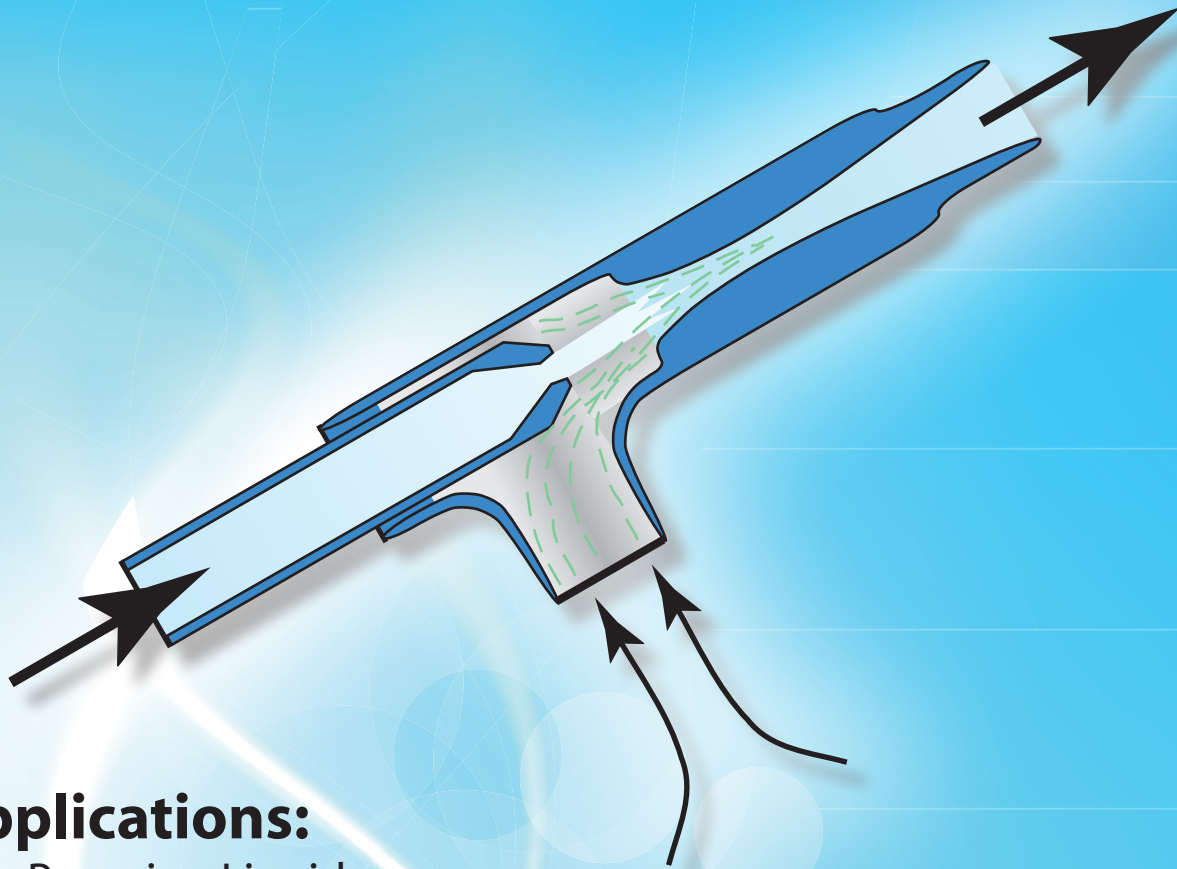


Fox Liquid Eductors



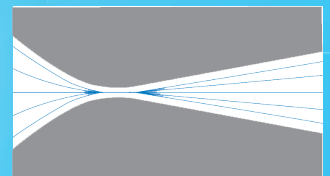
Applications:

- Pumping Liquids
- Diluting Acids
- Additive Injection
- Vacuum

Materials & Sizes:

- Stainless, PVC, TFE, Brass, Monel, Titanium
- 1/4" to 16"
- NPT, Flanges, Tubing

Fox Venturi Products
Dover, NJ 07801 USA
973.328.1011
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www.foxvalve.com



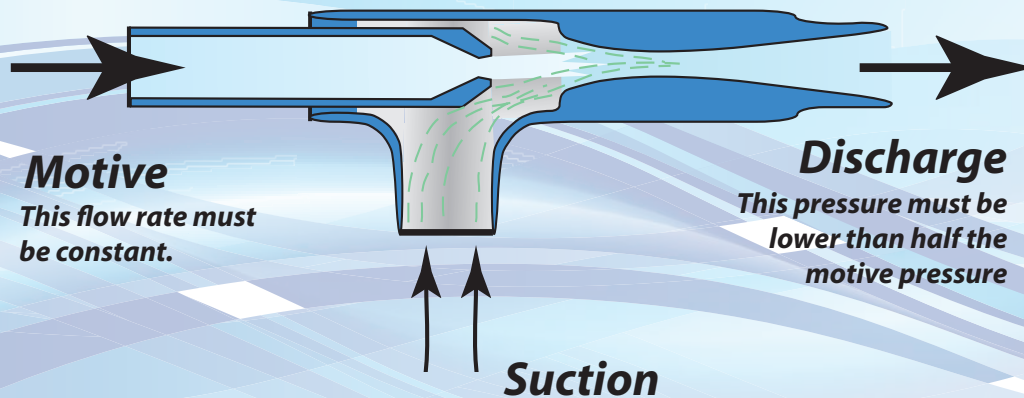
Fox Bulletin 111
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F O X

Fox Liquid Venturi Eductors



Fig. 1



Fox liquid-driven eductors use motive liquids to entrain, mix and pump liquids, slurries, or gases using no moving parts. Unlike pumps, they have no seals, packing, or bearings. They are therefore ideal for pumping corrosive, hazardous, abrasive, or toxic fluids, or in applications where 24/7 reliability is required. Because they require no maintenance, Fox Venturi Eductors are ideal for use in remote or difficult-to-reach applications. Fox can supply highly engineered liquid eductors for use in demanding applications, or for OEM solutions where castings are not adequate due to quality or delivery issues.

- **No Moving Parts**
Eductors are reliable, with no seals or packing to leak. They are maintenance-free.
- **Vacuum up to 27" Hg**
Eductors are capable of pulling deep vacuum, and can be used to lift liquids 20 - 28 ft (7 m)
- **Rugged and Easy to Operate**
Eductors are self-priming and can be installed in any position. They can ingest small particulates and slurries without damage.
- **Cost-Effective**
Since there are only two main components in an eductor, initial cost is low compared to other mechanical equipment, especially when exotic materials are required.

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Fox Liquid Venturi Eductors



Liquid-driven eductors are used in almost every industry where eliminating maintenance and leakage when handling liquids is important. Typical applications include:

- Acid/Caustic Dilution
- Additive injection/Mixing Solutions
- Sump pump or primary pump back-up
- Pump Priming
- Sampling liquid process lines
- Condensate pumping in power plants
- Venting of acid, caustic or dusty vapors
- Pumping liquids with abrasive solids

Stock (Off-the-Shelf) Eductors

To accommodate the above broad range of applications, Fox manufactures a diverse family of standard liquid eductors to meet industry's urgent requirements. Fox maintains an inventory of off-the-shelf liquid eductors to meet industrial applications. These can be easily and quickly custom-modified, if necessary, to serve as prototypes towards the development of optimized production eductors for OEM applications:

Materials:

- 304 stainless
- Carbon Steel
- PVC

Line Sizes: 1/2" - 3"

End Conn: NPT, Flg'd
BSP

Custom Engineered Venturi Eductors

Fox has been supplying custom-engineered, custom built venturi products since 1961. These are used in applications as diverse as municipal water treatment, biodiesel, petrochemical, HVAC, nuclear, and flight hardware for spacecraft.

Materials:

- Stainless
- Carbon Steel
- PVC, TFE
- Brass, Naval Bronze
- Monel, Hastelloy, Titanium

Line Sizes: 1/2" - 16"

End Conn: Any



Fig. 2

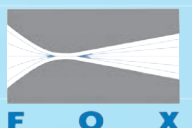
Fox maintains a large inventory of carbon steel and stainless liquid eductors that can be shipped in just a few days. Moreover, components of stock eductors can be custom modified and welded together to create a highly optimized eductor in just one to two weeks.

Fox Venturi Products

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Fox Liquid Venturi Eductors

FAQs

1) What are the most common applications for Fox liquid eductors?

- a) Chemical or acid dilution;
- b) Pumping out sumps, tanks, or vessels where using a pump is undesirable;
- c) Creating solutions with chemical additives

2) Are they available from stock? Can they ship in 2 - 3 days?

Yes. Fox has a large inventory of carbon steel stainless and PVC eductors from 1/4" to 3" line size. If your performance requirements can be met by a stock eductor - this can ship in 2 - 3 days. Moreover, we can custom modify eductor internal geometry to optimize performance - to your stated operating conditions and still ship in one week.

3) What's the maximum lift an eductor can generate?

With 60+ psig supply pressure, a Fox eductor can lift liquids about 25 - 27 feet. (If the water is hot or we are pumping a fluid near its vapor pressure, this limits maximum lift.)

4) We want an eductor that can suck in an additive, and maintain a constant mixture ratio even as the total liquid flow rate through the eductor changes. Can that work?

No. An eductor cannot work in that application. To maintain a fixed mixture ratio, the motive pressure and flow rate must be fixed and constant.

5) Can I use city water pressure to drive a Fox liquid eductor?

Yes. But this requires a pressure regulator set to the lowest expected pressure.

6) Can we control the suction flow rate by changing the motive flow?

No. Suction flow rate must be controlled with a valve on the suction line.

7) What is the maximum discharge pressure an eductor can tolerate?

A good rule of thumb is that discharge pressure can be about half of motive psig. However, many operating conditions effect this. The best way to get the right answer regarding your specific application is to complete our application data sheet and email to info@foxvalve.com.

8) Can a liquid driven eductor suck in and compress vapors, fumes, nat gas, or air?

Liquid driven eductors are capable

9) Can an eductor have 2 or more suction ports for the simultaneous injection of multiple additives?

Fox has been supplying customized liquid eductors with two, three, or four suction ports for 30+ years. This enables a separate control valve to be used on each line to control additive flow rate. This is commonly used in water treatment.

Fig. 3

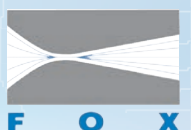


Fox Venturi Products

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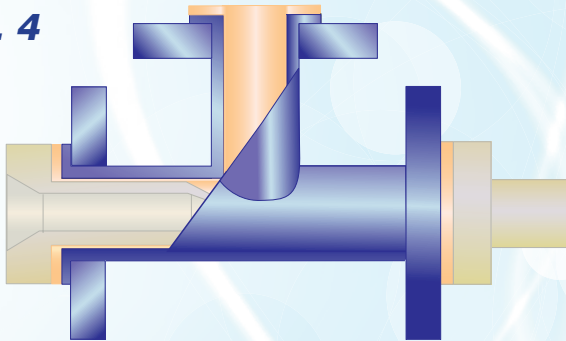


Fox Liquid Venturi Eductors for Special Applications

For Highly Corrosive Applications: Teflon, PVDF, PolyPro Lined Eductors

Fully plastic-lined, flanged eductors with all-TFE or PVDF wetted parts are ideally suited for replacing pumps in highly corrosive applications. They are also used to replace fragile glass, graphite, and carbon eductors. Request Bulletin 550.

Fig. 4



Fox Custom-Built Eductors

Fox has specialized in the design and manufacture of specialized venturi products for demanding applications since 1961. We build both production eductors by the thousands and uniquely configured venturies that are flight-qualified for use on spacecraft. If a liquid eductor can be applied to your special application, Fox is ideally suited to design and build it.

Materials such as titanium, Hastelloy, Monel, and admiralty bronze are common. Additional requirements which we can readily accommodate include pressure ratings to 5000 psig or higher, weld inspection and/or certification, construction to ASME codes, and any required end connections, such as butt-weld, DIN flanges, BSP threads, etc.

© Teflon, Kynar - trademarks of E. I. DuPont Co.

Fully Sanitary/Food-Grade Eductors for Food and Pharma Applications

Fox has supplied sanitary, food-grade liquid and slurry eductors since the 1980's. They are available in line sizes from 1" to 6".

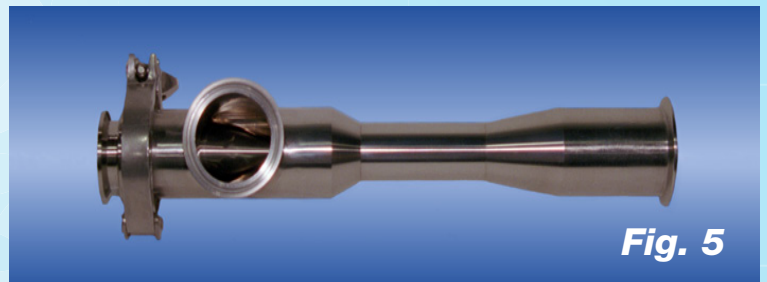


Fig. 5

Food and Dairy Blending with Eductors

Fully sanitary, Fox eductors with tri-clamp have been used for thirty years to blend additives to milk, beverages, and other liquids for production of ice cream, infant nutrition products, and ready-to-drink beverages. In the photo at right, flanges were installed on the additive port of USDA-approved eductors.

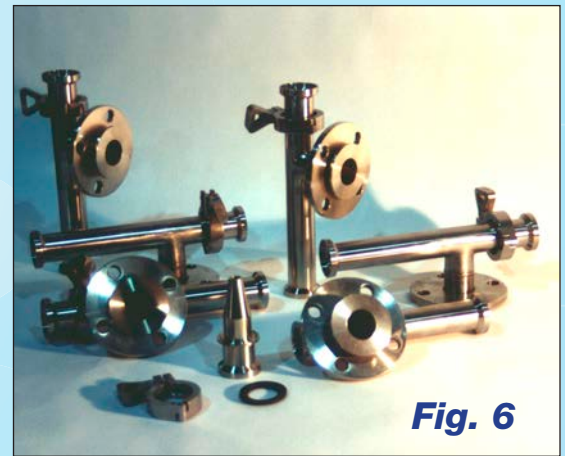
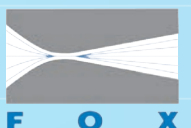


Fig. 6

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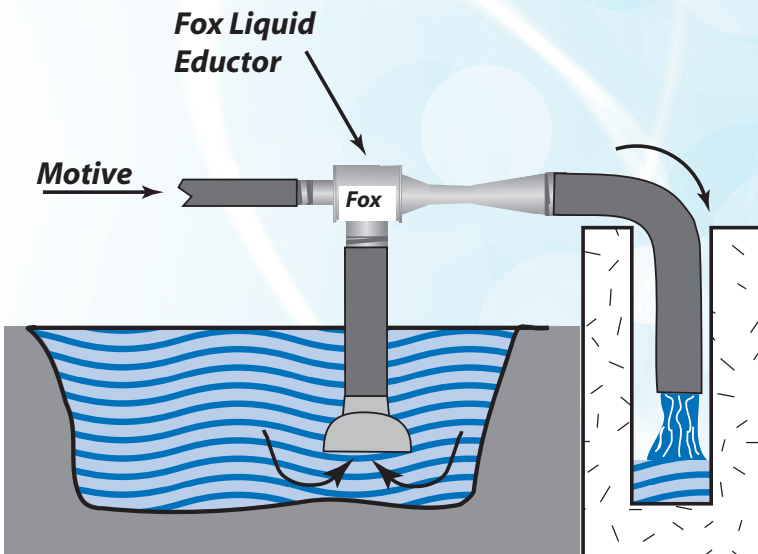


Pumping from Sumps, Reservoirs & Vessels

Sump Pump (or Primary Pump Back-up)

Naval vessels have used eductors to empty bilges for over a hundred years. Many eductors are in use as primary or backup transfer pumps on "catch-all" sumps or receivers. They are frequently used for emptying tanks where some particulates, such as sludge and scale, would cause catastrophic wear of impellers in pumps.

Fig. 7

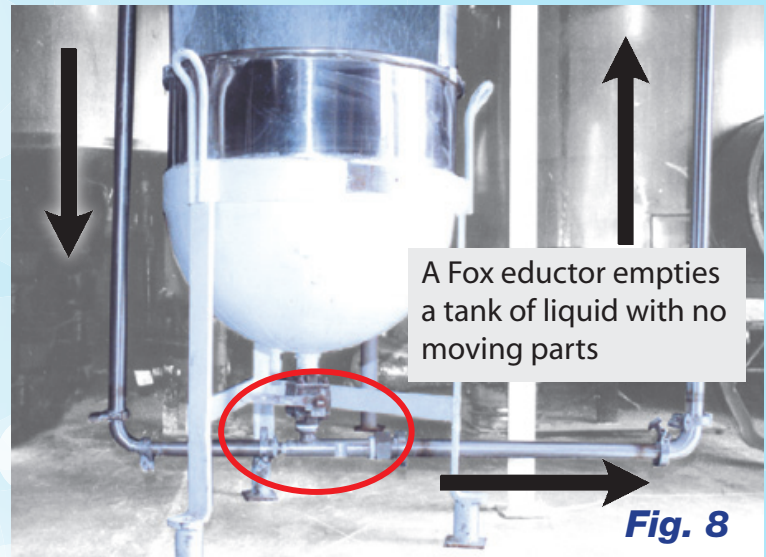


Condensate Eductors in Power Plants

Power plants often produce condensate lines of heated water that must be drained reliably. Fox eductors can be made in whatever materials (304 ss, P22, Duplex, Monel) and with whatever weld qualifications are necessary for installation in your power plant.

Pumping Out Tanks with No Moving Parts

Eductors are used in all types of industrial settings to eliminate motor starters, pumps, bearings, and maintenance from the process of emptying tanks and vessels. If the fluids being handled are corrosive, toxic, or contaminated with solids, replacing pumps with eductors is often a very attractive alternative.

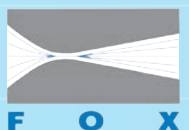


A stainless steel eductor eliminates the motor starter, wires, maintenance, and seals associated with using a pump to pump liquids from a vessel. If handling highly corrosive, toxic, or explosive fluids, the cost advantage of using eductors is very significant.

Remediation/ Pumping Soil

Fox eductors are often applied by environmental technology companies for use in soil remediation, water contamination sampling, or other similar applications.

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Mixing Concentrates & Additives; Acid Dilution

Acid/Caustic Dilution/Blending

Fox eductors are often used to blend batches of caustic or acid solutions. Fig. 9 shows a Plastic-lined liquid eductor filling a batch tank. Motive water is used to entrain the concentrated liquid. The concentrate is then mixed to form the desired solution. This method of mixing and pumping offers two major advantages:

- Since the concentrated chemical is being handled under vacuum, it avoids costly, messy and hazardous spills that may occur if the chemical is pumped under pressure.
- The eductor eliminates expensive and troublesome corrosion-resistant chemical feed pumps.

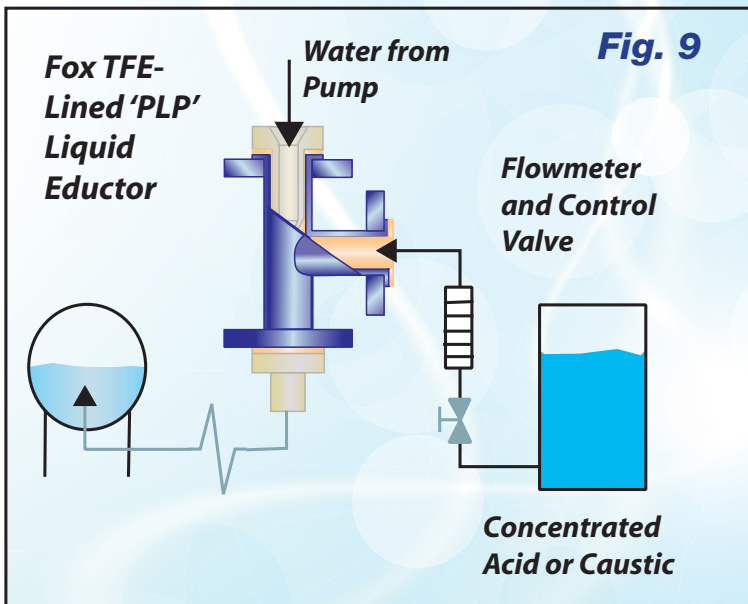
Fuel Additives

Mixing additives into volatile fuels like diesel oil, gasoline, or rocket or jet fuel can require explosion-proof pumps. Elimination of maintenance and seals is particularly attractive for fuel storage locations in remote areas.

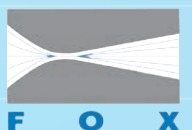
De-Mineralized (DI Water) & Ultra-High Purity

Fox has provided high purity eductors for use with DI water in the semiconductor, fuel cell, and pharmaceutical industry for years. Using electromechanical pumps is difficult and expensive in these applications, since demineralized water lacks the lubricity of water, and the lubricants, bearings, and seals on conventional pumps are sources of contamination. Fox can build eductors similar to those used in food and drug applications: with polished and ground welds, highly finished internal surfaces, etc. Teflon eductors are also sometimes used in these applications.

The water management systems in fuel cells often use Fox eductors..



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Venturi Injectors for 2% Concentrate Injection

Fox Venturi Injector Syphons have been available since 1963 and offer a unique solution for the introduction of a small quantity of a secondary fluid, or additive, with no moving parts.

When does it make sense to use a Fox Venturi Injector Syphon?

- Discharge Pressure (psig) is over 60% of inlet/upstream pressure
- Additive flow rate is below 2% of Main Flow rate
- Highly corrosive, caustic, or high temperature fluids are used

How do they work?

Fox venturi injector syphons are machined from a single piece of metal or plastic. The venturi contour manipulates the fluid to reach its vapor pressure at the throat (below 1 psia with water), which results in the creation of deep vacuum, often exceeding -25"Hg (or approx 2 psia = 140 mbar abs.) This deep vacuum then lifts and sucks in the additive or secondary fluid, which mixes in the main flow in an area of extreme turbulence. A needle valve on the suction line then provides precise control of the mixture ratio - which can range from 20:1 down to a few parts per million. Motive flow must remain constant.

**Request Bulletin 125-
Venturi Injector Syphons**

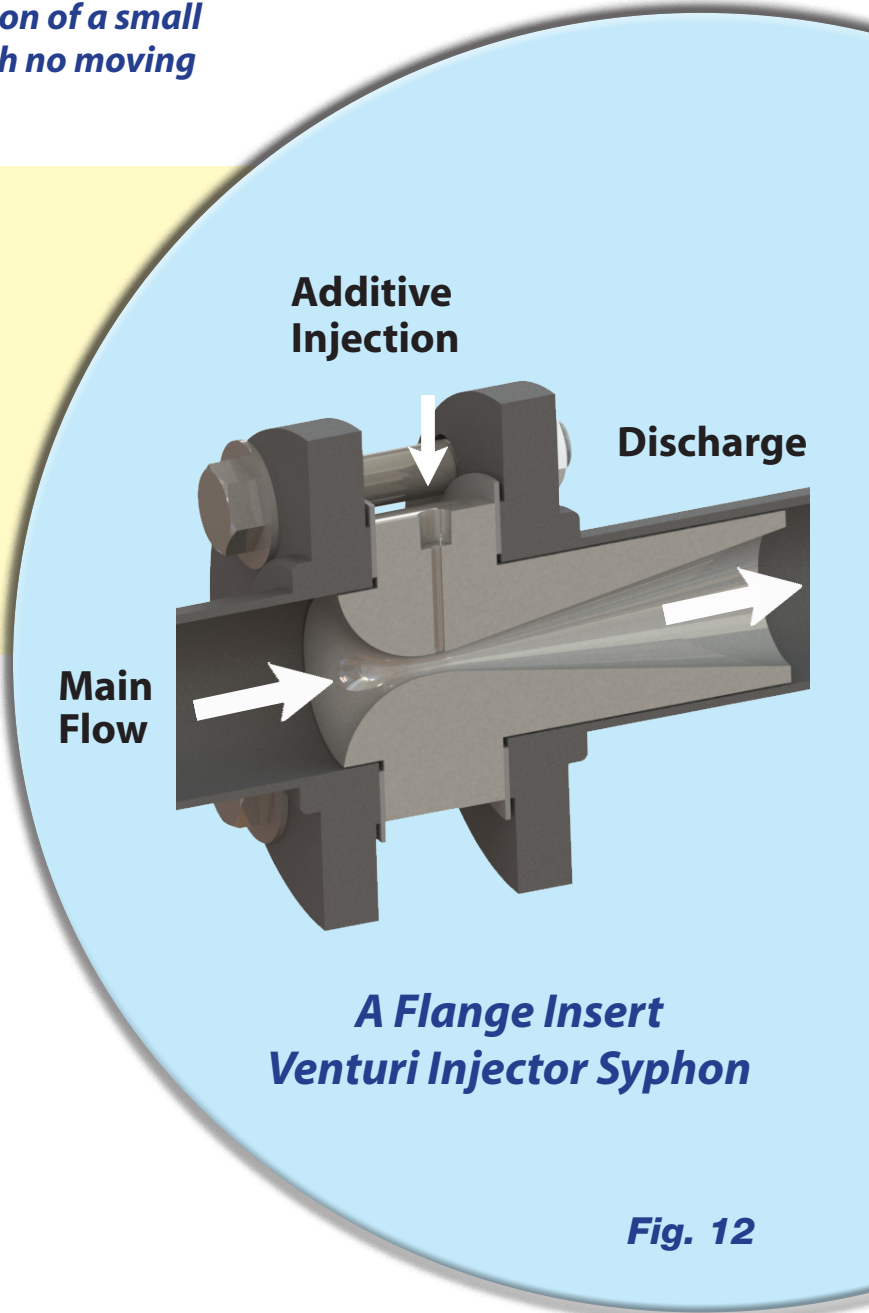


Fig. 12

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Development and Production of Fox Liquid Ejectors for Use in OEM Equipment

Fox Supplies Thousands of Liquid Ejectors to OEM's for Use on a Broad Range of Industrial Equipment

Fox has been through the process of taking an initial phone call, or email from a project engineer and taking it through the many stages that lead to the supply of optimized production hardware. Fox has Annual Blanket Orders from many manufacturers for monthly releases of ejectors in quantities ranging from 4 per month to 300/month. Fox excels at this process. There is a reason why 'development' is in our company name:

• Quick Supply of First Prototype Based on Stock Ejector for Concept Trial

Our first goal is to see if the remachining or modification of a stock liquid ejector can serve as a useful 'proof of concept' or test unit to verify that a Fox ejector can come close to meeting the requirements within your OEM equipment - such as venting gasses, establishing vacuum, purging lines, recirculating refrigerants. If the application permits modification of a stock unit, shipment can occur in one week.

• Building a Prototype

The next step is the custom manufacture of one or more prototypes with an ejector internal design optimized around your precise requirements. These are machined in-house at Fox Valve and can include whatever end connections, materials of constructions, and special features to make the equipment ideal for inclusion in your system.

• Production Hardware

This is the final product, typically machined at Fox Valve in our CNC lathes. Quantity pricing is significantly lower than the highly engineered prototype. Annual blanket orders, where Fox can schedule a large manufacturing run and ship hardware in monthly releases, maximizes the quantity discount an OEM can obtain.

• Testing

Certain OEM customers require testing of each and every part before shipment. This can include hydrotest, leak test, or a performance test.

About Fox Valve...

Fox Valve Development Corp. was founded in 1961 to build high-performance, custom-engineered venturi controls for aerospace applications, primarily in rocket engines. Fox's reputation in the 1960's as venturi specialists with superb in-house manufacturing soon attracted inquiries from diverse industries seeking venturi products tailored to their needs. Our problem-solving skills, familiarity with materials, and manufacturing expertise led Fox into broader range of industrial applications. One by one, standard product lines emerged as we serviced different industries,

all based on our one core technology - venturies. These varied product lines have helped Fox grow continuously and rapidly. Our current major product lines include:

- Solids Conveying Ejectors
- Sonic Chokes and Cavitating Venturies
- Mini-Ejectors
- Steam Jet Ejectors & Thermocompressors
- Air and Natural Gas Ejectors
- Venturi Flow Meters

To Receive a Quotation:

Request and complete our Application Data Sheet.

Additional Technical Literature

The following materials are available upon request:

• Bulletins:

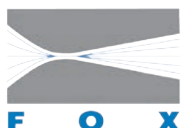
- 125 — Venturi Injector Syphons
- 106 — Fox Slurry Ejectors
- 551 — Teflon and PVDF Lined Ejectors
- 203 — Steam Jet Ejectors and Vacuum Systems
- 252 — Fox Venturi Air Jet Ejectors
- 301 — Solids Conveying Venturi Ejectors
- 401 — Mini-Ejectors

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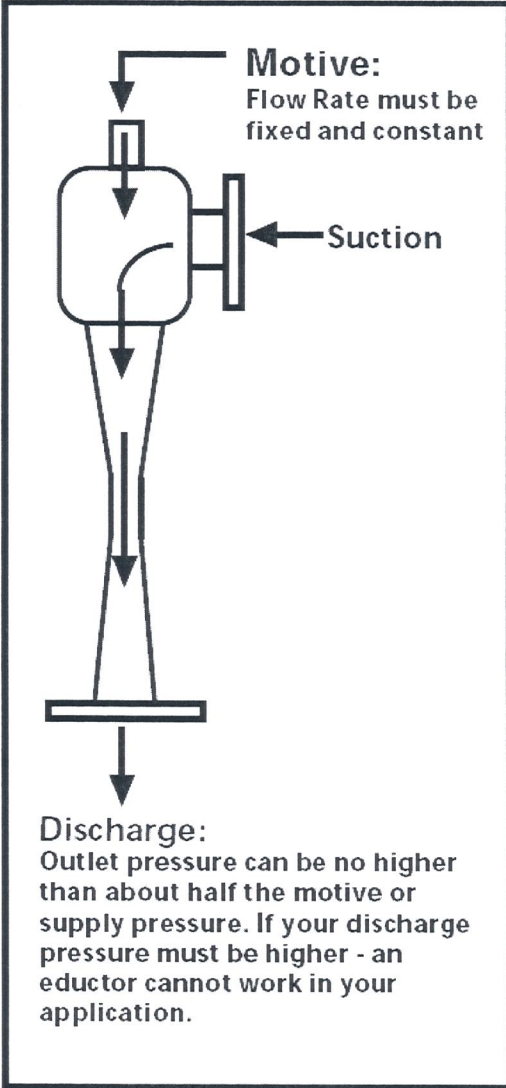
Fox Liquid Eductors - Application Data Sheet



Fox Venturi Eductors from Fox Valve
 Dover, NJ 07801 / www.foxvalve.com

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

Company Name: _____ Contact Name: _____
 Company Address: _____
 Phone: _____ Fax: _____ E-Mail: _____



1) Liquid Motive Conditions

Liquid Type: _____
 Specific Gravity: _____ Temp.: _____ °F
 Flow Rate: _____ GPM (Flow rate must be constant!)
 Pressure: _____ psig

2) Liquid Suction Conditions

Liquid Type: _____
 Specific Gravity: _____ Temp.: _____ °F
 Suction Pressure: _____ psia, or lift: _____ ft.
 Flow Rate: _____ GPM

3) Discharge Conditions

Pressure: _____ psig

Discharge pressure must be less than **half** of the motive pressure. If you must have a discharge pressure higher than half of your available supply pressure, an eductor cannot be used.

Construction Requirements

Preferred End Connections: NPT Flanges - _____ Other: _____

Material of Construction: Carbon Steel Stainless Steel PVC
 Teflon Other: _____

Comments: _____