

## **TECHNICAL BULLETIN No. 4**

### **USE OF MAZZEI INJECTORS IN WATER-WELL/PRESSURE TANK APPLICATIONS**

The selection, installation and use of Mazzei Injectors in water-well/pressure tank systems is quite straightforward. There are several steps, however, which must be understood and completed prior to installation.

#### **A. Step One: Gathering Data**

1. Water-Well Pump Information
  - a. Pump Performance Curve
  - b. Maximum discharge pressure
  - c. Maximum flow rate
2. Pressure Tank Information
  - a. Volume of tank
  - b. Bladder or air-cushion?
  - c. Materials of construction
  - d. Operating Pressure Range
    - i. Pump on pressure
    - ii. Pump off pressure
3. Injection Requirements
  - a. What do you want to inject? Liquid or gas?
  - b. How much of the above do you want to inject? Per hour? Per day?

#### **B. Step Two: Injector Selection**

Once the above information has been obtained, a suitable Mazzei Injector can be selected. Please refer to the “Required Information” sheet attached. The injector should be selected to have enough suction capacity, at actual operating conditions, to meet your injection requirements.

#### **C. Step Three: Selection of Installation Method**

There are several methods for installation of a Mazzei Injector into a water-well system. These are illustrated in the attached “Typical Installations.” For most installations the choice will be between three methods: (1) In-line with all of the water flow going through the Mazzei Injector, (2) in a Bypass Assembly with only part of the water-well pump flow going through the injector, or (3) with a Booster Pump to supply the inlet water pressure required by the Mazzei Injector.

Before you decide how the injector should be installed, it is important to fully understand just how a Mazzei Injector operates. In simple terms, a Mazzei Injector is a differential pressure venturi eductor. When a sufficient pressure differential is established between the inlet and outlet ports of the injector, and when sufficient water is flowing through in injector, suction is created at the suction port of the injector. Each Mazzei Injector has its own requirements for minimum flows and minimum pressure differentials to initiate suction. If either of these requirements is not satisfied, water will flow through the injector but suction will not be created. Please refer to the Mazzei “Product Catalog” for a complete listing of Performance Tables and minimum pressure differentials.

1. In-line

Installing the Mazzei Injector in-line is the simplest and most straightforward method. This method will only work, however, if the water-well pump has enough discharge pressure to create a sufficient pressure differential across the Mazzei Injector. For instance, if the pressure tank shuts off at 60 psig, the water-well pump must be capable of a discharge pressure of at least 80 psig. This would create a  $[(80-60)/(80)] \times (100) = 25\%$  pressure differential across the Mazzei Injector. If the water-well pump cannot meet these requirements, this method should not be used. Also, the water-well pump must produce adequate flow through the injector, at operating pressures, to provide the minimum flow requirements as listed in the Performance Tables.

2. Bypass Assembly

In many water-well/pressure tank systems, the in-line method of installation will not be feasible. For these systems, the bypass assembly is an option. An example of a bypass assembly is shown in the “Typical Installations.” The purpose of the bypass assembly is twofold. First, to provide adequate flow and sufficient pressure differential across the injector so that the injector will operate properly. Second, to allow excess water, not required to operate the injector, to flow through the bypass and then to the pressure tank.

There are two types of bypass assemblies. The first is the “manual” assembly. This uses a manually operated valve to direct sufficient flow to the injector. The second is the “automatic” assembly. The “automatic” assembly uses an adjustable, spring-loaded check valve to force water first through the injector. When the injector flow has been satisfied, and a sufficient pressure differential generated across the check valve, the check valve will open and permit excess water flow through the valve.

3. Booster Pump

Some installations will not work with either of the methods described above. Another option is to use a booster pump. This type of installation is also shown in “Typical Installations.” The booster pump must be sized properly to generate

adequate flow through, and sufficient pressure differential across, the injector. Suction for the booster pump should be taken from the main flow line between the water-well pump and the pressure tank. Discharge for the booster pump should be back into the same line at a location between the suction fitting for the booster pump and the pressure tank. The booster pump should be wired into the system so that it operates only during the water-well pump cycle. Power may be taken from the water-well pump electrical circuit by means of a relay.

#### D. Step Four: Additional Considerations

Mazzei Injectors should always be installed in a manner and location that permits easy access for inspection and/or repair. The injectors themselves should be installed with unions so that they can easily be removed for inspection, cleaning or replacement. Ideally, pressure gauges should be installed before and after Mazzei Injectors so that pressure differentials can be monitored. 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. If Mazzei Injectors are installed into a bypass assembly manufactured by the installer or dealer, valves should be sized so as to be able to accommodate the total water flow (injector plus bypass) with minimum pressure loss.

### REQUIRED INFORMATION FOR GAS OR LIQUID INJECTION APPLICATIONS

The following information and calculations are required to determine the proper size and model of Mazzei Injector for water treatment.

1. Total water flow of system (gpm or l/m) \_\_\_\_\_
2. Rate of injection required: (gpm or l/m for liquids) (scfh or l/m for gasses) \_\_\_\_\_
3. Pressure differential across injector
  - a. System, or pump pressure at inlet to injector (psig or Kg/cm<sup>2</sup>) \_\_\_\_\_
  - b. Pressure (back-pressure) at outlet of injector (psig or Kg/cm<sup>2</sup>) \_\_\_\_\_
  - c. Available pressure differential (3a. – 3b.) (psig or Kg/cm<sup>2</sup>) \_\_\_\_\_
  - d. Percentage pressure differential  $[(3c./3a.) \times (100)]$  \_\_\_\_\_ %

### INJECTOR SELECTION

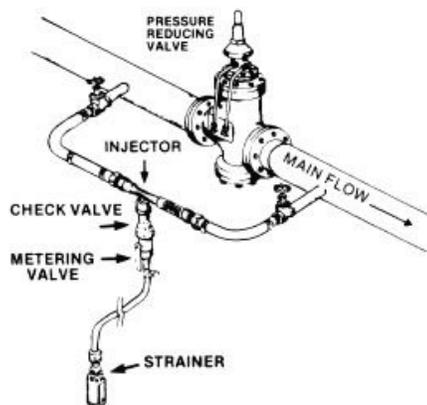
The Injector Performance Tables shown in the Mazzei Product Catalog list the motive flow values and suction capacities for all models of Mazzei Injectors at various differential pressure conditions.

From the calculations above, use the Performance Tables to select an Injector model that can exceed the required injection (suction) rate. The motive flow (water flow through the injector) must not exceed the total water flow of the system. If the required motive flow is less than the

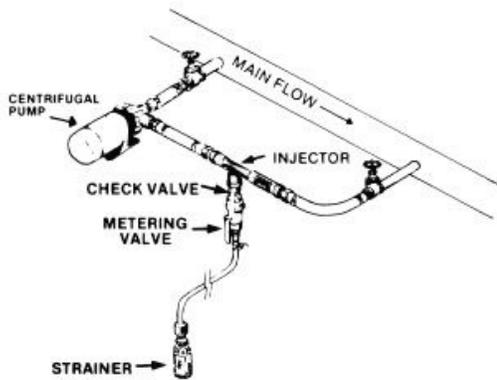
total water flow of the system, the Injector may be installed in a “bypass” mode so that only part of the total water flow passes through the Injector.

1. Locate the Injector inlet pressure which most closely corresponds to your maximum available water pressure (3a. above).
2. Locate the Injector outlet pressure which most closely corresponds to your system pressure downstream of the Injector, after installation.
3. Review the Performance Tables to locate an Injector model which has a suction capacity that is greater than the required suction capacity. Use a metering valve or orifice assembly to obtain the precise suction required.

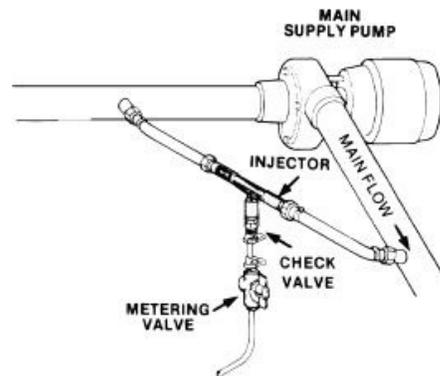
TYPICAL INSTALLATIONS



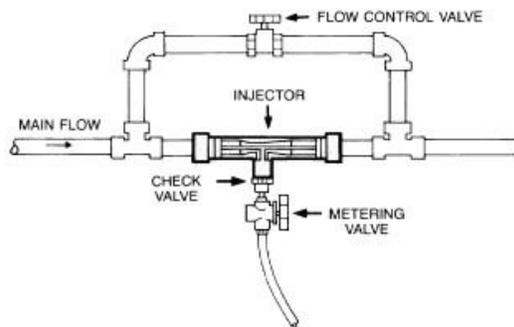
Injector installed around a point of restriction such as a regulator valve or gate valve which creates a differential pressure, thereby allowing the injector to produce a vacuum.



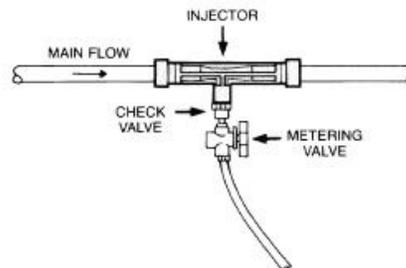
Installed in conjunction with a centrifugal pump to boost pressure through the injector thereby creating a differential pressure and producing a vacuum for chemical induction downstream from the pump.



Injector installed across the differential pressure created by an existing booster or supply pump in the system. It is plumbed from the discharge side to the intake side of the pump.



Injector installed in main flow line with flow control valve on by-pass line.



Installed directly in the main flow line with total flow of the system moving thru the injector.