



## **VENTURI INJECTORS**

The Low Cost  
Solution for  
Agriculture



**For  
Trouble Free  
Injection of  
Fertilizers and  
Chemicals**



## **Mazzei Chemigation:**

### **The Simple, Low Cost Solution for Agriculture**

Chemigation is the process of injecting chemicals and fertilizers into an irrigation system. Mazzei pioneered simple-to-use, low cost solutions.

Using high-efficiency venturi injectors, Mazzei's chemigation technology delivers a uniform distribution of chemicals and fertilizers within the irrigation water. With no moving parts, and often no supplemental pump system, Mazzei is the right choice.

- ▶ **Easy to install**
- ▶ **Uniform chemical injection**
- ▶ **Low cost solution**
- ▶ **Generally injection stops when water flow stops**
- ▶ **Available in polypropylene or PVDF – PVDF is resistant to most chemicals, including acids**



### **There Is No Substitute for a Mazzei**

Mazzei patented designs are precisely engineered and cannot be duplicated. Imitations and look-alike products simply do not perform like a Mazzei.

Injecting fertilizer into a pressurized irrigation system is the most common application for Mazzei injectors. With Mazzei you get the advantages of a non-mechanical chemigation system that is easy to maintain. You get precise mixing and uniform distribution of material into the water stream. Mazzei injectors are designed for vacuum transfer of irrigation chemicals, providing additional chemigation safety.

## Mazzei® Venturi Injector

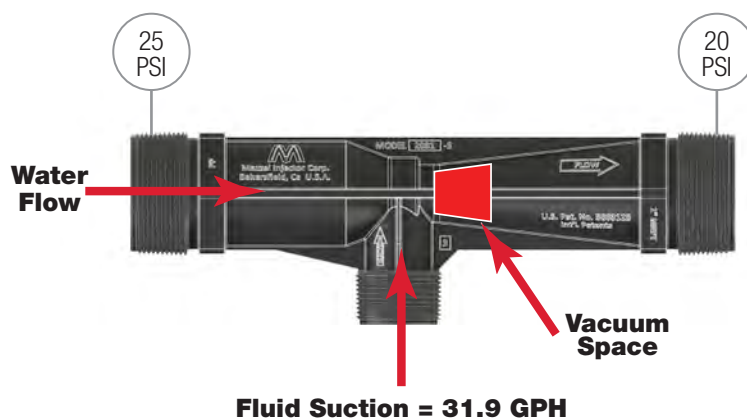
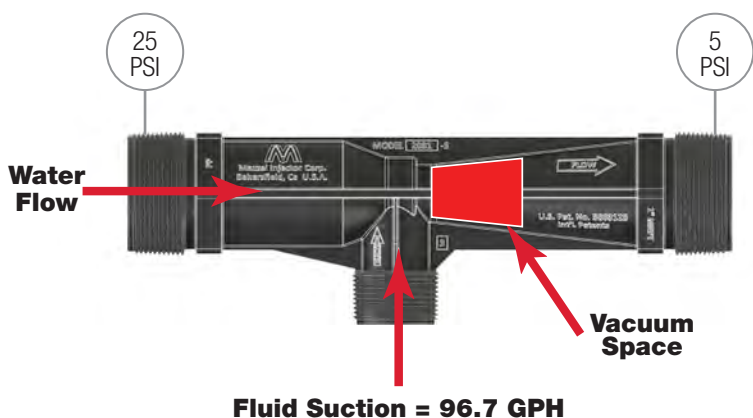
The key to the operation of a Mazzei venturi injector is the difference between the water pressure upstream of the injector (the water flow entering the injector) and the pressure downstream of the injector (the water flow exiting the injector)... this difference is generally referred to as the "pressure differential."

### How Does A Mazzei Work?

As the water stream enters the injector, the shape of the injector causes the water pressure to decrease as it flows through the constricted portion of the injector... therefore, the water pressure entering the injector is higher than the water pressure exiting the injector. This difference between the inlet pressure and the outlet pressure creates a vacuum inside the injector which causes suction to occur at the injector's suction port. This suction can be used to inject and mix fertilizers and water treatment chemicals into irrigation water.

Typically the pressure at the outlet of the injector should be at least 25% to 30% less than the pressure at the inlet of the injector for suction to occur. Merely placing a Mazzei injector in a pressurized water line will not necessarily create the needed water pressure differential to enable the system to work. If the pressure differential is below 25% to 30%, a booster pump can be used to create the additional pressure necessary. The larger the pressure difference between the water flow at the inlet and outlet of the injector, the higher the suction rate will be for that injector.

**Example:** the Mazzei 1-inch injector Model 1078 with an inlet pressure of 25 PSI and an outlet pressure of 5 PSI will have a suction rate of 96.7 GPH. The same injector Model 1078 with an inlet pressure of 25 PSI but with an outlet pressure of 20 PSI will have a suction rate of only 31.9 GPH.





## What You Need to Know to Select the Proper Model Injector

- 1 INLET PRESSURE** (Injector Inlet Pressure): What is the upstream water pressure available?
- 2 MOTIVE FLOW RATE** (Flow through the Injector): What is the available water flow of the irrigation system?
- 3 OUTLET PRESSURE** (Injector Outlet Pressure): What is the downstream water pressure?
- 4 INJECTION RATE** (Suction Rate): How much fertilizer or chemicals do you want to inject?

### Example

A grower plans to inject **120 GPH** (2 GPM) of a liquid fertilizer through a by-pass into his irrigation system. He has **40 PSI** available and needs to maintain **25 PSI** downstream. He also wants to maintain a water flow rate of around **30 GPM** through the by-pass. Going by the grower's requirements, refer to the Injector Performance Table below:

Water Suction Capacity													
Operating Pressure PSIG		Model 584 ½" & ¾" Threads		Model 684 ¾" Threads		Model 878-03 1" Threads		Model 885X-03 1" Threads		Model 1078-03 1" Threads		Model 1583 1½" Threads	
Injector Inlet	Injector Outlet	Motive Flow GPM	Water Suction GPH	Motive Flow GPM	Water Suction GPH	Motive Flow GPM	Water Suction GPH	Motive Flow GPM	Water Suction GPH	Motive Flow GPM	Water Suction GPH	Motive Flow GPM	Water Suction GPH
20	0	4.2  *(18.0)	24.8	7.0  *(16.5)	25.1	7.3  *(16.5)		7.3  *(16.5)		15.5  *(20.5)	93.2	21.5  *(17.9)	228
	5		24.8		25.2						95.4		205
	10		23.7		25.2						70.0		144
	12		19.2		18.4						51.5		132
	15		14.6		10.4						30.3		66.2
30	0	5.1  *(27.0)	25.3	8.6  *(26.0)	24.5	9.0  *(26.1)		9.0  *(26.1)		15.5  *(26.0)	94.4	26.3  *(26.0)	227
	5		25.4		24.6						94.5		226
	10		24.9		24.6						94.5		212
	15		25.2		24.6						82.1		167
	20		18.2		14.7						55.4		126
40	0	5.9  *(35.5)	25.6	9.9  *(35.0)	25.0	10.3  *(34.4)		10.3  *(34.4)		15.5  *(34.4)	99.2	30.3  *(33.4)	227
	5		25.6		25.0						99.2		229
	10		25.6		25.1						93.2		227
	15		25.5		25.0						93.2		221
	20		25.2		25.1						91.9		193
50	25	6.6  *(45.0)	21.3	11.1  *(42.0)	24.7	11.6  *(42.3)		11.6  *(42.3)		17.3  *(43.9)	72.2	33.9  *(41.9)	153
	30		15.0		10.8						42.7		81.5
	0		25.6		25.0						92.4		227
	10		25.6		25.0						92.4		226
	20		25.4		24.9						92.4		224
60	25	7.6  *(48.0)	24.5	12.1  *(46.0)	25.0	12.6  *(46.0)		12.6  *(46.0)		17.3  *(43.9)	92.4	33.9  *(41.9)	204
	30		21.6		17.1						86.4		172
	35		15.8		9.2						64.3		121
	40		2.8		6.7						35.0		40.5

Model 1583 will work.  
This model has enough suction to provide a maximum of **153 GPH @ 25 PSI** with a motive (water) flow of **30 GPM**

1

2

3

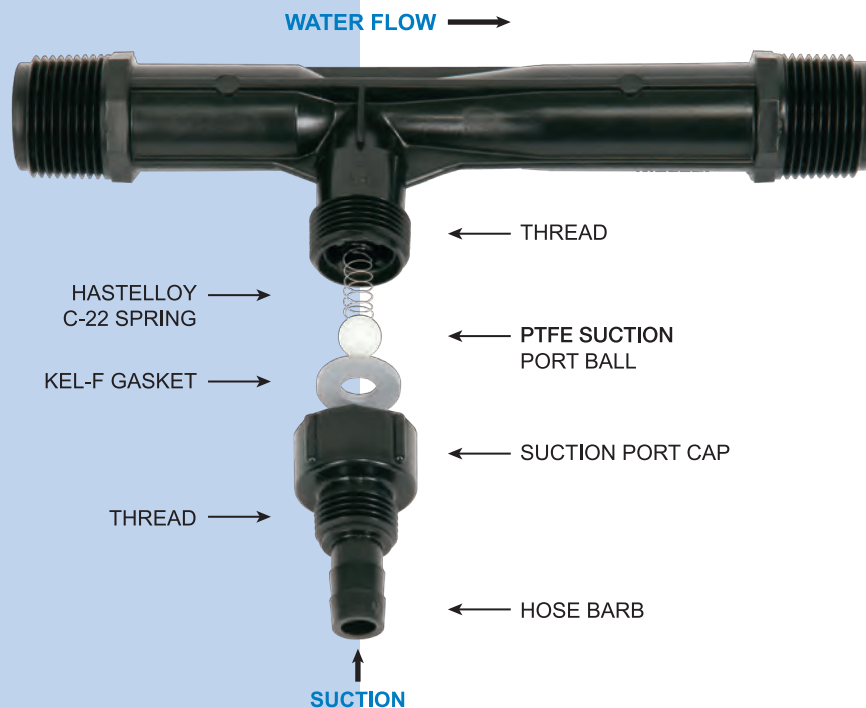
4

**Model 1583** will work.  
This model has enough suction to provide a maximum of **153 GPH** @ **25 PSI** with a motive (water) flow of **30 GPM**

### Other Factors Affecting Liquid Injection

Suction capacity will differ from listed suction capacity under non-standard conditions (i.e. if not at sea level; if the injector placement and liquid additive are not at the same elevation; if the additive is heavier or more viscous than water; if temperatures differ significantly from 70° F; etc). See Mazzei Technical Bulletin No. 1 – available on the Mazzei website, [www.mazzei.net](http://www.mazzei.net) –for correction calculations.

# TROUBLESHOOTING MAZZEI® INJECTORS



When properly specified, installed, and operated, Mazzei injectors provide trouble-free operation. In the real world, however, there are a number of factors that can cause a Mazzei injector to decrease in performance or fail to perform altogether. These factors are discussed in detail below.

## A. Installation Tips

1. Mazzei injectors should always be **installed in a horizontal or vertically up position** (outlet above inlet). Installation in a vertically down position (outlet below inlet) may cause intermittent or erratic suction by the injector.
2. To optimize performance of a Mazzei injector, there **should always be some piping attached to the injector outlet**. For plastic injectors, as little as 12" of piping works well when venting directly to atmospheric pressure.
3. Always **use "full flow" valves and fittings** when connecting to a Mazzei injector. Never use piping or pipe fittings smaller than the thread size of the Mazzei injector.
4. **Do not over-tighten** Mazzei injectors when attaching them to pipes or fittings. The use of a thread sealant/tape is recommended.
5. Mazzei injectors **require a pressure differential to operate properly**. Normally, the outlet pressure must be at least 25-30% less than the inlet pressure for significant suction to occur. Pressure gauges

are recommended to determine the actual pressure differential.

## B. Some Simple Tests to Determine Whether or Not a Mazzei Injector Is Working

1. With the suction line disconnected and the injector in operation, place your finger over the suction port. Can you feel suction?
2. With the suction line disconnected and the injector in operation, gently depress the ball inside the internal check valve on the suction port (a slender, blunt tool should be used for this purpose). Does water spurt out of the suction port?
3. If you can feel suction and water does not spurt out of the suction port during operation, the injector is generating a vacuum and is working properly. If you cannot feel suction and water does spurt out of the suction port during operation, the injector is not generating a vacuum.

## C. Reasons Why a Mazzei Injector Might Not Be Working

1. **Injector Is Damaged:** Mazzei injectors are made from polypropylene (PP), polyvinylidene fluoride (PVDF), or natural PVDF. These materials are quite resistant to abuse. They can be damaged, however, by over tightening, from impact or from being subjected to

excessive torsion. If you suspect this to be the case, examine the injector for cracks, holes or other signs of damage. If any of these signs of damage are found, replace the injector.

2. **Insufficient Pressure Differential:** Mazzei injectors typically begin suction with a water pressure differential of about 20%. Significant suction does not begin until the water pressure differential is in the range of 25%-30%. For liquid suction, Mazzei injectors reach maximum suction when the water pressure differential is about 50%. For gas suction, suction capacity increases until the outlet water pressure is zero. It is difficult to estimate water pressure differential. It should be measured with pressure gauges both upstream and downstream of the injector.

An important characteristic of Mazzei injectors is that they do not, by themselves, create a pressure differential. Both the upstream and downstream pressures experienced by an injector are caused by the system into which the injector is placed, not by the injector. Thus, merely placing a Mazzei injector in a pressurized water line will not necessarily create a significant water pressure differential, other than friction loss. If a particular system cannot generate sufficient water pressure differential for the Mazzei injector to operate properly, then an alternative method of installation must be considered.

3. **Insufficient Water Flow:** At any given set of inlet and outlet water pressures, Mazzei injectors require a certain water flow. This water flow may be determined from the Injector Performance Tables shown on the Mazzei website (mazzei.net) in the "Performance Data & Drawings – Injectors" section. If less water is supplied than that stated in the Performance Table, suction capacity could be decreased or disappear entirely. There are several possible causes for insufficient water flow. These are:
  - a) The supply pump is incorrect, worn or damaged.
  - b) Inlet and/or outlet piping are too small. Piping and pipe fittings should always be of the same piping size as the injector thread size.
  - c) There is debris or an obstruction in the upstream side of the injector.
  - d) The injector selected is too large. Select an injector that requires less water flow.
4. **Suction Line Is Obstructed:** The suction line to a

Mazzei injector may become dirty or obstructed. It should be checked periodically to make certain that it is clean and clear.

5. **Injector Is Scaled or Fouled:** Many contaminants found in water can precipitate on water-wet surfaces. These surfaces include the interior of the Mazzei injector. When this occurs, the performance of the injector can be severely impaired. Sufficient scaling and/or fouling can cause a complete loss of suction capacity.

Compounds that can cause scaling and/or fouling include calcium carbonate, iron, manganese, metal sulfides, calcium sulfate, silica and microbiological slimes. Many times scaling and/or fouling are most severe at the point of gas or chemical injection. This is due to the gas or chemical being extremely concentrated at the injection site owing to water not passing through this point which would dilute it.

Scaling and/or fouling of the Mazzei injector are not design flaws of the injector. Rather, they are characteristics of the water being treated and would occur with any method of gas or chemical injection. When scaling and/or fouling occurs, the Mazzei injector must be removed from service and chemically (not mechanically) cleaned.

The injector can be cleaned with the following method:

\*Pour two quarts of water into a 5-gallon bucket. Pour one quart of "Pool Acid" into the bucket – **ALWAYS ADD THE ACID INTO THE WATER.** ("Pool Acid" is Hydrochloric Acid or Muriatic Acid. Typical "Pool Acid" is about 30% acid.) Place the injector in the bottom of the bucket and allow it to soak for 30 minutes. Rinse the injector with fresh water and place back in service. When finished cleaning the injector, fill the bucket with water and dispose of properly.

**ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN HANDLING ACIDS OR OTHER HAZARDOUS CHEMICALS.** At a minimum, this would include rubber gloves, rubber apron, and goggles or a full-face shield.

*\*As actual cleaning methods are beyond the control of Mazzei Injector Company, LLC, we assume no liability for this recommendation.*

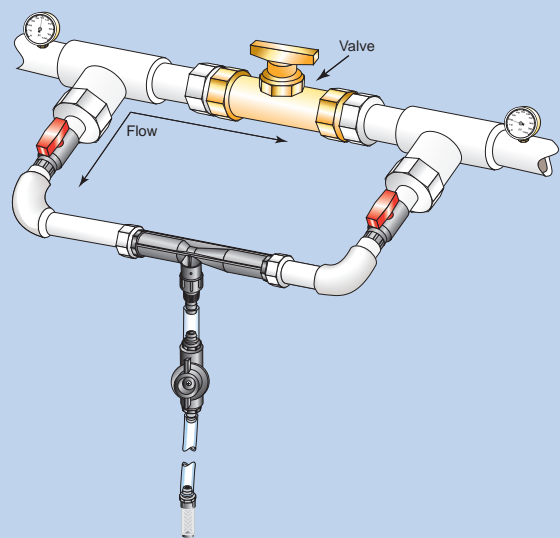


Diagram 1  
Bypass Assembly "A"

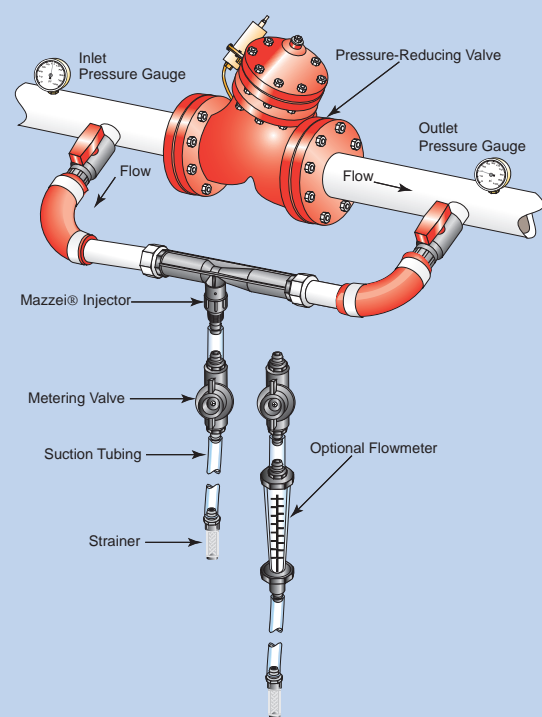


Diagram 2  
With Pressure-Reducing Valve

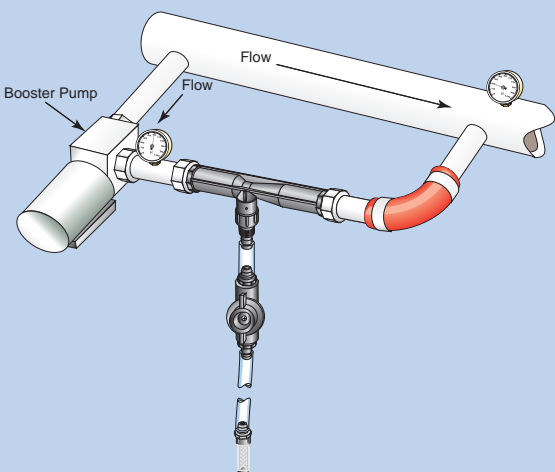


Diagram 3  
Bypass with Booster Pump

## Typical Installations for Irrigation Systems

Mazzei injectors require differential pressure to create suction. The injector's outlet pressure (backpressure) must be sufficiently lower than the inlet pressure. For most models, significant suction occurs with 25-30% pressure differential.

Mazzei injectors can be installed with the main body in a horizontal position or vertically with the outlet up. The injector suction port can be oriented in any position.

To insure consistent suction, the outlet side of the injector should be flooded or have some restriction downstream (backpressure).

Always use full flow isolation valves and non-restrictive fittings when connecting to the injector. These valves and fittings should be at least the same size as the inlet/outlet connections on the injector. Isolation valves are optional, but recommended.

Do not over-tighten the injector when attaching piping and fittings. The use of an appropriate thread sealant is recommended.

Install pressure gauges near the inlet and outlet of the injector to monitor operating conditions.

### Diagrams 1 and 2

The injector is installed around a point of restriction, such as a regulator valve or a gate/ball valve. These create a differential pressure across the injector, thereby allowing the injector to produce a vacuum and draw in material.

### Diagram 3

When mainline pressure cannot be reduced, a small booster pump can be used to create a sufficient differential to operate the injector.

For additional information, including troubleshooting tips and injector performance data, please visit our website at [www.mazzei.net](http://www.mazzei.net). Always follow environmental regulations regarding backflow prevention and chemical use.



**InjectorSelector™**

To help with selecting the right injector for irrigation applications, we have developed a web-based calculator that will assist users in selecting injectors for liquid injection applications. Called the InjectorSelector™, the web-based tool is accessible for registered and approved users via our website, [mazzei.net](http://mazzei.net).

### **Why Mazzei**

Since 1978, Mazzei has distinguished itself by an ability to evaluate problems and develop innovative solutions.

When you need a system and a supplier that delivers long-lasting service and value, there's only one name you need to remember: Mazzei.



*World Leader  
in Mixing and  
Contacting  
Technologies*

Contact us today.

**Mazzei Injector Company, LLC**

500 Rooster Drive

Bakersfield, California 93307-9555

TEL 661.363.6500

FAX 661.363.7500

[mazzei.net](http://mazzei.net)

