

Tuning Up the Pivot for Dry Years

Steve Melvin

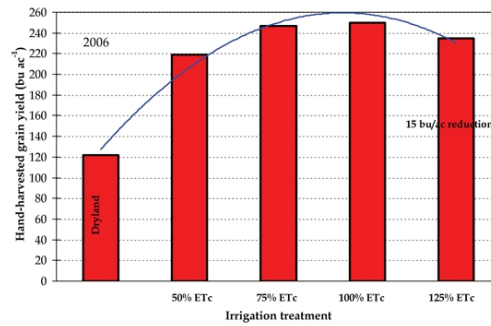


Session Goals

- At the end of this session participants will be able to better evaluate the sprinkler package on a center pivot.

- At the end of this session participants will be able to check the system pressure of a center pivot and know some ways to correct any problems found.

Com Yield Response to Total Applied Water



Data from Irmak and Rathje. 2008. Plant growth and yield as affected by wet soil conditions due to flooding or over-irrigation. University of Nebraska NebGuide G1904

Check Your Pivot for:

- Sprinklers not installed in correct position
- Missing sprinklers
- Sprinklers worn out or not operating properly
- Leaks – tower boots, drains
- Sprinkler spacing too wide
- Operating pressure does not match system requirements

Chart Shows Nozzle Order

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tw104 29 May 2015 LINDSAY . 7 TOWER, 700 gpm, 20 psi PAGE 2
---OUTLET--- -REQ- PSI ---GPM--- ---SPRINKLER--- ---NOZZLE---
No Loc Sep Model Req Req Del Model Plate Spds.
--
4 22.6 22.6 LB15 30.5 0.6 1.3 R3000 Orange 1 #14 Lime
FLUG 3
7 44.8 22.2 LB15 30.3 1.0 1.3 R3000 Orange 2 #14 Lime
FLUG 2
10 66.6 21.8 LB15 30.0 1.1 1.3 R3000 Orange 3 #14 Lime
FLUG 2
12 81.3 14.7 LB15 29.9 1.1 1.3 R3000 Orange 4 #14 Lime
FLUG
13 88.8
14 95.8 14.5 LB15 29.7 1.2 1.3 R3000 Orange 5 #14 Lime
FLUG
16 110.6 14.8 LB15 29.6 1.3 1.3 R3000 Orange 6 #14 Lime
FLUG
17 117.9
18 120.3 14.7 LB15 29.4 1.3 1.3 R3000 Orange 7 #14 Lime
FLUG
19 132.8
20 139.4 14.5 LB15 29.3 1.5 1.6 R3000 Orange 8 #15 Lime w/lav
FLUG
21 147.9
22 154.6 14.8 LB15 29.1 1.6 1.6 R3000 Orange 9 #15 Lime w/lav
FLUG
24 169.3 14.7 LB15 28.9 2.0 2.0 R3000 Orange 10 #17 Lvndr w/gra
FLUG
25 176.8

181.6 TOWER NO. 1 INLINE PRESSURE: 26.2 psi
26 182.6
27 186.8 17.5 LB15 28.7 2.2 2.2 R3000 Orange 11 #18 Gray
FLUG
28 184.9
29 201.6 14.8 LB15 28.6 2.2 2.2 R3000 Orange 12 #18 Gray
FLUG
30 208.9
31 216.3 14.7 LB15 28.4 2.3 2.2 R3000 Orange 13 #18 Gray
FLUG
32 223.8
33 230.4 14.5 LB15 28.3 2.5 2.5 R3000 Orange 14 #19 Gray w/trqu
FLUG
34 238.3
35 245.6 14.8 LB15 28.1 2.7 2.7 R3000 Orange 15 #20 Turquoise
FLUG
36 252.9
37 260.3 14.7 LB15 27.9 2.7 2.7 R3000 Orange 16 #20 Turquoise
FLUG
38 267.8
39 274.8 14.5 LB15 27.8 2.9 3.0 R3000 Orange 17 #21 Trqu w/yllw
FLUG
40 282.3
41 289.6 14.8 LB15 27.6 3.1 3.0 R3000 Orange 18 #21 Trqu w/yllw
FLUG
42 296.9
43 304.9 14.7 LB15 27.5 3.3 3.3 R3000 Orange 19 #12 Yellow
FLUG
44 311.8
45 318.8 14.5 LB15 27.3 3.4 3.5 R3000 Orange 20 #23 Yllw w/red
FLUG
46 326.3
47 333.6 14.8 LB15 27.1 3.5 3.5 R3000 Orange 21 #23 Yllw w/red
FLUG
48 340.9
49 348.3 14.7 LB15 26.9 4.1 4.2 R3000 Orange 22 #25 Red w/white
FLUG
50 355.8

360.6 TOWER NO. 2 INLINE PRESSURE: 24.4 psi
51 361.6
52 365.8 17.5 LB15 26.8 4.2 4.2 R3000 Orange 23 #25 Red w/white
FLUG
53 373.3
    
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Leaks



Sprinklers Missing/Plugged



Uniformity is critical during a chemigation application. Check system for proper nozzle operation. Get out nozzle chart from the manufacturer to make sure the correct nozzle is in the correct location.

Sprinkler Package Issues



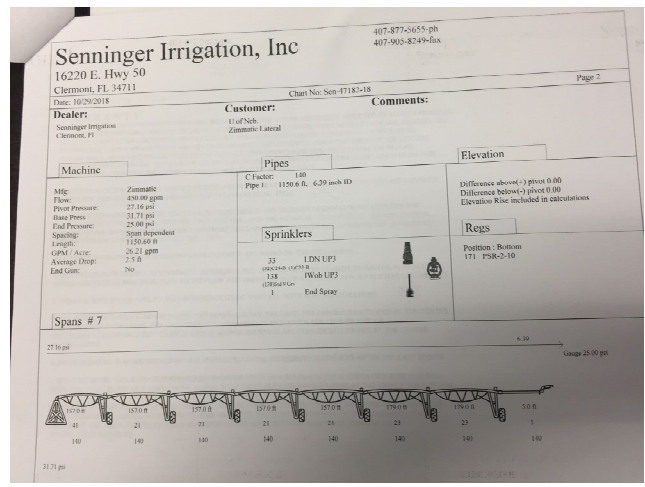
Operating Pressure Does not Match System Requirements



Checking System Pressure

- Lookup the pivot operating pressure in the sprinkler chart
- Check pivot operating pressure at the pivot point & at the end of the system at the highest elevation in the field with the end gun or corner arm on
- System pressure should be maintained at 5 psi above the pressure rating of the regulator
- If pressure is too low – it will cause uneven water application across the pivot lateral
- If pressure is too high – it will increased energy cost

Sample Sprinkler Chart



One pressure gauge to check all pivots

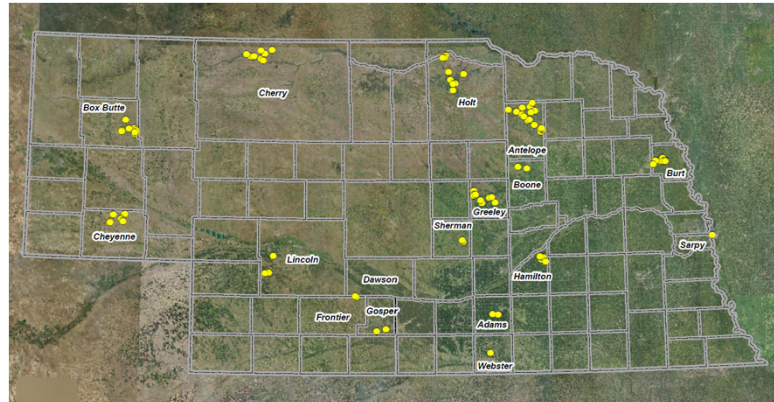


System Pressure

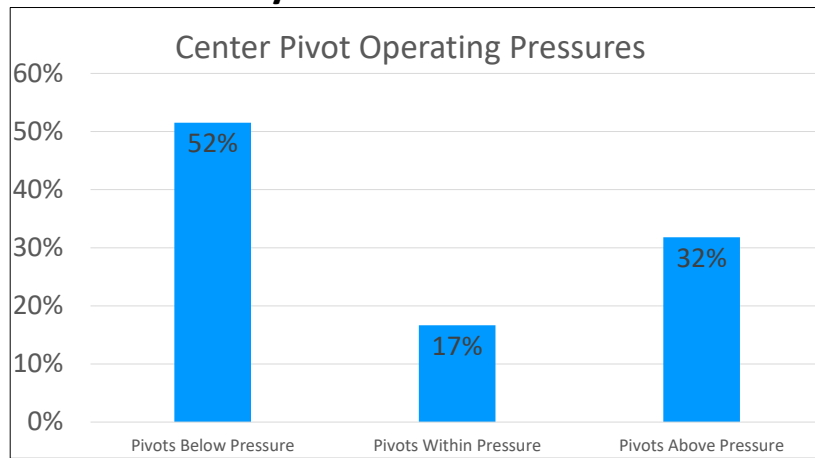
- Pressure Losses
 - Elevation Change: 10 psi for every 23ft change in elevation
 - System leaks & worn out nozzles
 - Bad pressure regulators
 - Worn out pump

System Locations

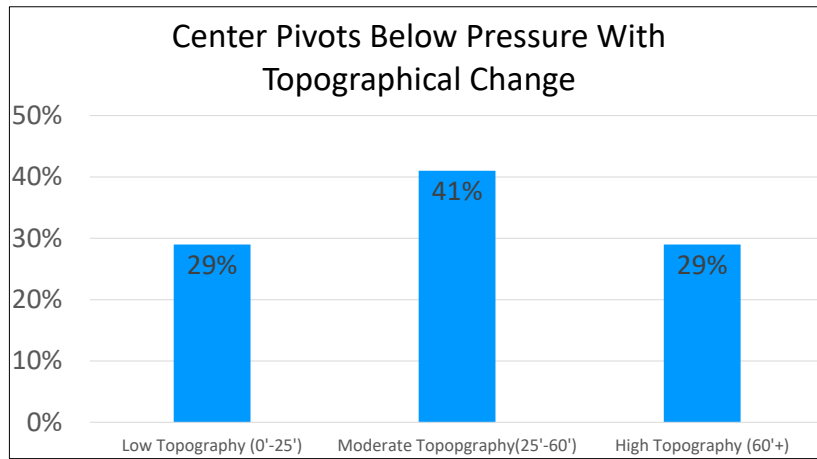
Data from 66 pivots across Nebraska with AgSense Field Commander and Lindsay FieldNET monitoring equipment



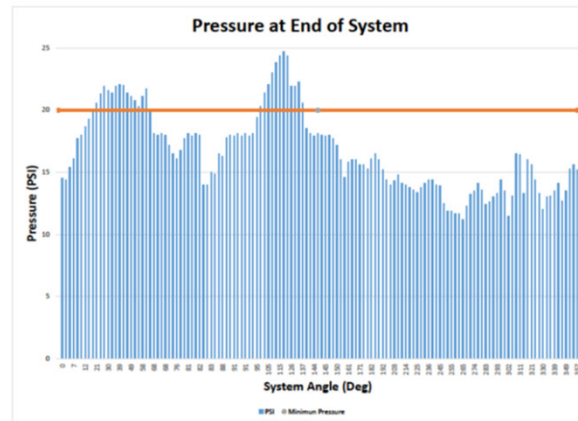
Analysis of Pivot Pressure



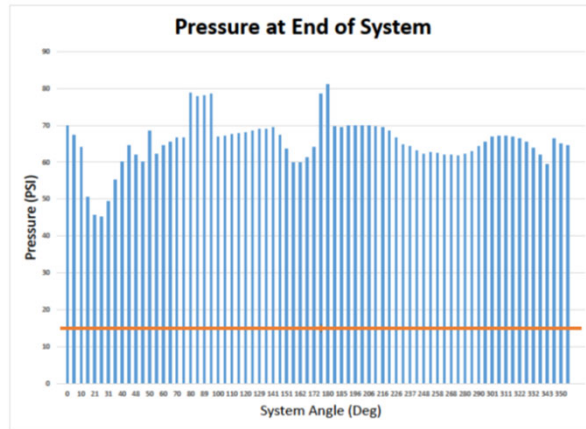
Analysis of Pivot Pressure

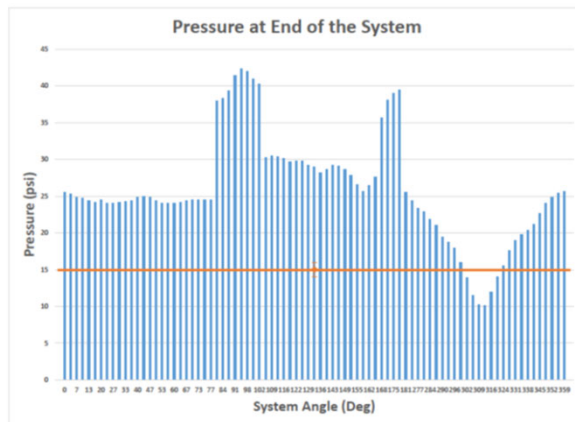


Pressure too Low

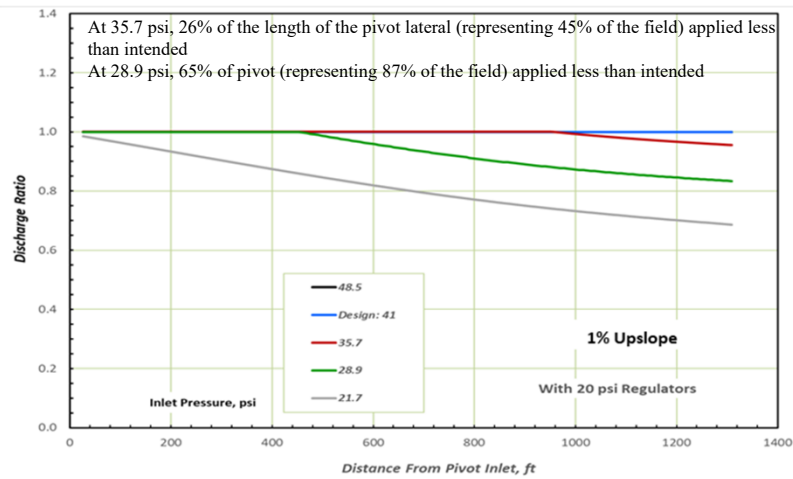


Pressure too High





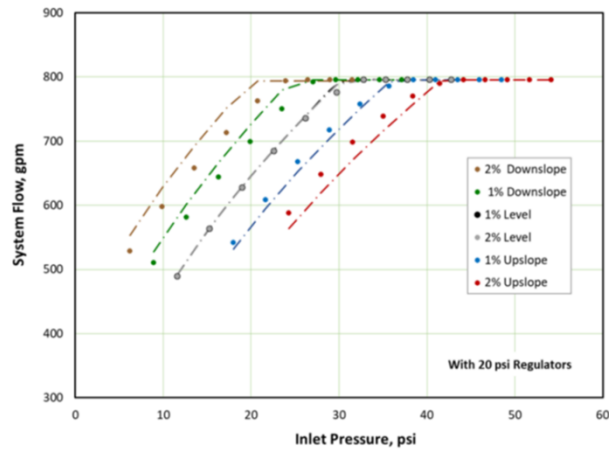
Ratio of Simulated To Design Nozzle Discharge for a Center Pivot



How to Correct Pressure

- Fixing leaks and broken nozzles
- Re-nozzling to smaller or larger nozzles
- Exploring ways to pump more water
 - Speeding up power unit
 - Add a VFD to speed up pump

Comparison of simulated relationship between inlet pressure and system inflow and predictions based on a center pivot flow coefficient approach.



Take Home Points

- A lot can be learned by closely looking at a sprinkler package on a center pivot when it is operating, so look them over every week or two.
- The operating pressure is a good indicator that the system is operating correctly, so continuously monitor the pressure.
- The operating pressure should be checked on the end of the center pivot when it is at the highest point in the field at least once to determine what the pressure at the pivot point should be.