



# EDUCTORS AND SER-DUCTOR® AGITATION SYSTEMS

OPERATION AND  
SERVICE GUIDE  
O-1660E  
APRIL 2001

Refer to Bulletin A-407.

## SAFETY PRECAUTIONS BEFORE STARTING

1. Read operating instructions and instructions supplied with chemicals to be used.
2. Refer to a chemical resistance chart for compatibility of materials in system with solution to be used.
3. Note pressure/temperature limitations.
4. Personnel operating system should always wear suitable protective clothing: face mask or goggles, apron and gloves.
5. All piping must be supported and aligned independently of the pump.
6. Always close valves slowly to avoid hydraulic shock (water-hammer).
7. Ensure that all fittings and connections are properly tightened.

## FEATURES AND SPECIFICATIONS

Eductors are designed for in-tank mixing of liquids using a liquid as the motive fluid.

Mixing is accomplished first within the eductor as the motive liquid entrains the tank contents into the suction openings, and thoroughly mixes within the unit before being discharged. The discharge flow, or plume, provides further mixing and agitation within the tank. The motive liquid can be drawn from the tank, or it can be a second liquid drawn from another source. For each gallon of motive liquid, 5 gallons are discharged in an 11° plume.

For Mixing:

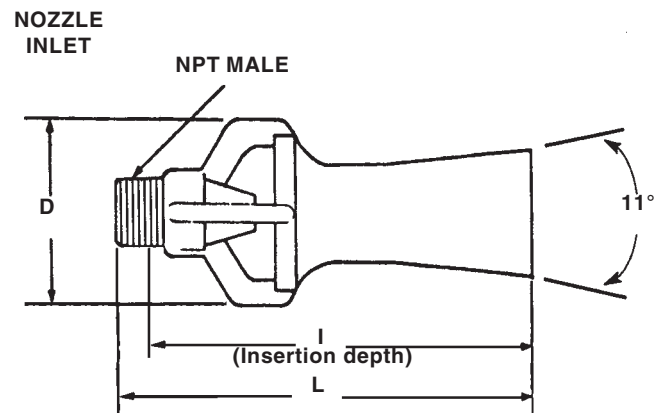
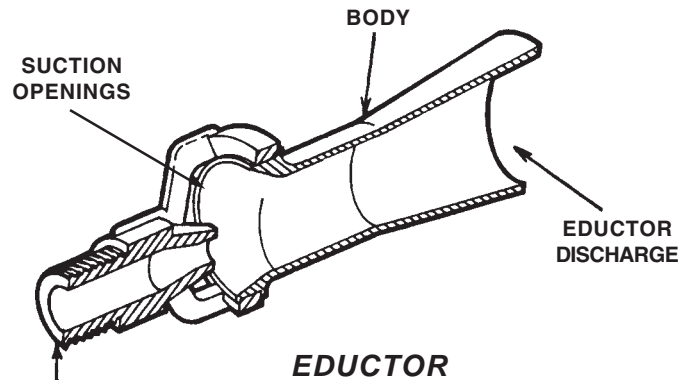
Minimum inlet pressure - 10 PSIG

Maximum inlet pressure - 100 PSIG

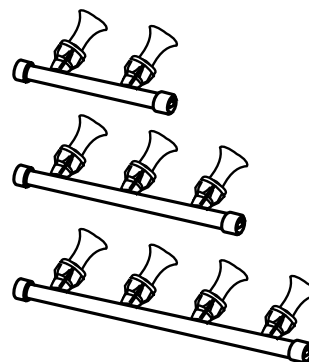
Most efficient operation takes place when inlet pressure is within the range of 20 to 70 PSIG.

## TURNOVER RATE

The rate at which fluid in the tank must be completely turned over will determine the overall capacity of the eductor(s) needed. When the inlet pressure supplied to the eductor is within a range of 10 to 70 PSI (133 to 483 kPa), four gallons of tank contents can be mixed for every gallon of operating fluid passing through the eductor. That is, the volume of fluid discharged from the eductor will be five times greater than the volume of operating fluid entering the eductor inlet. See chart on page 4.



PIPE SIZE NPT	PRICE CODE NUMBER	DIMENSIONS		
		L	D	I
1/4"	33-1930	2-3/4"	1-1/4"	2-3/8"
3/8"	33-1732	4-1/4"	2-1/8"	3-5/8"
3/4"	33-1733	6-3/8"	3"	5-3/4"
1"	33-1736	8-1/2"	3-3/4"	7-3/4"
1 1/2"	33-1734	9-7/8"	4-5/8"	9-1/8"



## SER-DUCTOR COUPLING / NOZZLE ASSEMBLY



## PRE-ENGINEERED SER-DUCTOR ASSEMBLIES

## I. MOUNTING

An eductor can be mounted in any position. The supply line and manifold piping to multiple eductors must be sized to supply uniform pressure to each eductor. It is important that the eductor be positioned within the tank to insure the free flow of liquid to be mixed into and out of the unit(s). The greatest agitation occurs within the discharge plume; therefore, the discharge end should be aimed towards the most remote part of the tank. On the other hand, the intake end of the unit must be just far enough from the tank corner or wall to allow the free flow of liquid into the suction openings.

Tank shape and size influence the placement and number of eductors required to maintain even agitation. With a spherical tank, a single eductor mounted as shown in the Figure 1 illustration makes the best use of the mixing characteristics of the eductor. With no corners to impede liquid flow, the liquid circulates evenly.

In simple mixing applications in a cylindrical, square or rectangular tank, not a plating tank, the angular intersection of surfaces can interrupt liquid flow patterns and cause liquid stagnation in these areas. A single eductor mounted as shown in Figure 2 will minimize this. For high agitation, use of multiple eductors are recommended as shown in Figure 3.

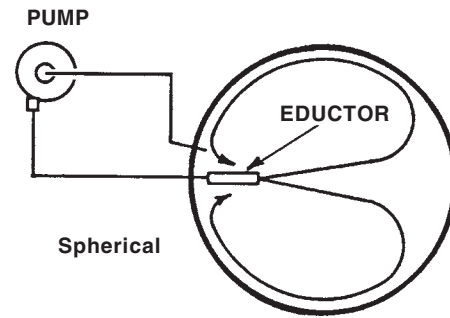
A slight downward angle of the eductors can be helpful in maintaining the velocity at the tank bottom which is necessary to keep solids in suspension for easier removal by a filter system. (See Figure 4).

## II. SER-DUCTOR INSTALLATION

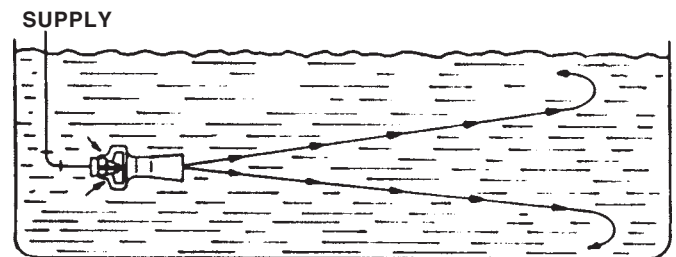
1. Connect pump discharge to Ser-Ductor manifold or eductor inlet using pipe and fittings. Adjust flow direction.
2. It is suggested that a pipe union be installed on pump discharge to allow convenient removal of eductor assembly for repositioning the eductors.
3. Ser-Ductor assembly should rest on bottom of tank. Do not allow the assembly to hang from the pump without support.
4. Energize pump-motor assembly and note solution surface movement. If repositioning of the eductor flow direction is necessary, then de-energize pump motor and disconnect at union before attempting to reposition eductor.



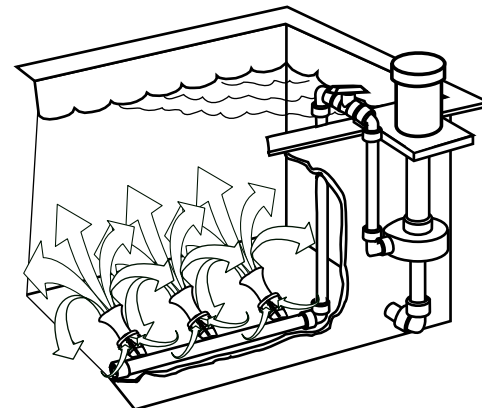
**CAUTION:** Be sure fluid depth is adequate or eductors are oriented so that the discharge will not spray out of the tank, at any foreseeable liquid level.



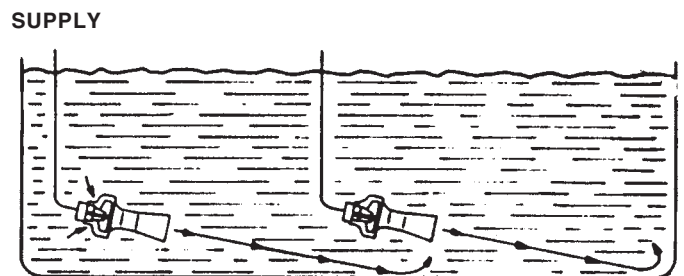
**Figure 1**  
**Eductor in a round tank**



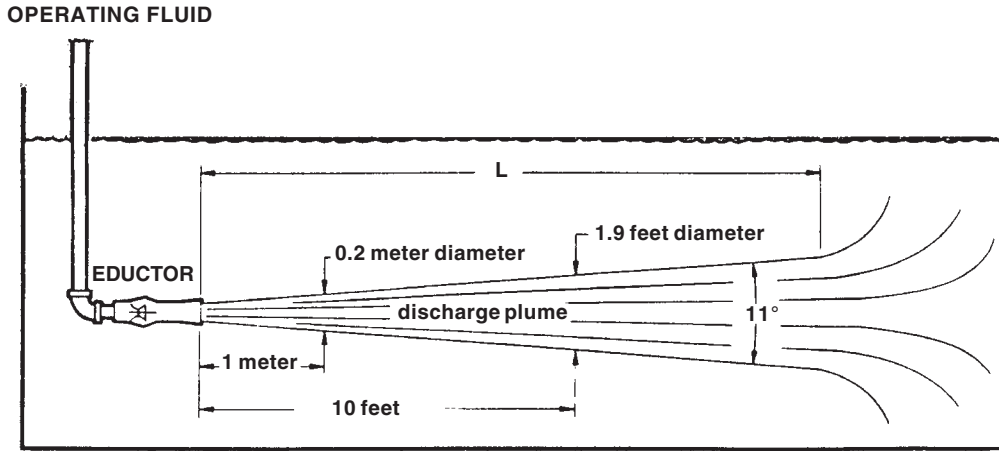
**Figure 2**  
**Eductor in a tank providing mixing**



**Figure 3**  
**Multiple eductor assembly**



**Figure 4**  
**Eductors in a tank maintaining suspension and mixing of solids.**



**Figure 5**

**III. DISCHARGE PLUME**

Significant agitation occurs in the plume exiting the eductors. The plume is cone-shaped from the eductor discharge, diverging at an 11° angle. In fluids such as water, the length of the eductor discharge plume increases proportionally with increased operating fluid pressure. Flow will be evident one foot away from the eductor discharge for every 1 PSI of pressure across the nozzle (or one meter away for every 23 kPa pressure). See Figure 5. The plume length needed to achieve effective agitation can be calculated as follows:

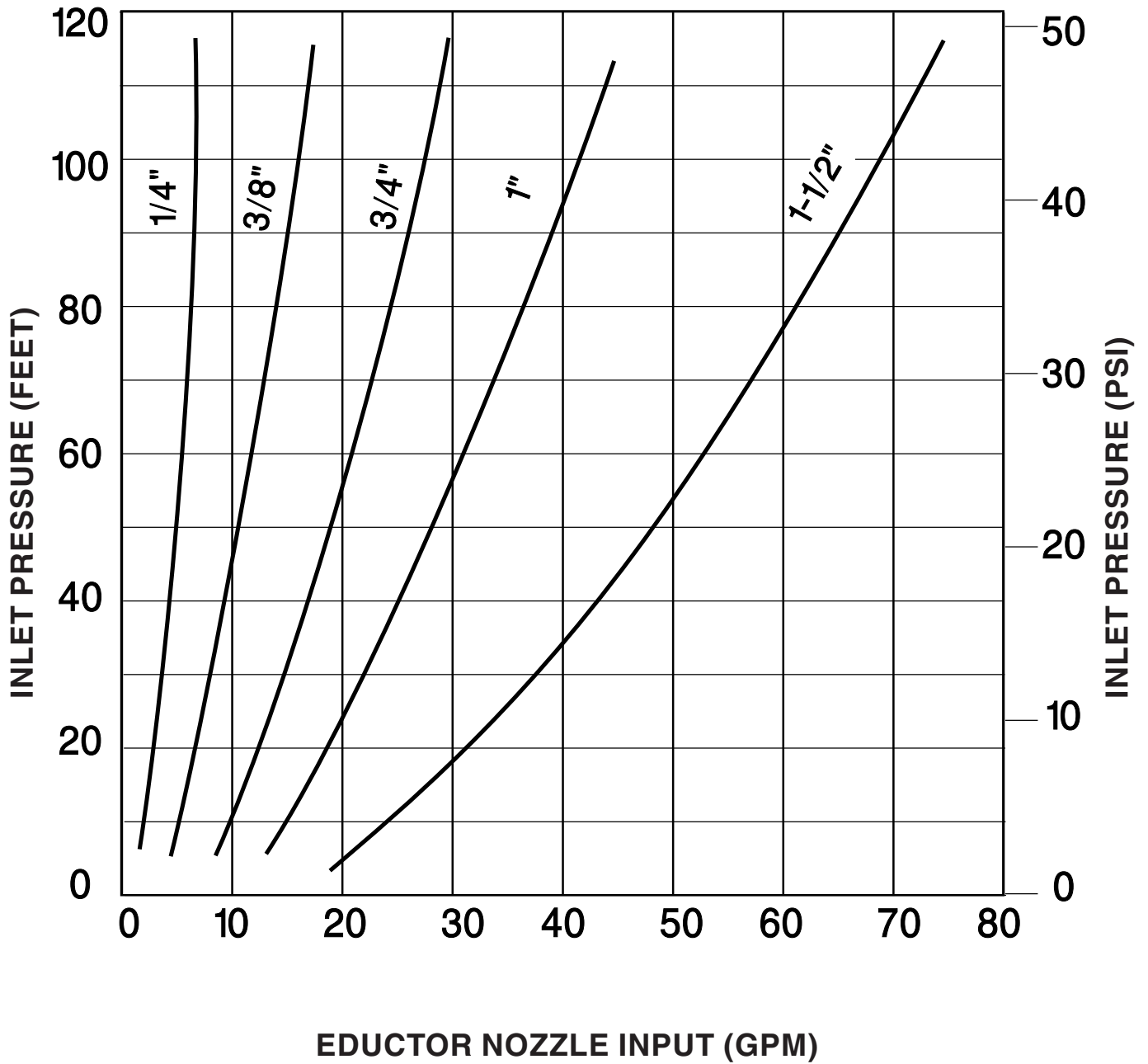
**PLUME POSITIONING** *To agitate* with liquid(s) only or liquids with solids in suspension, direct the plume from the bottom of one side of the tank toward the highest likely liquid level on the farthest point from the eductor. The ΔP should be sufficient to create a plume that reaches that point.

**TO SWEEP SOLIDS FROM THE TANK BOTTOM**

Direct the eductor plume to contact every point on the tank bottom with particular attention to the angular intersections where tank bottom and sides are joined.

EFFECTIVE PLUME LENGTH (L): Plume length varies with differential pressure (Δ P) across the eductor.	Multiply Δ P in PSI by	Multiply Δ P in kPa x 23 by
Tank Contents: Containing only liquid(s)	1 ft.	1 meter
To maintain solids in suspension	1 ft.	1 meter
To sweep solids off the tank bottom	½ ft.	½ meter

## PRESSURE / FLOW CHART



**NOTE:** Eductor inlet pressure will be where pump flow curve intersects eductor flow curve. Multiply corresponding nozzle input by 5 to arrive at eductor discharge (agitation) flow.



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