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Calibration of Fertilizer Injectors for Agricultural Irrigation Systems

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Fertilizer application through an irrigation system is called "fertigation". Fertigation is practiced for several reasons — the primary reasons are lower application costs and greater production responses. It is normally less expensive to apply fertilizers with irrigation water than by other methods, especially if several applications are required during the growing season. Also, for many Florida crops, growth and yields have been increased when fertigation was used to maintain optimum nutrient levels at critical crop growth stages.

Other reasons for the popularity of fertigation include: (1) the ability to make prescription applications of fertilizers; that is, to apply them precisely when needed and only in the amounts needed, thus maximizing their effectiveness, (2) a reduction in environmental pollution because fertilizers can be applied only in the amounts needed and thus large quantities are not subject to leaching loss if heavy rainfalls follow conventional applications, and (3) a possible reduction in the total volume of fertilizers applied because leaching losses are minimized.

Growers should only inject water soluble fertilizers or fertilizer suspensions that are compatible with their irrigation system and crop production system. Because they are potentially corrosive, fertilizers should be flushed from the irrigation system after each application. Fertilizer solutions should always be injected before (upstream of) the filters in microirrigation systems. The compatibility of fertilizer solutions with the irrigation water and with any other chemicals being injected should be tested to avoid the formation of chemical precipitates in the irrigation system. IFAS production guides should be consulted for the specific crop being produced to obtain recommendations for chemical formulations, fertigation rates and schedules.

Calibration of fertilizer injection systems

Each method of fertilizer injection must be calibrated by the user. Calibration procedures vary depending upon the injection method used and the specific design of the injection equipment. In all cases, however, the user must verify that the manufacturer's calibration or the method being used is correct by using a chemical flow meter which is accurate in the flow range of gallons per hour (or other rate being injected), or by measuring the injection rate volumetrically.

Chemical flow meters

Flow meters are available which can be used to directly measure the chemical flow rate while the injection system is operating under field conditions. Meters can often be mounted on the low pressure (suction) side of injection pumps.

Caution: If a chemical flow meter is used on the high pressure side of an injector, be certain that the flow meter is rated for the pressure being used before installing it in that position. Failure to use a properly installed, adequately pressure-rated meter may cause it to be damaged, and it may be hazardous to individuals working in the area.

Volumetric flow rate measurement

To measure flow rates volumetrically, a container of known volume (such as a graduated cylinder) and an accurate timer (such as a stopwatch or a watch with second hand) are needed. Measure the time required to fill the container. Then calculate the flow rate as the volume per time, typically in units of gallons per hour (gal/hr or gph).

For example, assume that a 100 ml graduated cylinder and stopwatch were used to measure injection rates. Assume that 92 ml of fertilizer solution

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