

Drip Irrigation Operation and Maintenance

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Three-row plastic machine laying plastic mulch and drip tape on preformed beds.

Before you get into the operation of tape systems, make sure you do not damage your system while installing it. First, check your tape injection pipe/tube to make sure it is in good condition and check it daily while laying tape and plastic. Second, after visual inspection of the tube, check the inside of the tube to be sure the inside is free of rust and burrs. This may be done by pulling either a balled up nylon stocking or a ball of tissue through the tube with a wire and then looking for snags. Also, make sure your tube is large enough for the tape to easily fit down the tube and not rub the edges of the tape. Third, make sure the person opening the roll of tape does not cut the side edges by cutting through the cardboard sides of the roll with a knife or blade.

Next, do your best to prevent clogging the tape. Install the tape with the emitters/strips up so that any debris that enters the line will settle to the bottom away from the tape emitter inlets. Also, make sure you do not stretch or damage the tape from too tight a setting on the layer tension.

Finally, always save a tag or label from the tape reel to keep a record of what product you are using. Record mil thickness, spacing, and emitter flow. Emitter flow may be recorded as the GPH per emitter or Q100, which is the flow in gallons per minute per 100 feet. Simply stating high, medium and low flow is not accurate information and varies by manufacturer and dealer.

Operation

When starting up your system for the season you need to flush all of your lines to remove any algae, dirt, debris or critters that got in during installation, or that entered over the winter for permanent systems. Start out by closing all submain valves and flush out the main lines first, then flush all the submains. Then close the submain flush valves, flush the tape laterals and last, close the ends of the laterals. Make sure you use properly adjusted pressure regulation devices so that downstream pressure will not exceed the maximum pressure rating of the lateral tape lines. Thin wall products like drip tape are generally rated at a maximum pressure of 8 to 15 psi depending on mil thickness. Thick-walled products such as orchard tubing or drip line are rated at 50 psi. Oval hose or flat tube are usually rated around 21 psi.

Filters should be cleaned and in good working order. Make sure disc and screen filter elements are clean and properly installed, and that the sand is not worn and is at the proper level in sand media filters.

Automating the back flush function when possible helps keep filters clean and operating properly. It also prevents dirt and debris from extruding through the filter from too much pressure differential. The differential between the upstream and downstream pressure indicates when the filter is clean and when it needs flushing/cleaning. Generally, a clean filter will only have a pressure differential of 1 to 3 psi, while a filter with a 6 to 10 psi differential requires flushing.

Now that you have your system up and operating you need to check and record the flows and pressures and make sure they are within specifications. Pressure should be checked and recorded at the pump, filters, main line, header, beginning and end, and then at the end of the lateral, and at all high and low points in the field.

For proper uniformity of water and fertilizer application, a classic non-pressure compensating tape system should not vary more than 3 psi from high to low.

Most systems operate at 8 to 10 psi, however, some growers increase the pressure thinking they can get longer runs with higher pressure. In reality, raised pressures shorten the recommended length of run due to the resulting increased flow and its affect on system hydraulics. If you need longer runs, contact your dealer or manufacturer to help you.

For pressure compensating drip tapes, the allowable pressure difference is usually 12 to 15 psi depending on tape wall thickness. This translates into an acceptable elevation change of up to 25 feet since 2.31 of elevation change is equal to 1 psi. The minimum operating pressure for pressure compensating tapes to work properly is 8 to 10 psi. For thicker walled, pressure compensating orchard tubes or drip lines, the pressure can vary from a high of 50 psi to a low of 10 psi and still maintain a uniform flow from each pressure compensating emitter.

Now that you have your flows and pressures recorded, you should monitor your system for anomalies. These can be caused by clogging, filtration problems, leaks, the wrong valve open or closed, and/or pump problems.

Your irrigation system should be operated to maintain moisture throughout the bed or row as much as possible keeping in mind that water moves through the soil and across the bed via capillary action. Drip irrigation should be operated frequently to maintain moisture, unlike a sprinkler system where you allow the soil to dry out and then replenish with saturation.

Moisture should be monitored regularly or on a daily basis depend-



Top: Chemical reaction in jar test of fertilizer and irrigation water forming cloudy precipitate.

Bottom: Chemical precipitate that has settled in jar after 24 hours.

ing on soil type and crops grown. Soils differ in their water holding capacities and wetting patterns. Light sandy soils hold less water and exhibit a conically shaped wetting pattern while heavy clay or loam soils hold more water and exhibit an oval shaped wetting pattern.

Moisture can be monitored with a variety of methods including direct analysis of the soil with the feel method, evapotranspiration tracking, and measuring readings from tensiometers, electrical resistance meters, capacitance sensors and others.

The tape system not only allows proper irrigation, but enables proper fertigation and chemigation to provide a boost to growth and crop production. A water and soil analysis is needed to determine crop requirements and chemical compatibility. Fertilizer applications should be scheduled to apply the amount of fertilizer needed depending on the crop, stage of growth and fruiting stage. Always follow the label when applying pesticides. Your dealer or manufacture can help you with chemigation scheduling by determining the fertilizer/chemical travel time from the pump station to the ends of the rows. A jar test is important and should always be conducted prior to adding fertilizer or chemicals, or mixing and adding chemicals, to your irrigation water.

Caution: Always add acid to water; never add water to acid.

Caution: Never mix or store acid and chlorine together.

Maintenance is critical

Proper system maintenance is the key to the life and proper operation of your system. Watching for anomalies in pressure and flows is one of the best ways to monitor your system for maintenance needs. Other ways include visual inspection for leaks by looking for wet spots, hearing or seeing squirting in the field, looking for dry spots, checking the ends of laterals for contamination or dirty water, and flushing headers

and mainlines.

Depending on what contaminant is in the water, you can inject either acid or chlorine to help correct/cleanup the problem. Chlorine is used to control algae and bacterial while acids are used to control carbonates, precipitates, and some organic problems. There are also some commercial chemical treatments available to help control water quality issues. Consult with your chemical supplier or your dealer for the proper material and use.

If the water contains elemental iron, please note that injecting chlorine (an oxidizer) will cause it to form a precipitate, which can cause clogging if it occurs downstream of the filters. To treat iron, either lower the pH to prevent oxidization and precipitation, or use a sequestering agent.

Leaks to the tape can be caused in several ways including damage by insects, by rodents, and the lens effect of the sun. Insects can be controlled by injecting labeled chemicals depending on the crop and insect. In some cases, a thicker mil tape may resist insect damage. Rodents are often controlled by baiting. To avoid damage from the lens effect under clear plastic mulch, bury the tape under some soil.

Most of this and additional information can be found in the Toro Micro-Irrigation Owner's Manual. This document can be downloaded free of charge at www.dripirrigation.org, or may be purchased for a nominal fee of \$15 at www.shoptoro.com. 🍅

**Editor's Note: Bill Wolfram, CID, is the District Sales Manager for Toro Micro Irrigation. He can be reached at: www.toromicroirrigation.com, Bill.Wolfram@Toro.com or (757) 710-0320. The material here is edited from a report given during the Great Lakes Fruit and Vegetable Expo Plasticulture Session, Dec. 7, in Grand Rapids, Mich.*



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