

## Pesticide Chemigation Through Pumped Irrigation Systems

Anti-Pollution Devices and Management Practices to  
Prevent Groundwater Contamination

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Chemigation is the application of agricultural fertilizers, soil amendments and pesticides through irrigation water. They may be applied through flood and sprinkler irrigation systems using metering equipment and chemical injectors.

Producers in Nevada recognize that chemigation offers several advantages over conventional pesticide application techniques; consequently, it is quickly becoming an important tool in controlling insects, weeds, and plant diseases in agricultural crops and on golf courses.

### **Advantages of chemigating with pesticides include:**

- ◆ reduced pesticide exposure to applicators,
- ◆ less soil compaction and crop damage from heavy spray equipment,
- ◆ more consistent control of pests because pesticides are more evenly distributed,
- ◆ less labor required to apply pesticides, and
- ◆ pesticides may be applied when conditions prohibit conventional equipment from entering the field, e.g. when the soils are wet.

### **Disadvantages of chemigating with pesticides include:**

- ◆ specialized equipment and knowledge are required for chemigation, including specific safety precautions,
- ◆ initial cost of equipment is high, but with long-term use there may be significant savings in labor and other equipment costs,

- ◆ chemigation improperly used increases the contamination of surface waters, if spray coverage enters streams, ponds or ditches, and
- ◆ localized spills, leaks or misapplications at the wellhead may contaminate the groundwater.
  - Avoid spills when filling the tank near the wellhead.
  - Avoid cleaning the chemical supply tank at the wellhead.
  - Include a secondary containment basin beneath the chemical supply tank.

A major drawback of chemigation is the increased potential for contamination of sources of surface and ground water. In Nevada, most irrigation water used in chemigation systems is groundwater. Much of the water used for domestic purposes and livestock is also groundwater. Although the wells may be different, the aquifer supplying them may be the same. Because irrigation water, livestock water and domestic water may come from the same source, it is essential that farmers who use chemigation follow specific guidelines to protect their groundwater supply from pesticide contamination. Federal regulations require that anti-pollution hardware be installed in chemigation systems that are used for pesticide applications.

Chemigation requires two separate hardware systems be joined together; the chemical injection system and the irrigation system. Functioning anti-pollution devices must be properly installed in both systems to effectively prevent ground water

contamination. A chemigation injection system with anti-pollution devices is outlined in figure 1. Table 1 describes each anti-pollution device, its

location and purpose in the chemical injection system.

**Figure 1: A chemigation station layout with the proper safety equipment.**

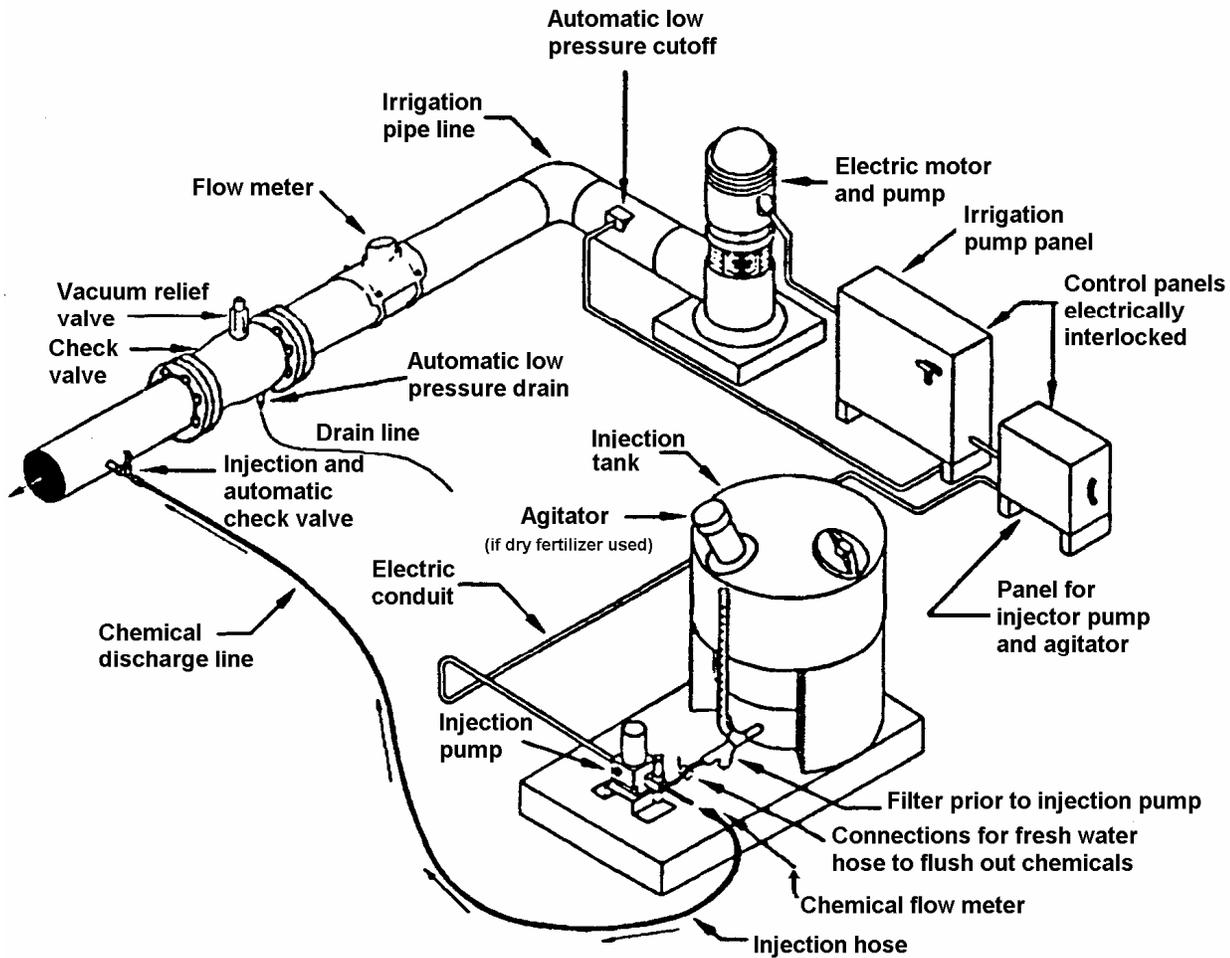


Table 2 outlines the appropriate anti-pollution devices, their location in the irrigation system and their purposes. A description of what

may happen if anti-pollution hardware is not installed properly in both systems or fails to work properly in either system is outlined in Table 3.

Table 1. Chemical injection system anti-pollution devices.

Device	Location	Purpose
Filter	Between pump and tank	Remove sediment that may clog pump or check valves
Check valve (normally closed unless under pressure)	At the point in irrigation line where pesticides are injected	Prevent water from flowing backwards into the chemical tank
Normally closed solenoid valve	Between pesticide tank and injection pump	Prevent tank from emptying unless injector is working

### Interconnection of chemical injection and irrigation pump power sources

Power sources for chemigation systems must be interconnected or interlocked so that if either the irrigation pump or the chemical pump inadvertently stops the other will automatically shut off. Interlocking the power sources prevents chemicals from being pumped into the irrigation system after the irrigation pump stops or when the

irrigation system is operating but chemicals are not being injected. Interlocks differ depending on how the system is powered.

An electrically powered irrigation system uses a small electric motor to power the chemical injection pump. The electrical system must be interlocked so in the event that one pump shuts down both systems will shut down.

Table 2. Irrigation pipeline anti-pollution devices

Device	Location	Purpose
Main line irrigation check valve	Between well and chemical injection point	Prevent back flow of pesticide into water source
Vacuum relief valve	Between check valve and well	Prevent vacuum when pump shuts off; reduces chance of back flow
Low pressure cutoff	Main irrigation pipeline	Shut off power to chemical injector when water pressure is low
Low pressure drain	Between check valve and well	Discharges water which may leak through the check valve after pump shuts off

Systems powered by an internal combustion engine use a belt off of the drive shaft to run the chemical injection pump. The chemical injection pump automatically stops when the engine stops. However, if the chemical injection pump fails, the irrigation pump will continue to

function. A flow or pressure sensor should be installed in the chemical injection line. The sensor will shut down the irrigation pump if the chemical pump shuts down and prevent inadvertent siphoning of chemicals into the irrigation system and possibly the water source.

Table 3. Absence or failure of anti-pollution chemigation equipment causes problems.

Failure of the....	May cause....	Resulting in....
Chemical injection system	Water to back flow through the injection system	Overflow of the chemical tank and contamination of the injection site
Irrigation pump	Water and pesticide to flow directly into the groundwater	Groundwater contamination
Irrigation pump while the injection system still functions	Pesticide to be pumped into the irrigation pipeline and directly into the water source	Serious contamination of the groundwater

### Other Equipment

Components such as fittings, hoses, and clamps that will come in contact with pesticides should be made of chemically resistant materials. The material best suited for fittings is stainless

steel, and in most cases hoses should be made of ethyl vinyl acetate. Hoses should be inspected regularly for leaks and cracks. Because hoses may break down when exposed to sunlight it is recommended that chemigation injection

equipment be covered with a tarp when not in use.

### Management Practices

Good management practices are essential to protect water supplies from pesticide contamination. They should follow good common sense and the laws established to protect our animals, the environment and us. For example, it is handy to install a freshwater supply faucet at the chemigation injection site, rather than to haul water. Fresh water is necessary for mixing, loading, and cleanup and should be installed upstream from the mainline check valve. This will ensure that fresh water is available, even when pesticides are being injected.

In order to prevent contamination of areas where irrigation or chemical pumps are located, sprinkler heads adjacent to these sites should be turned off during chemigation. Also sprinkler heads that apply water to roadways, creeks, ditches, or wildlife sites should be turned off

during chemigation. Surface runoff containing chemicals should be prevented from running off into any of these features or ponding within the immediate vicinity of the wellhead. Remember that polluted water can run down the outside of the well casing and into the water supply.

As with any pesticide application the conscientious applicator will always pay close attention to the weather. Wind can cause the pesticide to drift off target, resulting in ineffective pest control, non-target crop damage, human and livestock exposure, and environmental pollution. Applicators also must be sure to always read and follow the label instructions of the products they are using, including those pertaining to safety clothing and equipment, application by chemigation and potential environmental hazards.

#### PRECAUTIONARY STATEMENT

While pesticides can produce benefits, they also can present certain risks to the applicator, others, and the environment. To maximize benefits and reduce risks, read and follow label instructions. Pesticide labels are legal documents, making it a violation of both federal and state laws to use a pesticide in a manner inconsistent with its labeling.

Information was obtained for this fact sheet from the Cooperative Extension Service, Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln and the Nevada Pesticide Applicators Training Manual, Nevada Cooperative Extension.

Trade or brand names are used to simplify information; no endorsement by Nevada Cooperative Extension is intended. Mention of a pesticide does not constitute a recommendation or a guarantee of efficacy. Always read the pesticide label.

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