OFFICE OF CHARLES SWANSON

May 20, 2013

Shannon Geno
Rain Bird Corporation
6991 East Southpoint Road
Tuscon, AZ 85756

Dear Shannon,

RE: Irrigation Audit Report

Attached is the audit report for Canyon Creek Townhomes in College Station, Texas. Results are given for before and after the sprinkler head retrofit.

Results show that uniformity increased (both DU & CU) at the Canyon Creek Townhomes site after retrofitting with the Rainbird PRS sprinkler heads while reducing water use by 23% and maintaining similar precipitation rate.

Please contact me if you have any questions,

Sincerely,

Charles Swanson

Charles Swanson
Texas Licensed Irrigator #16931
Extension Program Specialist – Landscape Irrigation

cc. Guy Fipps

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Irrigation Audit Report
Rainbird PRS Field Study

College Station, Texas

May 20, 2013

Report By:
Charles Swanson, Extension Program Specialist-Landscape Irrigation
Guy Fipps, PhD, P.E., Extension Agricultural Engineer

Audit Conducted By:
Charles Swanson, Texas A&M Agrilife Extension Service
Shannon Geno, Rainbird Corporation
David Hebert, Texas Lawn Care

Introduction

An irrigation audit was conducted on May 1, 2013 in College Station, Texas. The purpose of the irrigation audit was to measure the performance of the irrigation system before and after a retrofit of the sprinklers with Rainbird PRS Sprinklers. Irrigation systems performance is analyzed using Low Quarter Distribution Uniformity (DULQ), Coefficient of Uniformity (CU), Scheduling Multiplier, Precipitation Rate and measured water use. The sprinkler retrofit was done by David Hebert of Texas Lawn Care.

Audit Procedure

The audit consisted of a catch can test of the landscape irrigation system. Water meter readings were also recorded to determine any potential water savings. The audit procedure included the following components:

- Locate and flag the desired stations sprinklers
- Place catch cans within the station
- Record initial meter readings
- Run the irrigation station for a specific amount of time
- Record wind speed with portable anemometer and sprinkler pressure with pitot tube
- Record catch can volumes and final meter readings

The catch can test was repeated twice before and twice after the retrofit. Field data collected is given in the appendix of this report.

Uniformity Calculations

Lower Quarter Distribution Uniformity

Various methods exist to determine the DU of an irrigation system. The method widely used in irrigation auditing is the Low Quarter Distribution Uniformity Method (DU_{LQ}). This method can be calculated as follows:

$$DU_{LQ} = \frac{\overline{V}_{LQ}}{\overline{V}} \quad \text{(Eq. 1)}$$

Where $\overline{V}_{LQ}$ is the average volume of the lowest quarter of the cans and $\overline{V}$ is the average of all the cans. This method places more emphasis on the adequacy of irrigation among the low quarter of catch cans. In ranking the irrigation volumes from lowest to highest, this method neglects the overall location of the irrigation water applied and not taking into account any beneficial (high volumes) that may have been applied near the low volumes.

Christiansen's Coefficient of Uniformity

While not widely used landscape irrigation, CU is the most widely accepted and used method for calculating the uniformity efficiency of irrigation systems. Christiansen's Coefficient of Uniformity (CU) takes a different approach to evaluating system performance. By taking the absolute value of the irrigation volume from the mean (the standard deviation), the method treats over irrigating and under irrigating equally:

$$CU = 1 - \frac{\sum_{i=1}^{n} |Vi - \overline{V}|}{\sum_{i=1}^{n} V_i} \quad \text{(Eq. 2)}$$

Where V_i is an individual catch cans volume and $\overline{V}$ is the mean (average) catch can volume. In comparing the standard deviation to the mean, you calculate on average how uniform the irrigation is being applied.

Results

The irrigation system at the property entrance of Canyon Creek Townhomes (Site #1) had high pressure and operated during wind conditions. During the initial catch can test with the existing rotors, some misting was observed resulting in a low uniformity for both DULQ (44-52%) and CU (56-63%) even though the irrigation system hardware was in good condition. Following the retrofit to the Rainbird PRS rotors, uniformity increased for DULQ (65-67%) and CU (76-77%).

Water meter analysis also showed a 23% decrease in water use while maintaining the similar precipitation rates.

Site #1 Canyon Creek Townhomes

Table 1. Site #1 Performance Data						
Test	Precipitation Rate, in/hr	DULQ	CU	Scheduling Multiplier	Water Use, GPM	Test Runtime, Minutes
#1 Existing Rotor	0.27	52%	63%	1.40	9.53	15
#2 Existing Rotor	0.23	44%	56%	1.51	9.87	15
#1 Rainbird PRS	0.20	65%	77%	1.27	7.33	15
#2 Rainbird PRS	0.25	67%	76%	1.25	7.33	15

Appendix A

Site #1, Canyon Creek Townhomes
Controller Station 3, Property Entrance

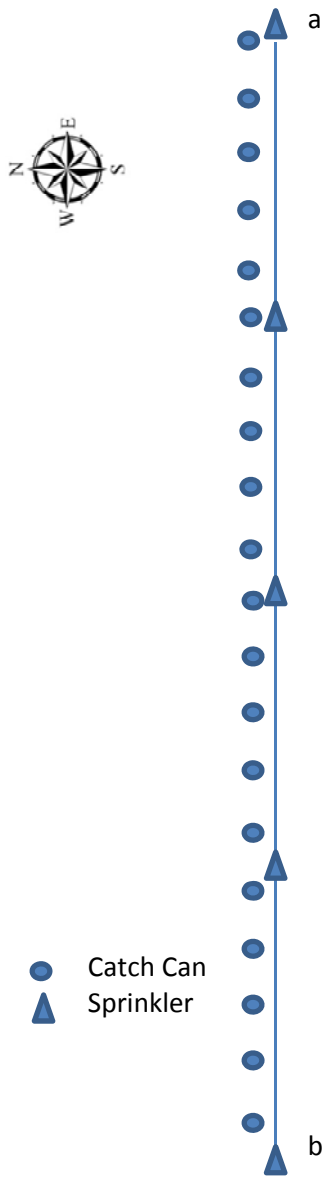

Table 3. Site #1, Catch Can Data (milliliters) in the order it was recorded (a-b)			
Existing Rotors		**Rainbird PRS**	
Test 1	**Test 2**	**Test 1**	**Test 2**
28[a]	30	24	26
30	26	15	20
23	24	14	20
17	21	15	23
15	15	15	23
28	25	23	25
35	23	15	20
26	18	14	17
17	15	13	17
10	9	11	16
15	7	19	20
17	8	12	13
13	7	7	11
9	6	7	10
4	5	8	8
14	8	13	15
23	18	14	14
22	20	15	14
14	14	12	17
7[b]	8	9	13

Table 4. Site #1, Test Pressures and Wind Data			
Test	Pressure, PSI	Wind Speed, MPH	Wind Direction
#1 Existing Rotor	50-65	3-5	S-SE
#2 Existing Rotor	50-65	3-5	S-SE
#1 Rainbird PRS	50-55	3-5	S-SE
#2 Rainbird PRS	50-55	3-10	S-SE

Table 5. Site #1, Test Meter Data			
Test	Initial Meter Reading, Gallons	Final Meter Reading, Gallons	Total Flow, Gallons
#1 Existing Rotor	18909330	18909473	143
#2 Existing Rotor	18909473	18909621	148
#1 Rainbird PRS	18909955	18910065	110
#2 Rainbird PRS	18910065	18910175	110

Figure 1. Site #1, Catch Can Test with Existing Rotors

Figure 2. Site #1, Catch Can Test with Rainbird PRS