Irrigation Performance – A Key to Maximizing Inputs

Irrigation System Performance - An Overview

Most producers understand the base components needed for plant growth; water, light, air and nutrients. These growers are also likely to understand the importance of utilizing quality inputs and services to assure that these base elements for plant life are met. However, arguably the most important building blocks for plant growth is often the most overlooked component ...water.

Since approximately ninety percent of plant tissue is comprised of water, it makes sense that supplying a growing crop with a consistent supply of clean water is essential. As irrigation systems have evolved so have expectation for water efficiency and uniformity.

Measuring emitter flow rates for D.U. calculations.

Distribution Uniformity

Drip irrigation has transformed the Agricultural industry by allowing farmers to maximize their crop production for decades. Well-designed systems can ensure that every plant within a given field or set will receive approximately the same amount of water and nutrients, which is the basis of distribution uniformity (D.U.). D.U. is defined as how evenly water is applied throughout a field during an irrigation event. It is measured on a decimal scale of 0-1 but is commonly given as a percentage. Systems are typically designed with a D.U. range of 90-92% but can quickly decline due to various factors. Poor distribution uniformity can result from inadequate design, improper system maintenance, and degradation of lines and emitters over time. When the D.U. of a system is at or below 85%, growers begin to substantially decrease their overall efficiencies and potential yield.

How Does D.U. Affect Crops

Distribution uniformity has a direct impact on the efficient use of all inputs in the crop production cycle, as well as the level of production itself. Yields can significantly decrease if poor D.U. is not addressed, which decreases energy efficiencies and increases the cost of water. In order to make up for inconsistencies in an irrigation system with poor D.U. (anything below design rating or 85% - whichever is lower) producers must irrigate longer to assure that all crops receive the minimum water required. This practice not only wastes energy, but inputs such as water and fertilizer are unevenly applied as a result.

Raj Dhillon and Tyler Hawk performing a D.U. evaluation in Shafter, CA.

Improving Your Distribution Uniformity

Irrigation water and system maintenance is at the forefront of improving and maintaining good distribution uniformity. A drip or sprinkler system should first be

evaluated and compared to original design to determine how much improvement - if any - can be made. From there, when necessary a chemical flush should be performed to "shock" the system at high concentrations of either chlorine, acid, or peroxyacetic acid-based solutions. A well-executed flush can increase a system's D.U. by an average of 8% to 10%. However, irrigation systems with a much lower D.U. can see higher percentages of increased efficiency.

After a system flush has been performed on an irrigation system, growers should seriously consider incorporating a continuous water quality maintenance program on their irrigation system. Constant injection of the appropriate chemicals at very low concentrations can help to keep irrigation lines clear of contaminants which can increase D.U. This along with proper filtration and flush protocols contributes to increased efficiencies, crop uniformity, health and production.

Improving Your Distribution Uniformity

So, where to begin? Start by conducting a water quality analysis (Ag Suitability Test). This will help to determine which maintenance program is necessary to assure minimum plugging. In addition, a D.U. test can help establish a system uniformity baseline. It is also common to open a few select emitters to assist in identifying plugging contaminants and their severity. Once identified and if proven necessary, a flush and/or a maintenance program can be identified. It's all about return on investment. To achieve optimum efficiencies, uniformity and yield, we want to maximize all inputs, maintain system longevity and optimize plant health. All of which help to maximize production and ROI. Ag Water Chemical is helping growers identify and overcome these issues.

YIELD REVENUE IMPACT *from Poor D.U.*

Crop Values (per Lbs)	Distribution Uniformity (D.U.)					
	85%	80%	75%	70%	65%	60%
$2.00	$125	$250	$375	$750	$1,250	$1,500
$2.10	$131	$263	$394	$788	$1,313	$1,575
$2.20	$138	$275	$413	$825	$1,375	$1,650
$2.30	$144	$288	$431	$863	$1,438	$1,725
$2.40	$150	$300	$450	$900	$1,500	$1,800
$2.50	$156	$313	$469	$938	$1,563	$1,875
$2.60	$163	$325	$488	$975	$1,625	$1,950
$2.70	$169	$338	$506	$1,013	$1,688	$2,025
$2.80	$175	$350	$525	$1,050	$1,750	$2,100
$2.90	$181	$363	$544	$1,088	$1,813	$2,175
$3.00	$188	$375	$563	$1,125	$1,875	$2,250
$3.10	$194	$388	$581	$1,163	$1,938	$2,325
$3.20	$200	$400	$600	$1,200	$2,000	$2,400
$3.30	$206	$413	$619	$1,238	$2,063	$2,475

(1) Yield Degredation Factors are .5% loss from 85% to 75% D.U. .75% loss at 70% D.U. and 1% loss from 65% to 60%. Crop quality is adversly affected at D.U. below 60%. Average yield assumed to be 2,500 Lbs./AC.

by Raj Dhillon and Doug Larson, June 2020

Result of poor D.U. in an almond orchard.

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