Rain for Rent

Tulare Farm Equipment Show 2007

Drip and Micro-Sprinkler Flow Paths

Rain for Rent

With

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And

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History of Micro Irrigation

•First Experiments were in Germany, 1860

•First experiments in the United States, 1913, conclusion of experiment was that it was too expensive for practical use.

•Plastics development during World War 2 made drip irrigation economically feasible.

•During the 1960's Germany, Israel, and the United States published work on various facets of underground irrigation

•Beginning in the early 1970's drip irrigation acreage began to expand.

Some Possible Advantages of Drip Irrigation

1. Maximum beneficial use of available water supplies.
2. Application rates are controlled by the emitter, not the soil.
3. Most micro irrigation systems are solid set.
4. Irrigation can occur during or shortly after mechanical or cultural operations.
5. Low labor and relatively low operating costs. (not including maintenance)
6. Can be easily automated
7. Fertilizer and chemicals can be applied through system.

Possible Disadvantages of Drip Irrigation

1. Complete or partial clogging of emitters.
2. Salinity management in some conditions.
3. If not taken into consideration during design, soil moisture distribution could hinder crop root development.
4. Initial system costs can be high.

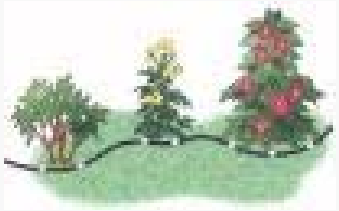
Typical Emitter Flow Paths

1. **Micro tube**: Long, small diameter spaghetti tube, laminar flow
2. **Molded long, smooth**: Long, smooth coiled or spiral passageway in a molded emitter body, laminar flow
3. **Vortex:** Water enters tangentially into a chamber, in which it spins and exits through a hole on the opposite side.
4. **Tortuous:** Labyrinth or “Zig-Zag” path. Turbulent flow at some points in passageway.
5. **Porous pipe:** Very small holes in the tubing itself sweat or emit water.
6. **Pressure compensating emitter:** Flexible membrane, O-ring, or other design used to reduce the path size at higher pressures

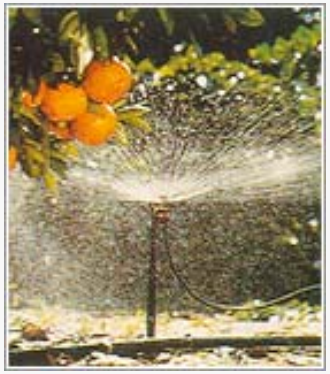
Typical Emitter Flow Paths

7. **Multiple Flexible Orifice:** Water passes through several orifices in flexible membranes. Dirt caught in one orifice will create back pressure, expanding the orifice and moving the dirt through.

8. **Orifice:** A single simple hole.



Characteristics of Emitter Flow Paths



Micro Tube

Merits

1. Inexpensive

Problems

1. Flow rate is sensitive to temperature changes
2. Very sensitive to plugging
3. Large manufacturing variation on some makes and models

Typical discharge exponent, X = .7 - .8

Molded, Long Smooth

Merits

1. No notable merits

Problems

1. Flow rate is sensitive to temperature changes
2. Relatively sensitive to plugging

Typical discharge exponent X = .7

Vortex

Merits

1. Inexpensive
2. Flow rate insensitive to temperature change
3. Low manufacturing CV

Problems

1. Typically a small hole
2. Relatively sensitive to plugging

Typical discharge exponent X = .4

Tortuous

Merits

1. **Less susceptible to plugging than other emitters with same hole size**
2. **Typically large hole**
3. **Low manufacturing CV**

Problems

No characteristic problems to note.

Typical discharge exponent X = .5 - .55

Porous Pipe

Merits

1. No notable merits

Problems

1. Flow rate sensitive to temperature changes
2. Typically small holes
3. Very sensitive to plugging
4. Large manufacturing CV with some makes and models

Typical discharge exponent X = Greater than 1

Pressure Compensating Emitter

Possible Merits

1. **Flow rate is not sensitive to temperature.**
2. **Small manufacturing CV**
3. **Typically a large hole**
4. **Less susceptible to plugging than other emitters with the same hole size.**

Typical discharge exponent X = 0 - .5

Pressure Compensating Emitter

Possible Problems

1. **Expensive**
2. **Relatively sensitive to plugging**
3. **Large manufacturing CV with some makes and models**
4. **Discharge characteristics of some makes and models may change after a few year of service**
5. **Some pressure compensating emitters are in name only.**

Typical discharge exponent X = 0 - .5

Multiple Flexible Orifice

Merits

1. Typically a large hole
2. Less susceptible to plugging than other emitters with the same size hole.

Problems

1. Expensive
2. (Possible) Discharge characteristics of some makes and models may change after a few years

Typical discharge exponent X = .7

Orifice

Merits

1. Flow rate is not sensitive to temperature.
2. Small manufacturing CV
3. Typically a large hole
4. Less susceptible to plugging than other emitters with the same hole size.
5. Inexpensive

Problems

1. No characteristic problems of note.

Typical discharge exponent X = .5

Thank You

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