

APPLICATION UNIFORMITY TESTS ON "START/STOP" ELECTRIC PIVOTS

For years farmers have seen the uneven water pattern (radial spoking) caused by the starting and stopping of their electric driven center pivot irrigation systems. These aerial photos of the uneven drying patterns have caused many discussions and questions as to how serious is the problem? This uneven distribution has become more of a concern as the trend for lower operating pressures reduces sprinkler coverage.

Until now the effect on the uniformity was debated between continuous movement proponents and the start stop electric pivot dealers and manufactures. Finally a computer program has been developed by a researcher from Michigan State University that allows various inputs to predict the effect on uniformity from the start/stop electric center pivot irrigation systems. This is one of the first major studies done on this subject. Research on this paper began in 1991 and now after 5 years the results are presented in a 204 page paper. The results of these field uniformity tests and the computer simulation are presented in the paper titled Tower Movement Effect on the Distribution Uniformity Along the Path of Travel in Center-Pivot Irrigation Systems.

The computer model was developed from actual field testing on a Valmont center pivot located on the Chris Rajer farm in Michigan. Technical information on tower velocities for the simulation was furnished by Valmont Industries.

UNIFORMITY: Constant Move versus Start/Stop

From the conclusions of this paper: *"The uniformity coefficient for the distributions obtained with the lateral moving continuously were higher than for the lateral moving intermittently. For both, traditional and LEPA systems the Wilcox and Swailes Uniformity Coefficient (UCW), were for all practical purposes equal to 100%, when the lateral moved continuously. With the lateral moving intermittently, UCW values as low as 82.9% and 15.3% were found for traditional and LEPA systems respectively."*

To put this into perspective, most center pivot nozzling packages can achieve a coefficient of uniformity of 90% or above when measured down the length of the system. This is done by matching spacing requirements, nozzle size, and nozzle pressure on the computer generated sprinkler chart. When this sprinkler package is installed on a system that starts and stops then the actual uniformity is most likely going to be much less.

ALIGNMENT ANGLE for Electric Start & Stop

Electric pivot salesmen for years have promoted one electric alignment versus another electric alignment to suggest better application uniformity. Simulations in this study were done for three different alignment angles, 2°, 1° and 0.5°. Results show that the most accurate alignment may not achieve the highest application uniformity.

"the coefficient of uniformity was in many instances higher for the distributions generated with the alignment angle equal to 1 degree than for 0.5 degree."

These surprising results are explained by: *“The movement of the lateral (or sprinkler) over any given point is a function of the state of its adjacent towers. Four combinations are possible, which are: (1) both towers are stopped; (2) both towers are moving; (3) outer tower is moving and inner tower is stopped; (4) outer tower is stopped and inner tower is moving”* These conditions contribute to a wide variation in the distances that a sprinkler moves with each start. These movements are not sequential from outside to inside. The paper shows that this random cycling can have many extremes. This was confirmed in the field test on the Valmont center pivot. In one movement time study, the time the next to last tower was stopped and watering in one spot ranged from 5 seconds to 50 seconds.

It appears that many electric systems may be needlessly accelerating the wear and tear on their electric drive train. They are trying to maintain very close alignment sensitivity in order to achieve higher water application uniformity which may not be possible under certain conditions. Customers should read *“Center pivots - how straight in line”* written by Laveme Stetson, ARS, USDA Agricultural Engineer with the University of Nebraska.

END TOWER RUN TIME

The field tests in this paper also indicated that the end tower percentage timer may not be as accurate as most electric salesmen would like to think. The *“on-times”* and *“off- times”* of the end tower was also measured during the field tests. From the graphs in this report the end tower *“on-times”* varied up to 13%.

OPTIONS

Researchers developing new lower pressure technology, chemigation products, and crop research have specified continuous movement for years, or have developed constant move test systems, to achieve the most favorable results from their testing. Several years ago Texas A&M, the leaders in LEPA irrigation development, designed and patented a continuous move electric irrigation system. In 1995 Lockwood / Powerhorse attempted to build the first commercially available continuous move electric pivot. Valmont has just introduced it's first continuous move corner span and end tower. It promises uniform application under the corner arm but still doesn't address the uniformity on the majority of the area under the standard pivot.

Have lower pressure sprinkler packages finally demanded that center pivot systems address this decreasing uniformity? Maybe, but the cost and reliability of the variable speed electric drives will no doubt cause most electric pivot salesmen to rebuff these facts for as long as customers let them.

The only proven continuous moving center pivot is the T-L hydraulic drive system. The T-L hydraulic drive is the most dependable and serviceable pivot available. The fact that it is a continuous move is because of the inherent variable speed capability of the hydraulic motors and T-L's patented alignment. T-L has been producing and perfecting the ideal center pivot for application uniformity for nearly 30 years.

THE CHOICE REALLY IS SIMPLE.

Michigan State University Studies Pivot Uniformity

Tower Movement Effect On The Distribution Uniformity Along The Path Of Travel In Center Pivot Irrigation Systems

By

Mario Fusco

Compare T-L Continuous Move versus Electric START/STOP?

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But My Electric Alignment is Very Accurate!

"the coefficient of uniformity was in many instances higher for the distributions generated with the alignment angle equal to 1 degree than for 0.5 degree."

Why Can't My Electric Drive Be Adjusted for A Uniform Application?

"The movement of the lateral (or sprinkler) over any given point is a function of the state of its adjacent towers. Four combinations are possible, which are: (1) both towers are stopped; (2) both towers are moving; (3) outer tower is moving and inner tower is stopped; (4) outer tower is stopped and inner tower is moving"

**The towers on this test system stopped and watered in one place for 5 seconds and the next time stopped for 50 seconds, so if you desire better performance!
The Choice is Simple! T-L Continuous Move Hydraulic Drive!**

FOR MORE INFORMATION - SEE YOUR LOCAL T- L PIVOT DEALER