Chemigation Injection Devices

Chemicals are often injected through irrigation systems, hence the name chemigation. When applied to fertilizers, it is called fertigation. Surprisingly many growers still apply fertilizers by hand, however the predominant use of micro-irrigation systems in avocados readily lends itself to fertigation. This compatibility is due to the frequency of operation and the control the operator has over the system. If the uniformity of the system is high, applying fertilizers through the irrigation system can improve fertilizer distribution, allow for flexibility in fertilizer timing, reduce labor in spreading materials, allow for less fertilizer to be used and can lower costs relative to hand applications of fertilizers.

Chemigation can still cause environmental damage, particularly when the chemicals injected move readily with the irrigation water. Over-irrigation resulting in deep percolation can contaminate groundwater when a mobile chemical is injected. Contamination can occur if:

1. the irrigation water pumping plant shuts down while the injection equipment continues to operate, causing contamination of the water source or unnecessary amounts of fertilizer to be injected into the irrigation system, or
2. the injection equipment stops while the irrigation system continues to operate, causing the irrigation water to flow into the chemical supply tank and overflow onto the ground.

To prevent these problems, back-flow devices and check valves can be installed. Local regulations should be followed in selecting these devices.

Many different materials may be injected, including organic fertilizers, dry fertilizers and liquids. The major fertilizer injected is nitrogen, but potassium and micro-nutrients, as well as water treatments, such as urea-sulfuric acid are also injected. The important point to remember is that the materials must be soluble. Fertilizers delivered as a solution can be injected directly into the system, while those in a dry form must be mixed with water to form a solution.

Fertilizer material differs widely in water solubility, with solubility depending on the physical properties of the fertilizer as well as on irrigation water quality. Agricultural grade fertilizers and amendments are often coated to inhibit moisture absorption and to assist in material flow through machinery. These coatings and other foreign materials can cause clogging problems in the mixing tank, as well as the irrigation system. The foreign material exists in the tank as sediment or as a scum on the surface. To prevent problems, stock tanks should be agitated until the material is dissolved. To further prevent problems, the solution should be filtered between the stock tank and the injection point, and the injection point should be upstream of the irrigation system filters.

Irrigators wishing to inject chemicals have a variety of injection equipment from which to choose, including differential pressure or batch tanks, venturi devices and positive displacement pumps. The most expensive are displacement pumps that are powered by electricity or water. They put out precise amounts of material. Venturi and batch tanks are much less expensive and are relatively simple to operate. Their major drawback is that they require a pressure loss to force the material into the irrigation system. A 10 - 30 psi pressure differential is often required and in some places this differential is not possible. In that case a fractional-horsepower pump can be used to provide the pressure differential. Neither of these devices is as precise as the displacement pumps. However, fertigation does not require a fixed concentration of solution, only a known amount of applied material. And these pressure differential applicators do the job very well.