Uniform Coverage

Uniform coverage is an assessment of an irrigation system’s nozzling package with regard to the spatial distribution of water on the treatment site. To evaluate the application uniformity (uniformity coefficient) over the area irrigated, the radial and, with center pivots, circular application uniformity must be determined. These calculations are normally done using catch-can data collected from a cross-section of the application site.

In reference to a chemigation application, uniform coverage pertains to the application of irrigation water, in conjunction with pesticide or fertilizer products. An irrigation system that is designed and maintained at a satisfactory uniformity coefficient will allow for the uniform application of pesticide or fertilizer products, with the exception of systems with the intermittent operation of endguns or swing spans (corner catchers). Unless equipped with a variable rate injection system that will compensate for water flow variations caused by the sequencing of nozzle operation (on the swing span) and of the endgun, product injection rate can vary by as much as 25 percent, or more.

Circular Uniformity (CUc) is a measure of the application uniformity along concentric circular paths under the center pivot lateral at constant radial distances from the pivot point. CUc provides information on how nozzle discharge varies with lateral position. However, CUc does not provide a good indication of how well the nozzle package along the entire lateral was specified at time of design or of the operating condition of the nozzle package as a whole, since only one radius is sampled. In this regard, CUr is a better measure of nozzle package performance.

The radical application uniformity (CUr) is a measure of the uniformity perpendicular to the circular or linear paths traveled by the sprinklers on the lateral. Consistent with guidelines as issued by the International Irrigation Association, CU values are used to assess self-propelled irrigation systems for distribution uniformity.

Distribution Uniformity

Distribution uniformity is a measure of the uniformity of irrigation water over an area, which is customarily reported as distribution uniformity of lower quarter, DUlq. DUlq is

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the ratio of the average of the lowest one-fourth of measurements of irrigation water applied to the average depth of the total irrigation water applied (ASAE Standard S526.2, R2006).

Distribution uniformity is determined through a field procedure utilizing “catch can” tests, which are used to measure the water actually being applied to the intended areas. The industry recognized standard for characterizing the uniformity of water distribution – that is, computing the coefficient of uniformity – of sprinkler packages installed on center pivots and lateral move irrigation machines is ANSI/ASAE Standard S436.1 (R2007). The ASAE standard is an accepted national standard by the American National Standards Institute (ANSI). For well-designed irrigation systems, the $DU_{lq}$ ranges from 93 to 96 percent with systems outfitted with impact sprinklers and, with spray nozzles, from 91 to 95 percent.

**National Standard for Distribution Uniformity**

USDA-NRCS Conservation Practice Standard, Code 442: Irrigation System – Sprinkler is a nationally recognized reference for sprinkler discharge systems.

As established in USDA-NRCS Code 442, the Pivot system (Heermann-Hein) or Linear system (Christensen) Coefficient of Uniformity (CU) shall not be less than 85% (76% Distribution Uniformity [$DU$]). It is recommended, prior to the application of a product through an irrigation system, that the CU (or DU) of the system should be determined and, if necessary, corrective measures undertaken.

USDA-NRCS Code 442 is the established industry standard in determining distribution uniformity. ANSI/ASAE Standard S436.1 (R2007) is the established industry standard that describes the procedure for determining the uniformity of water distribution for center pivot and linear move irrigation machines equipped with sprayheads or with impact sprinkler nozzles.