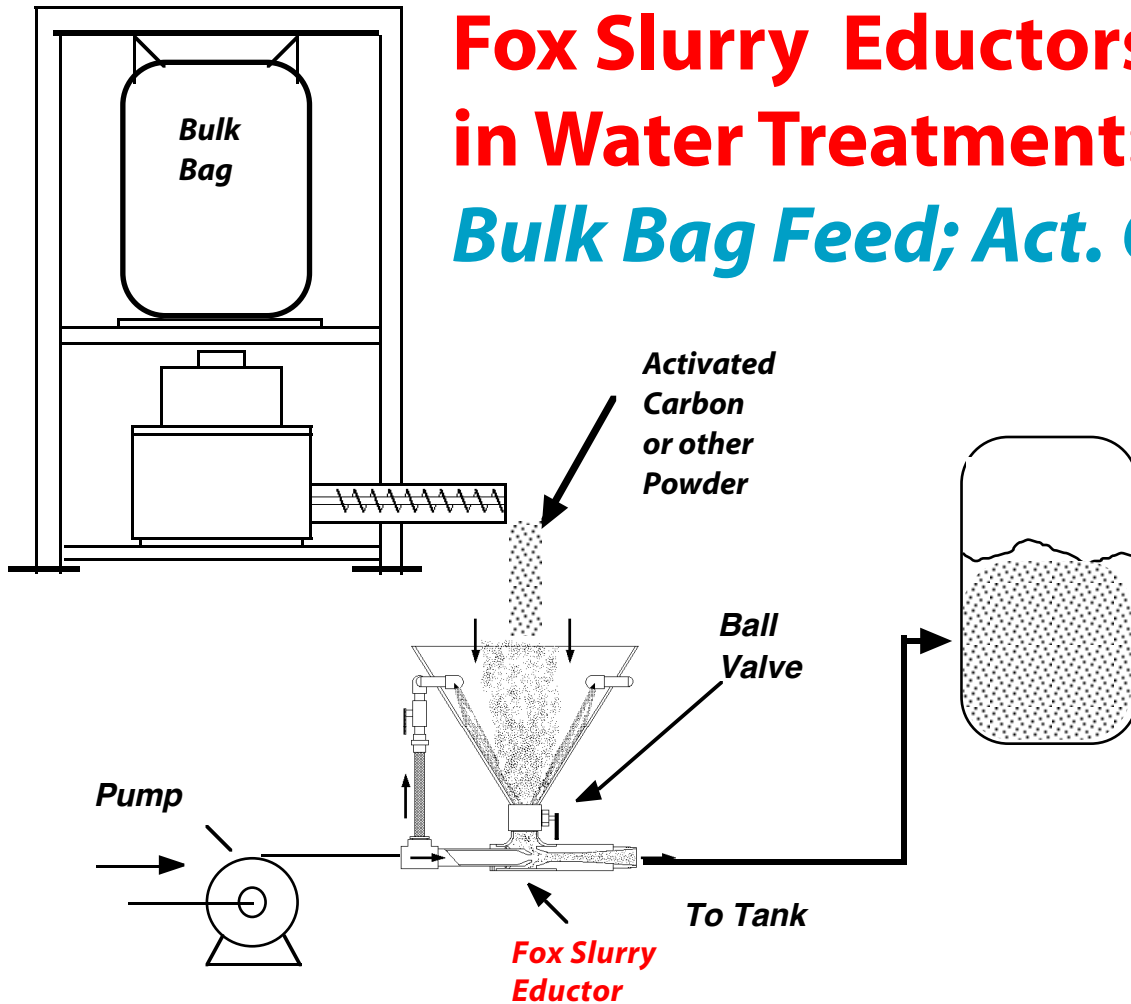
## The Ten Most Commonly Asked Questions About Slurry Eductors

- 1 **What is the maximum solids concentration that can be achieved?** About 10 - 20% or about 1-2 pounds of solids per gallon of liquid. This is largely dependent on the solid's bulk density, solubility, and flow characteristics.
- 2 **What's the single most important factor in determining whether a slurry eductor can work for my application?** Discharge piping and downstream pressure loss. Reduce the vertical lift, reduce the number of elbows, increase the pipe size if possible--in other words, minimize overall pressure drop through the system.
- 3 **How should the eductor be fed?** Fox slurry eductors, unlike dry conveying eductors, need evenly metered feed. Flood feeding can sometimes cause bridging or clogging.
- 4 **When is washdown on the solids feed hopper required?** Whenever mass flow rates are relatively high or discharge piping is either long, or has significant vertical lift, or both.
- 5 **Why are slurry eductors without washdown so sensitive to discharge pressure?** If the suction port of the slurry eductor is entraining a dry solid and is open to atmosphere, it will inevitably suck some free air into the downstream pipeline. These air bubbles will continually expand as the pressure gradient through the pipe approaches atmospheric, creating larger and larger bubbles that will effectively limit suction flow rate. Washdown provides a water seal that prevents free air from entering the slurry. (see image below)
- 6 **What's the effect of the viscosity of the motive fluid? What about the viscosity of the discharged mixture or slurry?** If motive fluid viscosity is over 200 centipoise, solids suction flow is greatly reduced and becomes unpredictable. Discharge viscosity has a dramatic effect on performance, since viscosity is directly related to pressure losses downstream.
- 7 **Can a slurry be recirculated to increase the solids/liquid concentration?** Only with non-abrasive solids. High velocity in the motive nozzle would result in very rapid wear if any abrasive slurry is recirculated.
- 8 **When and why is a valve necessary between the feed hopper and the eductor suction port?** This valve prevents the contents of the discharge line from backing up into the feed hopper. It is used during startup and shutdown in cases where the discharge line is at a higher elevation than the eductor. This valve eliminates the use of check valves, which can be troublesome if solids are present.
- 9 **What type of valve is used?** A full ported shut-off ball valve or pinch valve. It should never be used to control or regulate the mass flow rate of solids into the eductor.
- 10 **What line velocity should be used in the discharge piping?** Velocity should be: a) Low enough to minimize  $\Delta P$  through the convey line, but b) High enough to keep undissolved solids in suspension. Generally, 6-8 ft/sec is adequate.

Entrainment of free air in a slurry eductor without a washdown hopper introduces bubbles that limit discharge capability. Washdown on suction hopper reduces this problem.

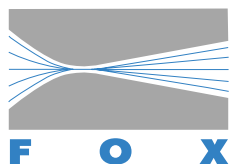
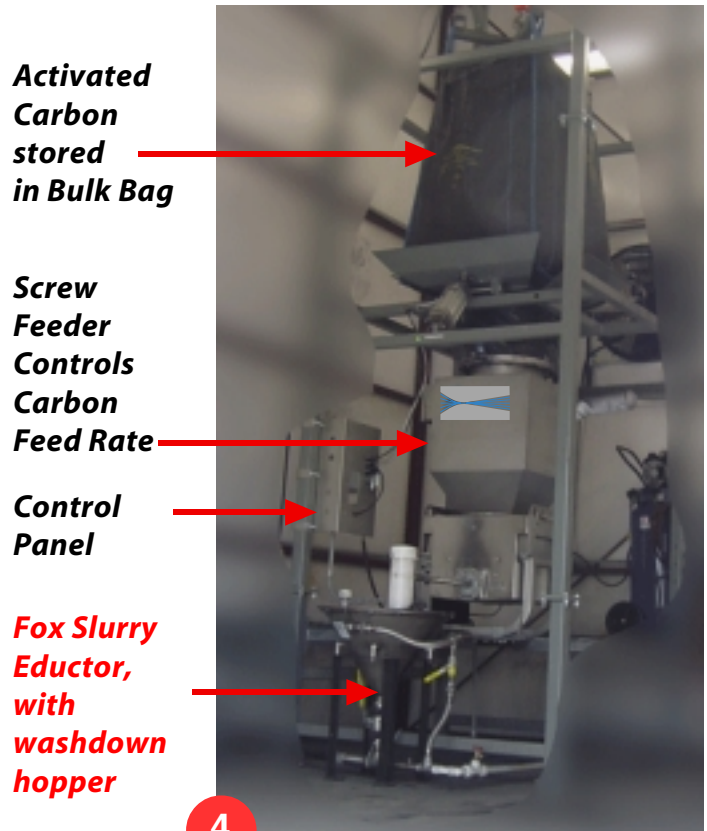


# Fox Slurry Eductors in Water Treatment: Bulk Bag Feed; Act. Carbon



Fox Slurry Eductors are widely used in water treatment and waste-water treatment plants to add chemicals. In one of the most common applications throughout municipal water treatment plants, Fox slurry eductors are integrated with a bulk bag unloader and a screw feeder to provide a fully automated activated carbon feed system. The carbon is typically used to adsorb organics to remove contaminants, and unpleasant tastes and/or odors.

The system shown in the photo at right is currently installed at a municipal water treatment plant. This plant previously prepared activated carbon slurries using a batch system, manually dumping carbon from sacks into a 300 gallon tank. When they needed to upgrade to a fully automated system that could run with 24/7 reliability, they used a Fox rep to integrate the bulk bag unloader, screw feeder, and slurry eductor into a system that has worked perfectly since its installation.



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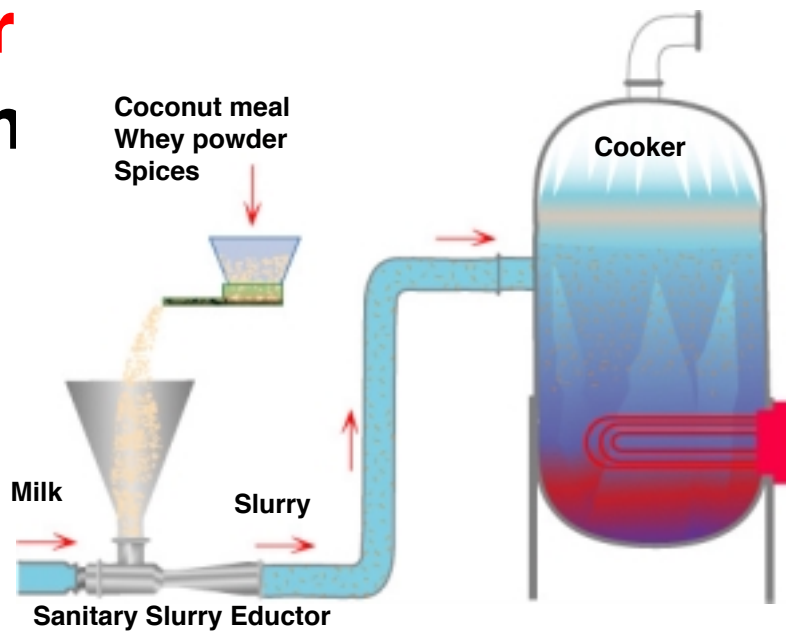
# Fox Slurry Eductor

## Typical Application

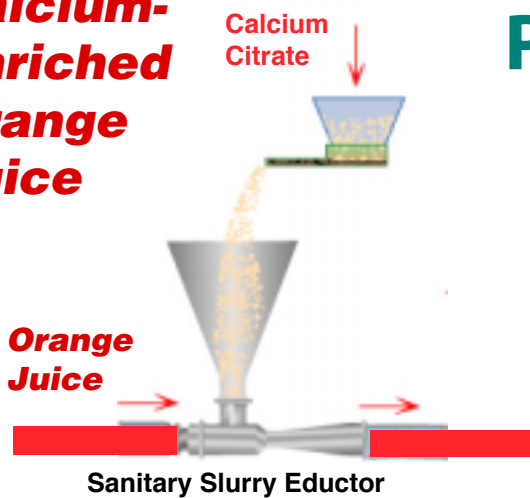
### Food/Dairy

**Coco Powder, Whey, and Spice Additives into Milk:** Here a dairy manufacturer needed to continuously blend pulverized coconut meat, whey, and flavorings into milk on its way to an interim process.

The motive nozzle in the slurry eductor maintains the milk at a fixed, constant flow rate, enabling three loss-in-weight feeders to drop additives into the washdown hopper at a constant feed rate, producing the desired mixture with uniform solids/liquids ratio.

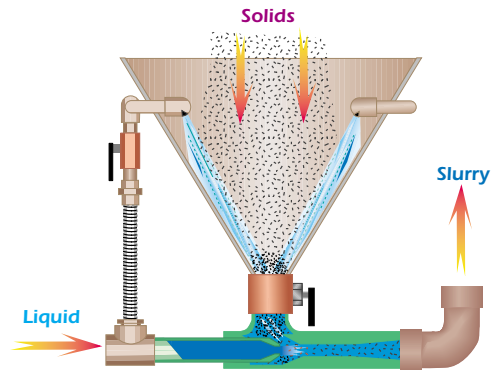


### Calcium-Enriched Orange Juice



### Plastic Compounding

**Plastic pellets from pelletizers:** Fox eductors have been used for twenty years to transport plastic pellets from the end of extruder lines and various types of pelletizers.



### Pharmaceutical Products



#### Mouthwash, Shampoos, Cosmetics

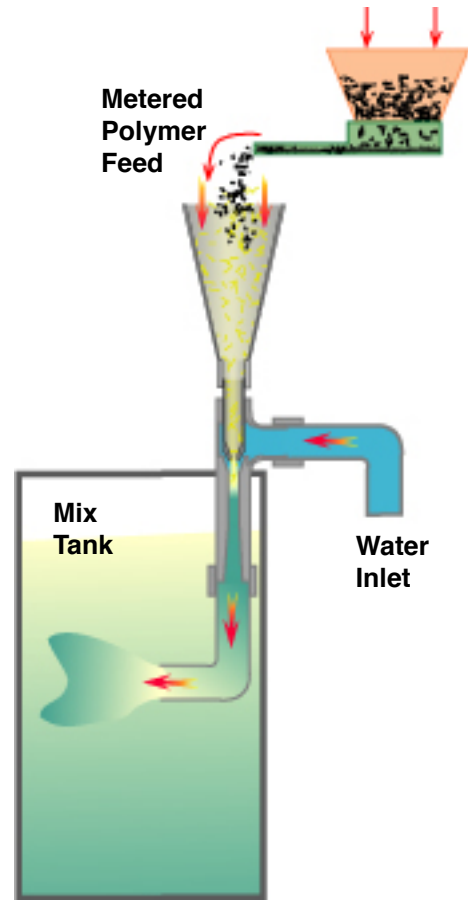
Fox USDA-Approved slurry eductors have been used to blend powders into pharmaceutical solutions for consumer products since the 1970's.

# Fox Co-axial Slurry Eductors

for Dispersion and Hydration of  
'Hard-to-Wet' polymers and  
Additives such as:

**Carbopol®**  
**Emulsifiers**  
**Guar, Xanthan Gum**

*Specially developed polymers, such as Carbopol, and traditional thickeners in food, such as guar gum, are very widely used but are difficult to disperse in liquids. When improperly blended, they will clump, resulting in dispersion defects such as grainy texture, reduced viscosity, or the presence of insoluble lumps known as 'fish eyes.' Many polymer producers recommend use of Fox coaxial eductors. The outlet of the coaxial eductor is directed below the surface of a mix tank, facilitating complete hydration. This is the only acceptable installation geometry.*



## Reduce batch mixing times:

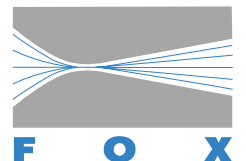


*Mechanical mixing of hard-to-wet food additives like Guar require long mixing cycles to achieve hydration - with frustratingly inconsistent results.*

*Instantaneous wetting with a Fox Coaxial Slurry Eductor (shown above) eliminates mechanical mixing and provides consistent viscosities.*

*Carbopol® is a registered trademark of the B F Goodrich Co*

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# How Much Water (or other liquid)

## Do We Need to Drive a Fox Slurry Eductor

You will only know exactly how much motive liquid is needed to work in a guaranteed Fox Slurry Eductor after you have completed and submitted a Slurry Application Data Sheet. However, the following tables will indicate very approximately how much motive water is required:

### Chart A - Motive Liquid for a 1-1/2" Eductor

**Motive**  
Use Capacity Factor ( Chart C) To Convert Data to other size eductors.

<b>Motive Pressure (psig)</b>	30	40	60	80	100
<b>Motive Flow (GPM)</b>	marginal		45	49	52

### Chart C Capacity Factors

Multiply flow rates in Chart A by factors below to determine Motive water flow rates for 1-1/2" to 6" eductors.

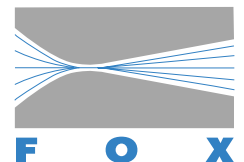
Eductor Size	Capacity Factor
1-1/2"	1.0
2"	1.8
2-1/2"	2.8
3"	4.0
4"	7.1
6"	16

## When is a Slurry Eductor NOT an Option for My Application?

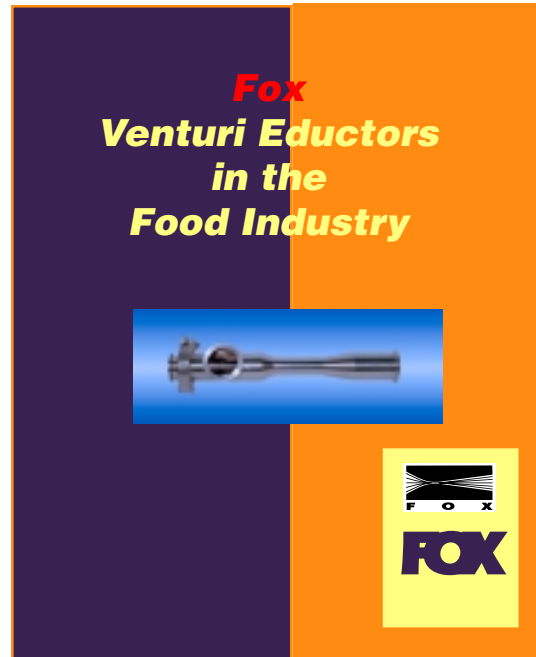
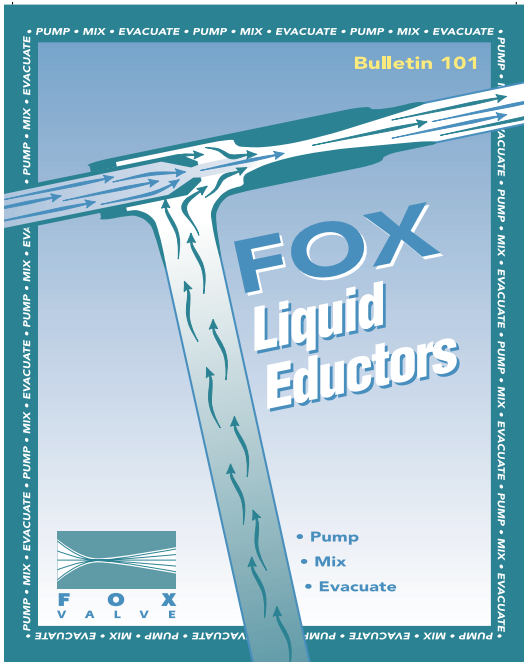
1. Solids/water **ratio exceeds 1:4** and the powder is abrasive, so recirculation is not an option.
2. We have **no plans to buy a screw feeder** or other device to meter powder from a bin or bulk bag or a silo into a slurry eductor.
3. We want the slurry eductor to **suck powder up** out of a drum or bag on the floor.
4. Total discharge pressure downstream of the eductor is higher than one third of the pump pressure we planned on using to drive the eductor.
5. We need to mix a hard-to-wet powder like Carbopol or guar gum and cannot locate the feeder and coaxial eductor directly above the slurry tank.

7

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## Additional Product Literature Available Upon Request:



### Liquid Eductors

#### Request these Slurry Case Studies:

- Case Study #3 — Carbopol
- Case Study #5 — Graphite into Mineral Oil
- Case Study #6 — Guar & Xanthum Gum
- Case Study #7 — Citric Acid
- Case Study #8 — TFE-Coated Hopper w/polymer
- Case Study #9 — Calcium into Orange Juice
- Case Study #10 — Activated carbon from Bulk Bag Unloader

### Solids Conveying Fox Eductors in Food Industry Applications

### To Receive a Quotation:

Request and complete our Application Data Sheet.

#### Additional Technical Literature

The following materials are available upon request:

##### Bulletins:

- 101 — Liquid Eductors
- 105 — Tank Mixing Eductors
- 301 — Pneumatic Conveying with Fox Eductor/Blower Systems
- 350 — Fox Eductor Systems in Food Plants
- 316 — Reclaiming Food Product from Screeners, Packing, Dust Coll.
- 336 — Applications in Plastic Compounding with Fox Eductors
- 203 — Steam Jet Ejectors and Vacuum Systems; including Evaporative Cooling of Kettles and Retorts
- 205 — Thermocompressors, used in Evaporator Systems
- 261 — Steam Spargers and Tank Heaters
- 280 — Air Jet Ejectors



### FOX VALVE

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# Fox Slurry Eductors - Application Data Sheet

Fox Venturi Eductors from Fox Valve

Dover, NJ 07801 / [www.foxvalve.com](http://www.foxvalve.com)

Phone: (973) 328-1011 / Fax: (973) 328-3651 / E-Mail: [info@foxvalve.com](mailto:info@foxvalve.com)

Please provide the requested information so that Fox can prepare a quotation on a performance guaranteed slurry eductor. Discharge piping configuration is critical to slurry eductor performance. This data sheet will constitute your formal technical specification for this part and subsequent deviations or changes could void our performance guarantee.

Company Name: \_\_\_\_\_ Contact Name: \_\_\_\_\_

Company Address: \_\_\_\_\_

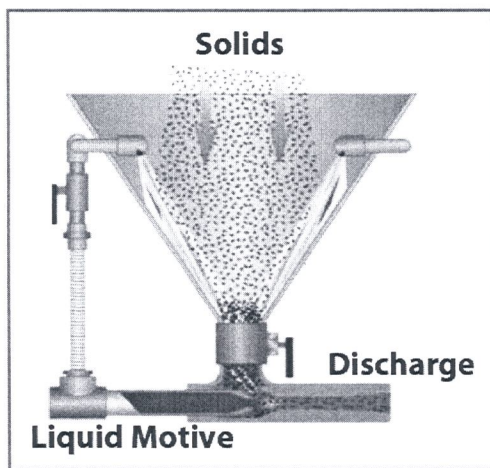
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-Mail: \_\_\_\_\_

## 1) Motive Liquid Conditions: (Primary Operating Fluid)

Fluid Type:  Water  Other: \_\_\_\_\_ Specific Gravity: \_\_\_\_\_

Flow Rate: Available \_\_\_\_\_ GPM Max. Pressure Avail.: \_\_\_\_\_ psig Temp.: \_\_\_\_\_ °F

Are solids present in this fluid?  Yes  No *Viscosity must be below 900 SSU or 200 cs*



## 2) Suction Conditions: (Solids to be mixed with liquid)

Type of Solid: \_\_\_\_\_

Bulk Density: \_\_\_\_\_ lb/ft<sup>3</sup>

Required Flow Rate: \_\_\_\_\_ lb/hr

Particle Size: Nominal: \_\_\_\_\_ Max.: \_\_\_\_\_

Pellets  Irregular  Tacky when wet  Free Flowing

Dissolves in solution  Abrasive  Hygroscopic

## 3) Discharge Conditions

Downstream Pipe Geometry: Horiz.: \_\_\_\_\_ ft. Vert. Up: \_\_\_\_\_ ft. Vert. Down: \_\_\_\_\_ ft.

Number of Elbows: \_\_\_\_\_ Is slurry line discharging into a vessel at 0 psig?  Yes  No

Is discharge pipe size installed or already selected?  Yes  No

If yes, what size? OD: \_\_\_\_\_ ID: \_\_\_\_\_ Valves or restrictions in line? \_\_\_\_\_

Required Material of Construction:  Stainless Steel  USDA-Approved  Carbon Steel

Preferred End Connections:  Flanges  NPT  Other: \_\_\_\_\_

Special Requirements: \_\_\_\_\_