SOP 21: Evaluation of design and operation of a micro-sprinkler system

Updated 7/28/14
Estimated completion time: 8 hours

Materials and equipment needed:

1. Data sheet
2. Clipboard
3. Sharpie pen
4. Flags
5. Calibrated pressure gauge with Schrader valve adapter
6. Flow meter with adapters
7. GPS / measuring wheel (for measuring length of beds and submains)
8. Calipers
9. Tape measure (measure diameter of pipe, width of beds, etc)
10. 15 Schrader valves that fit on drip tape or drip hose (number each Schrader valve for reference to location in field)
11. 5 Flush valves with adapters for drip tape and drip hose (number each flush valve for reference to location in field)
12. 10, ¼ inch threaded Schrader valves
13. Teflon tape
14. Small adjustable open ended wrench (crescent)
15. Cordless drill, drill bit, tap
16. Hand held EC and pH meter

Procedures:

A. Characterize soil and irrigation water:

1. Determine soil type and texture from NRCS on line soil map or laboratory report.
2. Determine source of irrigation water (surface, ground, recycled, blend)
3. Determine water chemistry from water suitability analysis report

B. Describe crop and field dimensions (sketch map of field and irrigation system):

1. Determine crop
4. Measure longest and shortest row of field (irrigation block).
5. Determine width of field (irrigation block)
6. Determine area of field (irrigation block)
7. Estimate slope (percent change in elevation per 100 ft)
8. Determine between row spacing
9. Determine in row spacing of trees
10. Map block to be evaluated and location of measurements

C. Describe irrigation system design (sketch map of field and irrigation system):

1. Determine number of micro-sprinklers per tree

2. Determine lateral (polyethylene hose) diameter and wall thickness
3. Determine number of lateral lines per row of trees
4. Determine manufactures discharge rate for microsprinkler head (gph),
5. Determine microsprinkler head pattern (ex. 270 degrees), and if pressure compensating
6. Determine if polyethylene leads are used to connect lateral lines to submain
7. Determine the length and diameter of polyethylene leads
8. Determine if flush valves are present
9. Determine diameter of submains
10. Count number of submains in field
11. Determine length of submain (from connection with main to end of submain)
12. Count number of lateral lines per submain line
13. Determine main line diameter
14. Determine type of filter present
15. Determine where and if backflow prevention device is present
16. Determine where air/vacuum release is present
17. Determine if low pressure drain is present near well
18. Determine if low pressure drain is present near lowest point in drip system
19. Determine locations where pressure can be monitored by operator
20. Determine if pressure regulators are present at main/submain connections and if functional

D. Before starting irrigation system:

1. Install flow meter on main or submain, record the initial gallons, and determine area irrigated after flow meter
2. Install Schrader valves before and after filter if possible
3. Install Schrader valves at 3 locations on submain (near mainline connection , middle, and end of submain)
4. Install Schrader valves at 10 locations at end of lateral lines
5. Install 5 flush valves at end of lateral lines
6. Map locations of all valves with a number reference for each valve.
7. Determine the distance of valves from reference point (main/submain connection, bed number, and distance from submain)

E. At start of irrigation:

1. Record start time of irrigation
2. After starting irrigation system, make the following readings 2 times during the irrigation:
   a. Flow rate (gpm) on flow meter
   b. Pressures at all locations with Schrader valves (note time and valve number)

F. During the irrigation (at least 30 minutes after pressurizing system):

1. Count number of significant leaks per submain (big wet spots, standing water in furrows)
2. Count number of leaks per length of lateral line (drip tape or hose) on 10 or more laterals
3. Collect water from flush valves and determine if materials is collecting at end of lateral lines
4. Measure electrical conductivity and pH of irrigation water

G. After irrigation ends:

1. Record end time of irrigation
2. Record ending flow meter reading

3. Remove Schrader valves, flush valves, and flow meter, and reassemble drip system.

H. Reporting:

1. Enter data into “Irrigation evaluation drip” spreadsheet

Comments:

1. Distribution uniformity can also be evaluated during the irrigation. Refer to SOP 14: “determining distribution uniformity of micro-irrigation systems)

Grower _____ Date _____

Ranch _____ Block _____

crop and field dimensions

crop	
plant rows per bed	
between row spacing (feet)	
In row plant spacing (feet)	
bed width or spacing (feet)	
shortest bed length (feet)	
longest bed length (feet)	
field width (feet)	
field area (acres)	
slope of field (%)	

Description of drip system

drip lines per bed	
tape discharge rate (gpm/100 ft)	
drip tape diameter (inches)	
drip tap wall thickness (mil)	
emitter spacing (inches)	
lead diameter (inches)	
lead length (inches)	
number of driplines per lead	
flush valves (present/absent)	
submain diameter (inches)	
submain length (feet)	
main diameter (inches)	

Backflow prevention (check all that apply)

not present	☐
check valve	☐
low pressure drain	☐
vacuum release	☐

Air/Vacuum release

not present	☐
number of locations	☐

Pressure check (check all that apply)

not present	☐
number of locations	☐
before filter	☐
after filter	☐
submain	☐
other	

Grower _____ Date _____

Ranch _____ Block _____

pressure regulators at submains (check all that apply)

not present ☐
gate valve (not a regulator) ☐
not adjustable ☐
adjustable ☐
Adjustable regulating valve ☐
diameter (inches) _____

Filtration (check all that apply)

not present ☐
disk ☐
sand media ☐
screen ☐
automatic back flush ☐

filtering capacity (manufacturer's specifications)

max flow rate (gal per minute) _____
filtering mesh _____

Drain down at low end of block (check all that apply)

low pressure drain ☐
flush valves ☐
other _____

soil properties (from NRCS online soil map)

Texture _____
% clay _____
% sand _____
% silt _____
soil saturated paste SAR _____
soil saturated paste EC (dS/m) _____

water properties (from report unless specified differently)

field measured pH _____
field measured EC (dS/m) _____
pH _____
EC (dS/m) _____
SAR _____
bicarbonate (meq/L) _____
Iron (ppm) _____
Manganese (ppm) _____
Boron (ppm) _____
Chloride (meq/L) _____
Magnesium (meq/L) _____
Calcium (meq/L) _____
Sodium (meq/L) _____

Grower _____ Date _____

Ranch _____ Block _____

leaks on drip system

# of leaks along submain 1	
# of leaks along submain 2	
# of leaks along submain 3	
# of leaks on lateral line 1	
# of leaks on lateral line 2	
# of leaks on lateral line 3	
# of leaks on lateral line 4	
# of leaks on lateral line 5	
# of leaks on lateral line 6	
# of leaks on lateral line 7	
# of leaks on lateral line 8	
# of leaks on lateral line 9	
# of leaks on lateral line 10	
% of furrows with signficant amounts of ponded water	

flush valve water

material present in valve 1	
material present in valve 2	
material present in valve 3	
material present in valve 4	
material present in valve 5	

flow meter

initial flow meter reading (gallons)	
start time	
end flow meter reading (gallons)	
end time	

Grower _____ Ranch _____ Block _____ Date _____

	Time 1	Pressure (psi)	Time 2	Pressure (psi)	Time 3	Pressure (psi)	Time 4	Pressure (psi)
location 1								
location2								
location 3								
location 4								
location 5								
location 6								
location 7								
location 8								
location 9								
location 10								
location 11								
location 12								
location 13								
location 14								
location 15								
location 16								
location 17								
location 18								
location 19								
location 20								
location 21								
location 22								
location 23								
location 24								
location 25								