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Micro-Irrigation Business

Maximize drip irrigation benefits by automating

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Introduction

Ask any pro athlete if equipment makes a difference, and you can guess the answer: sure it does - but only if you know how to use it! Growers know that success depends on staying current with technology, which means knowing which equipment applies and how to use it. Drip irrigation equipment and automation technology has existed for decades, but today it is more powerful and affordable than ever before. Here are some ideas that can help growers automate drip watering to grow a better crop while at the same time better managing labor and water costs.

Advantages of Drip

Drip irrigation, also known as micro-irrigation or trickle irrigation, is a remarkable water technology first developed decades ago. Today, it is commonly used all over the world in agricultural, nursery, greenhouse, landscape and a variety of industrial applications. In recent years, the demand for drip irrigation has grown rapidly and for good reason – the technology can help solve serious problems associated with water use, and at the same time improve farm profitability by increasing income and reducing costs. Although the investment is significant, payback is often short, sometimes less than a year. The term Intelligation™ refers to the process of taking full advantage of the benefits drip irrigation offers.

Comparing drip with flood and sprinkler irrigation

Drip is significantly different from sprinkler irrigation. Conventional sprinklers typically apply water at a flow rate measured in gallons per minute (GPM) rather than GPH. As a result, application rates are generally higher, causing irrigation duration to be shorter and/or irrigation events less frequent. Higher application rates may also result in runoff if they exceed the soil and slope's ability to absorb water. Sprinklers typically operate at pressures ranging from 35-90 psi or more, spreading water through the air via spray or rotor type mechanical devices with wide distribution patterns. Thus, the plant material is typically wetted before water reaches the soil and root-zone, and non-targeted areas such as furrows and roads may be wetted as well. Since sprinkler irrigation systems apply water through the air, wind may affect wetting patterns, too. If hand move sprinklers are used, labor is required to move the pipelines and change the valves, and pipelines typically block entry to the field.

Drip differs from gravity irrigation even more. Gravity irrigation is commonly used to irrigate crops via a network of ditches, pipes, furrows and/or basins. After leaving ditches or pipelines, un-pressurized water flows down furrows or across basins from one end of the field to the other, using gravity and a slight elevation drop for propulsion. Energy requirements per unit of water pumped are lower with gravity vs. drip, but more water must be pumped due to relatively low application uniformities. Other drawbacks include high evaporative losses, germination of weeds in non-targeted areas, inability to spoon feed water and nutrients to crops on a frequent basis through, and unsuitability for hilly terrain, long lengths of run, variable or sandy soils. Perhaps most importantly, flood irrigated fields must dry down sufficiently before cultural operations such as harvest may proceed.

The following chart summarizes the relative differences between Drip, Sprinkler and Flood Irrigation systems. Positive differences are highlighted in green:

Comparing Drip, Sprinkler and Gravity Ag Irrigation Systems			
	Drip/Micro	**Sprinklers**	**Gravity**
Ability to maximize crop performance by "spoon feeding" water and nutrients via automation	High	Low	Low
Energy costs to pump water	Low-Medium	High	Low-Medium
Irrigation system labor requirements	Low	High	High
Ability to fertigate through the irrigation system rather than tractors	High	Low	Low
Likelihood of wetting plants, roads, furrows	Low	High	Low
Ability to avoid germinating weeds in non-targeted	High	Low	Low
Typical system application uniformity	High	Medium	Low
System application rates	Low	Medium	High
Ability to avoid runoff or deep percolation	High	Medium	Low
Ability to enter fields for cultural operations, even during irrigation	High	Low	Low
System purchase and installation cost	High	High	Low

In summary, utilizing drip irrigation may be advantageous in many applications. Whether the end user wishes to improve profitability or simply reduce water use, there are a variety of drip system components and automation equipment to choose from such that crops may be irrigated efficiently, and that the investment in a drip system is maximized.

Why Automate Crop Watering ?

There are many cases when it is inconvenient, if not impossible, to expertly irrigate without automation. For example, dedicated labor may not be available to operate drip systems frequently (multiple times per week or even per day) and for short durations of time, which in many cases is the ideal to maximize yields and avoid wasting water and fertilizer. The problem worsens if valves need to be changed during the night or on the weekends. Or in the case of cooling or propagation applications, it's difficult for labor to turn valves on for a few seconds every 10-15 minutes. Growers who automate find that controllers and valves are cost effective and reliable, leaving labor to perform other, more important tasks to grow a better crop.

Due to advancements in automation technology, relatively inexpensive stand-alone controllers and valves may be installed in virtually any application with little effort. Controllers are available for applications with or without power, and for situations where simplicity and low cost are key. Solenoid activated valves are available in a multitude of sizes and configurations, and are equally simple and cost effective. Controller and valve technology is extremely reliable and hassle free unlike past systems which could be fussy, complicated and expensive.

Applications with Power and a Low Budget

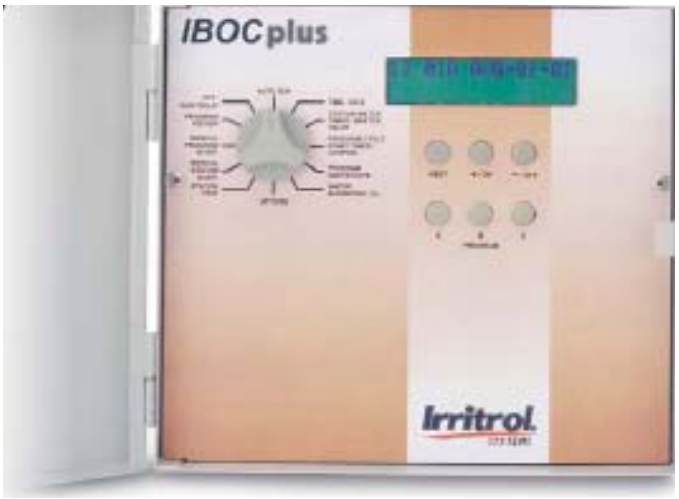
For growers that have 120 VAC power available, Toro's Jr. Max controller is both affordable and powerful. It accommodates up to two 24VAC solenoid activated valves per station and features three independent programs, three start times per day on each program, a 365 day calendar to simplify scheduling, Spanish language labels, and a weather–resistant locking cabinet.

Junior™MAX

A powerful feature called Looping is available on Program C. A looping cycle allows a valve to run repeatedly throughout a user defined time window, which will be of keen interest to growers germinating seed, propagating, or using evaporative cooling systems. For example, a misting system could be operated for 10 seconds every 20 minutes between 10 am and 6 pm each day to maintain high humidity and cool a crop to avoid losses. At a price point of approximately $20 US per station, the value can't be beat.

Applications without Power

Where power is unavailable, battery/solar/hybrid operated controllers may be installed to activate valves equipped with DC latching solenoids. Toro's family of IBOC Plus (**B**attery **O**perated **C**ontrollers) feature three independent programs, eight start times per program, a 365-day calendar and a large, easy-to-read LCD screen in Spanish or English. This technology is slightly more expensive and may require periodic changing of batteries, but is extremely powerful, reliable and in the long run, cost effective considering the benefits derived.



For instance, IBOC's enable growers to distribute smaller controllers closer to where they are needed. This can drastically reduce wire costs, especially if utilities require wire to be run from a plug-in controller to field valves. IBOC's are also less sensitive to lightening damage and dirty power. Finally, no permits are required, and IBOC's may easily become portable.

Toro IBOC power is supplied with one 6 volt alkaline DC battery or a solar-powered converter. Stand alone 6 volt batteries should be replaced each season, whereas the solar option includes a maintenance-free gel cell battery that boasts a three year life.

Summing it all up

Now more than ever before, growers can automate drip systems to grow better crops, save money and improve profitability. Crops will receive water when needed, and labor may focus on more important tasks. Best of all, payback is quick and it's hassle free, leaving time and money for