Microirrigation in agricuture

Ādaži 27.02.2018

A.M.Ozoli

Rivulis Irrigation

Agenda

1) **About Rivulis**
2) Basic hydraulics refresh
3) Dripline hydraulics
4) Typical AG system -> components and basic calculations
5) Overview of basic products and specific applications
- T-Tape
- Hydrogol
- Hydro PC
- F6400

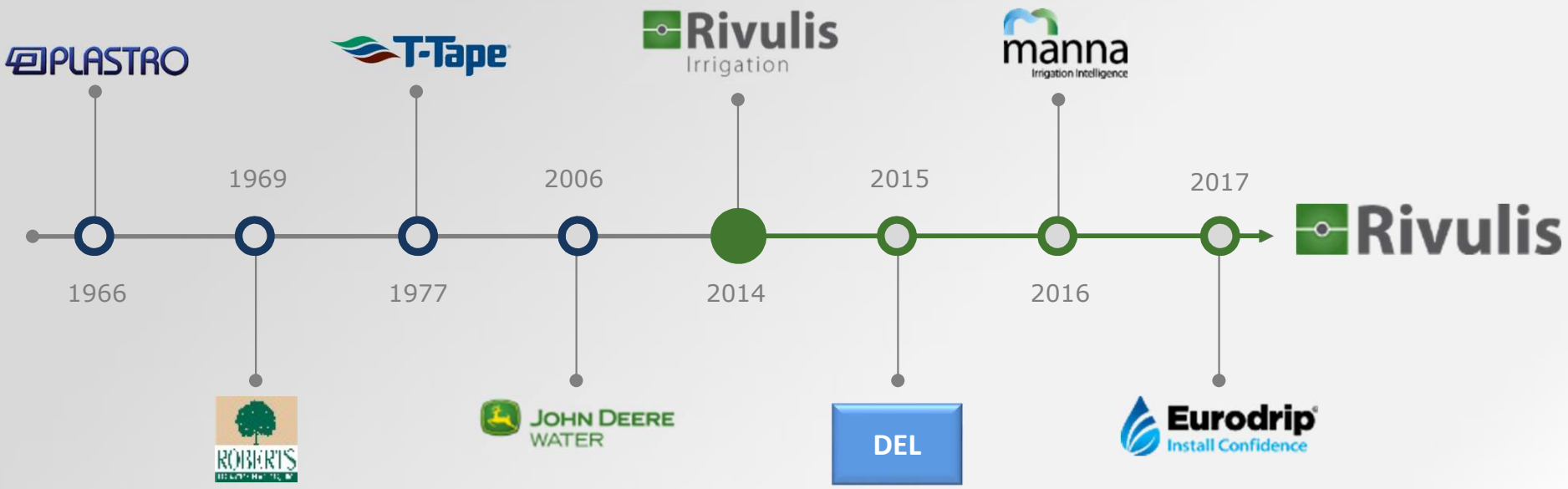
6) Drip line maintenance
7) Anti Frost protection

Presentation objectives

- After this presentation, you will be able to:

- Gain a general understanding of a drip line irrigation system
- Explain the purpose of drip lines
- Describe the category of drip lines
- Identify essential product components
- Identify common features and benefits
- Describe key grower applications

Our Solid Foundation: Past, Present & Future



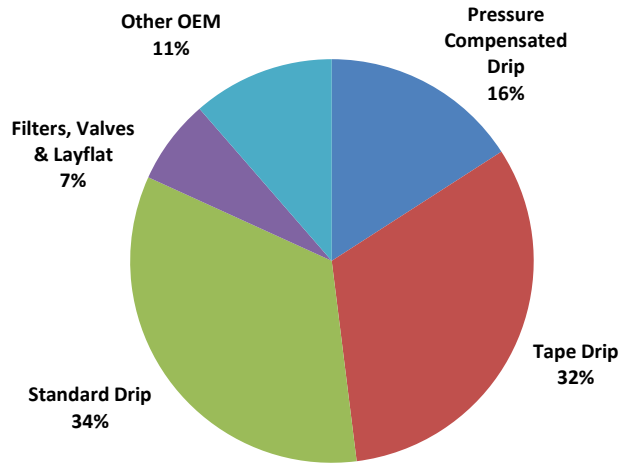
1966	1969	1977	2006	2014	2015	2016	2017
Plastro Irrigation established	Roberts Irrigation established	T-Systems, Int. established	John Deere Water created from acquisition of three companies	FIMI acquired John Deere Water business unit and created Rivulis Irrigation	DEL of India Investment	Manna, Precision Agriculture Subsidiary founded	Merger of Rivulis and Eurodrip

Rivulis Irrigation

Who We Are Today:

- Headquartered in Israel, operating across the globe
- 15 manufacturing & distribution facilities
- 1,700 employees spread globally
- Extensive line of irrigation solutions & turnkey projects
- Industries served: agriculture, horticulture, landscape & mining
- Committed to long term, win-win partnerships with more than 2,500 business partners
- #2 Drip Irrigation Player[1], generating $350 MM revenues

Sales by Product Type:



1 Drip Irrigation defined as agriculture, mining, horticulture and landscape, excluding India

Market segments

Orchards

Wineyards

Vegetables

Landscaping

Greenhouses

Open field crops

Product range

Basic hydraulics

Pressure [m, bar, PSI, atm, …]

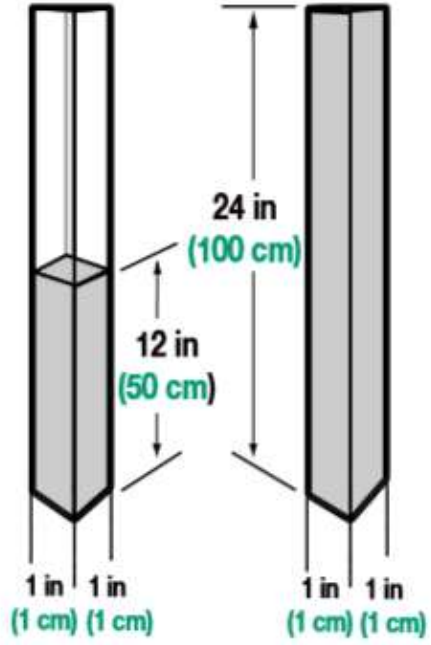
- Static
- Dynamic

Flow [m3/h, l/h, …]

Static pressure

P=F/A

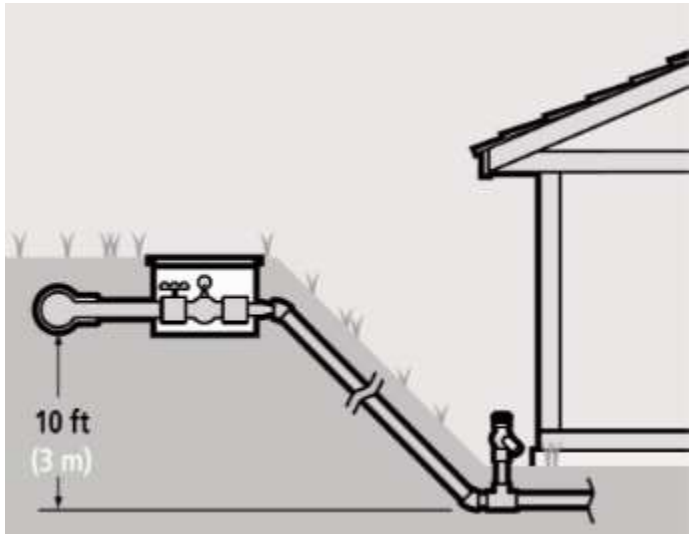
P – pressure (bar)
F – force (kg)
A – field of surface (cm^2)

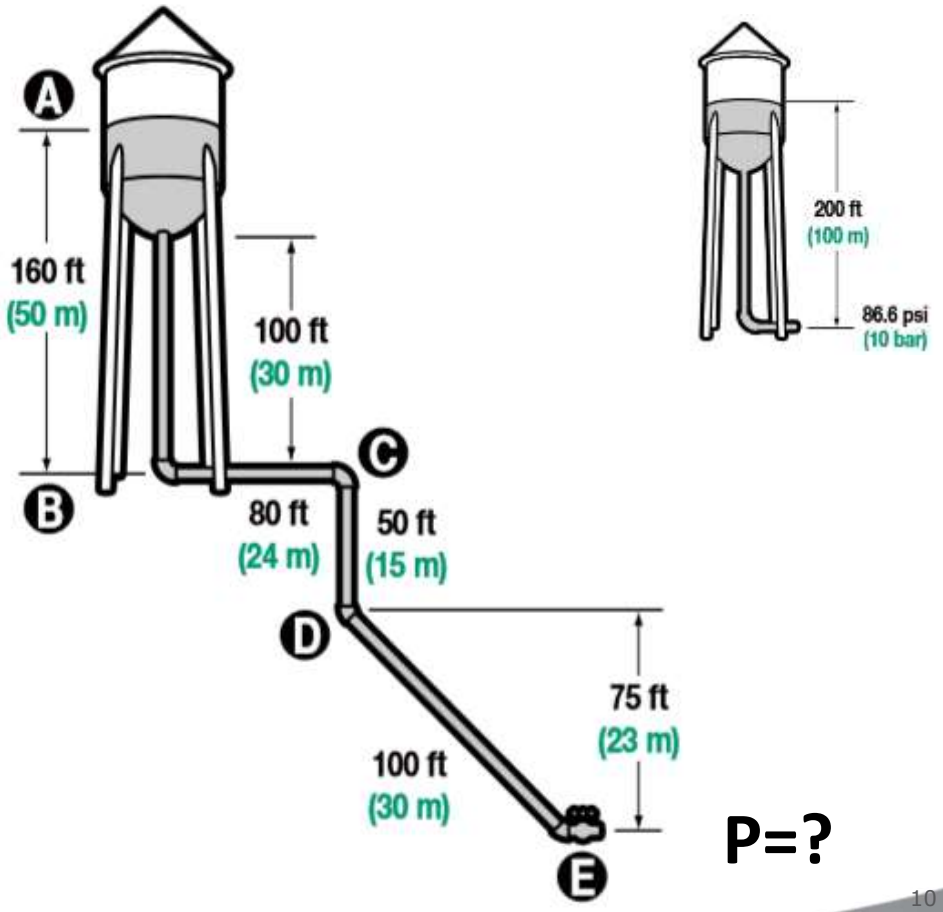


1 bar = 10m (~ 15 psi)

Static pressure

- Level difference
- Pump





P=?

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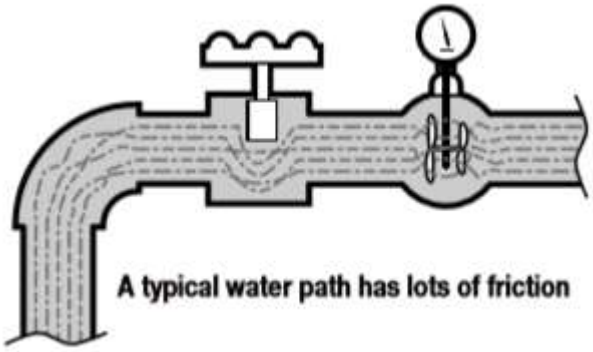
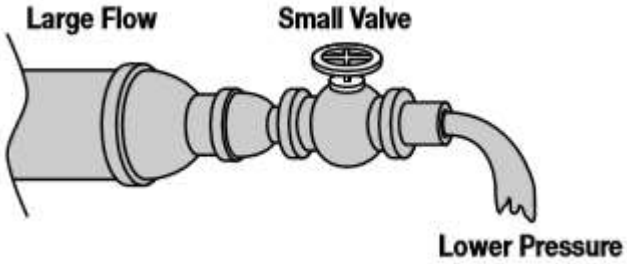
Dynamic pressure:

- Static pressure
- Friction loss



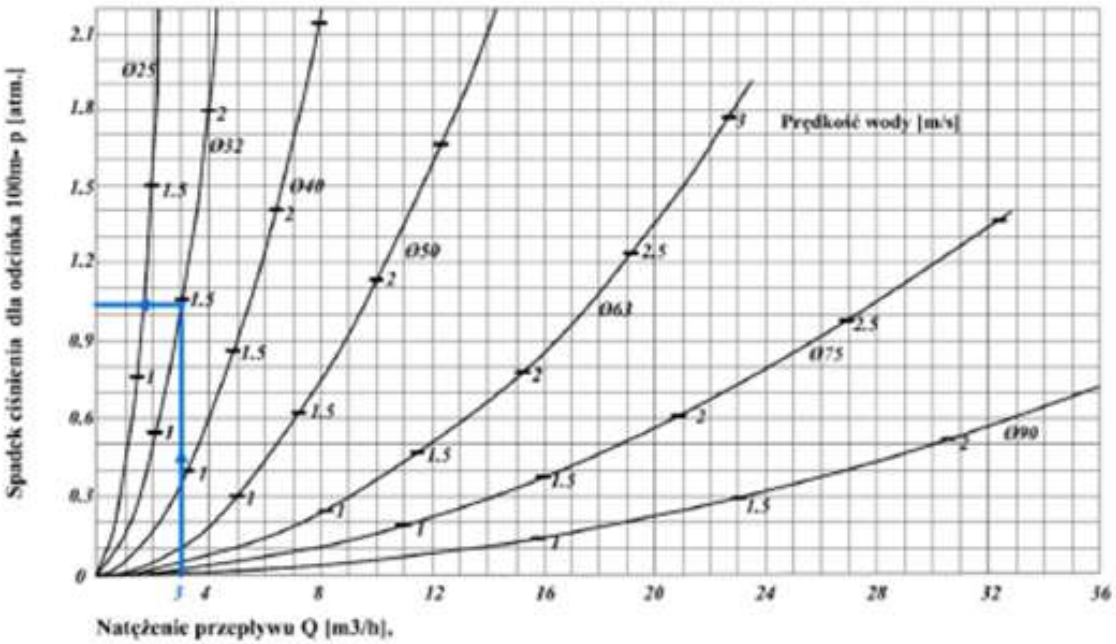
Friction losses:

- Pipe diameter
- Flow meters
- Water velocity
- Fittings



Friction losses chart

Przepływ = 1,38m³/h



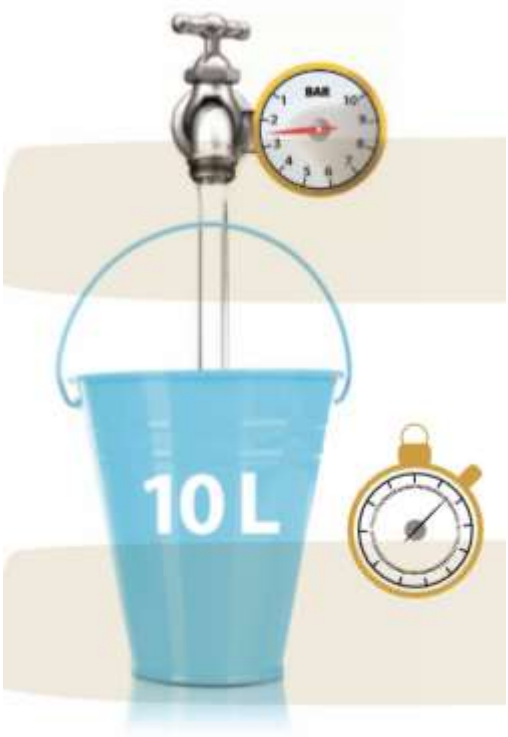
PE HD 6 BAR

Max. velocity= 1.5 m/s

- PE Ø 25 ~ 2,0 m³/h
- PE Ø 32 ~ 3,0 m³/h
- PE Ø 40 ~ 4,0 m³/h
- PE Ø 50 ~ 7,0 m³/h
- PE Ø 60 ~ 11,5 m³/h

Flow

- Quantity / time
- l/h, m3/h or l/s
- 1 l/s = 3600 l/h = 3.6 m3/h



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Types of driplines

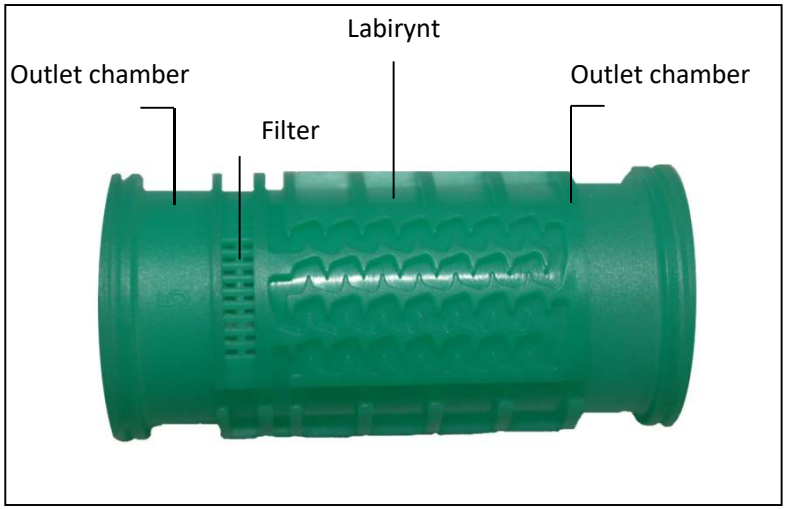
- Drip tapes
- Drip lines without p. compensation (NON PC)
- Drip lines with pressure compensation
    - PC (pressure compensation)
    - PC ND (non drainage)
    - PC SD (slow drainage)

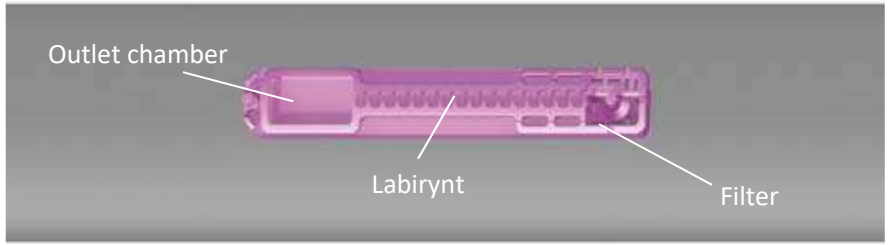
Parameters of dripline

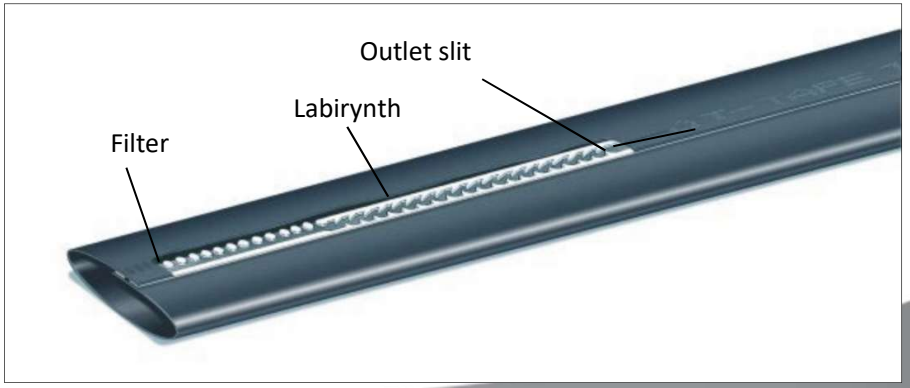
- Type of emiter
  - integrated (tapes)
  - round
  - flat
- Emiter flow (0,5 – 8 l/h)
- Spacing (10cm – 100cm)
- Wall thickness (06 – 45 mil)
- Max. Lateral lenght

Parts of the emiter

Parameters:
*Filtration area
*Number of inletzs in filter
*Lenght of the labirynth
*Critical path
*Outlet chamber







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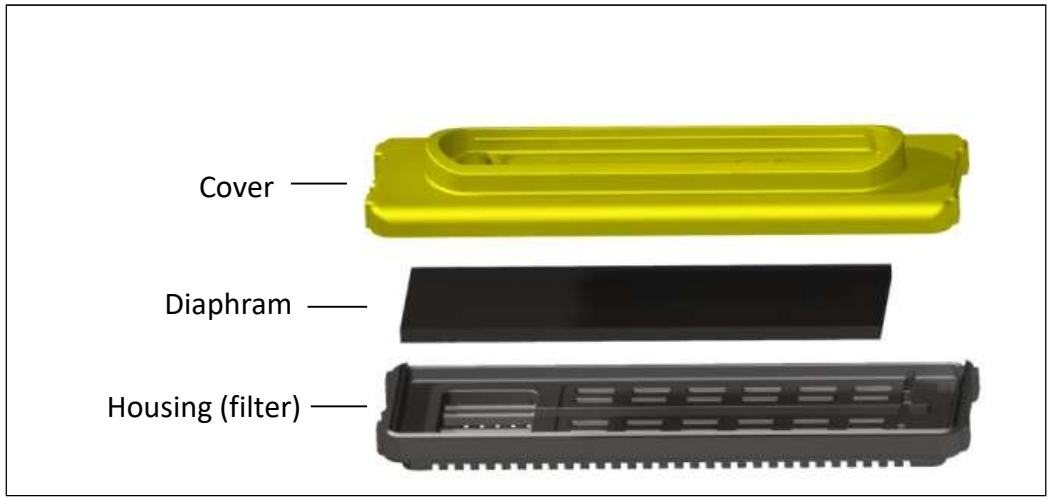
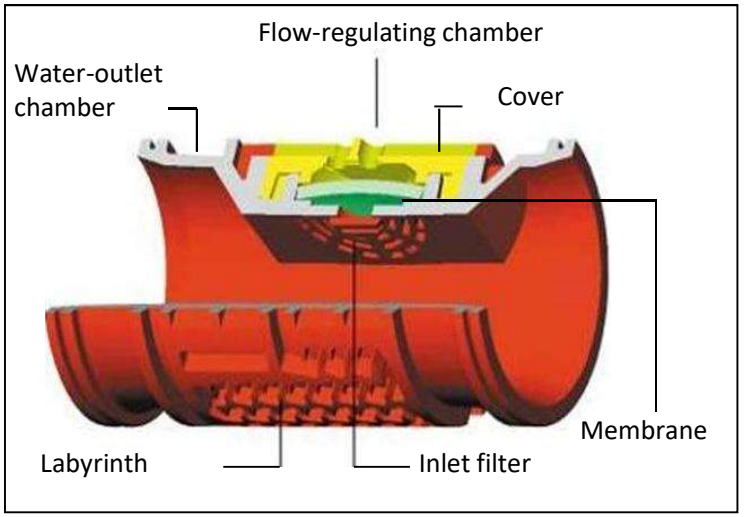
Pressure compensated emiter

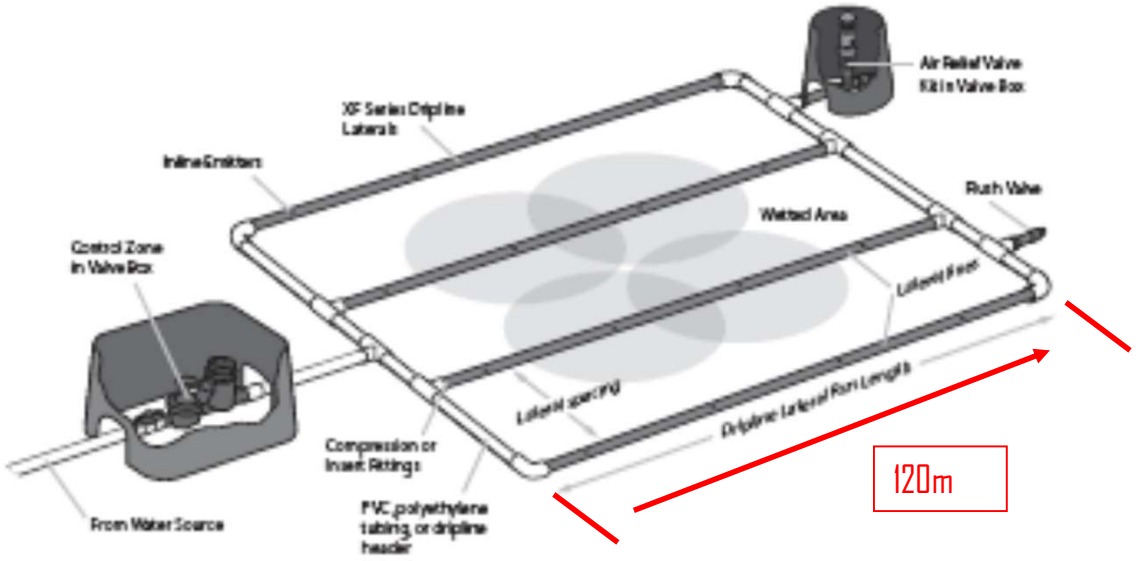




Difference between PC and flow regulation

- Driplines without compensation (flow regulated)
- Driplines with pressure compensation and flow regulation

Max. Lateral lenght <u>at 90% of unifomity</u>



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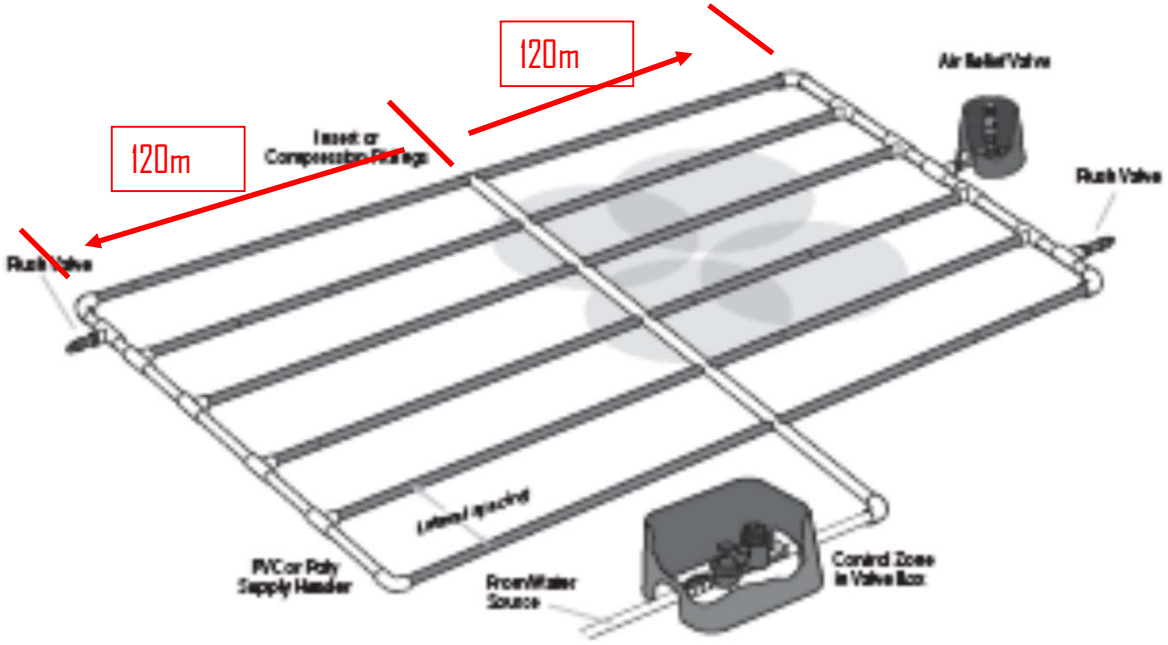

Open field microirrigation system

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Plant, Climate and irrigation

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4 Basic principles of irrigation

1. Drip irrigation
2. Sprinkler irrigation
3. Flood or furrow irrigation
4. Infiltration / Water table control

How (much) to irrigate ?

Irrigation application is defined by conditions

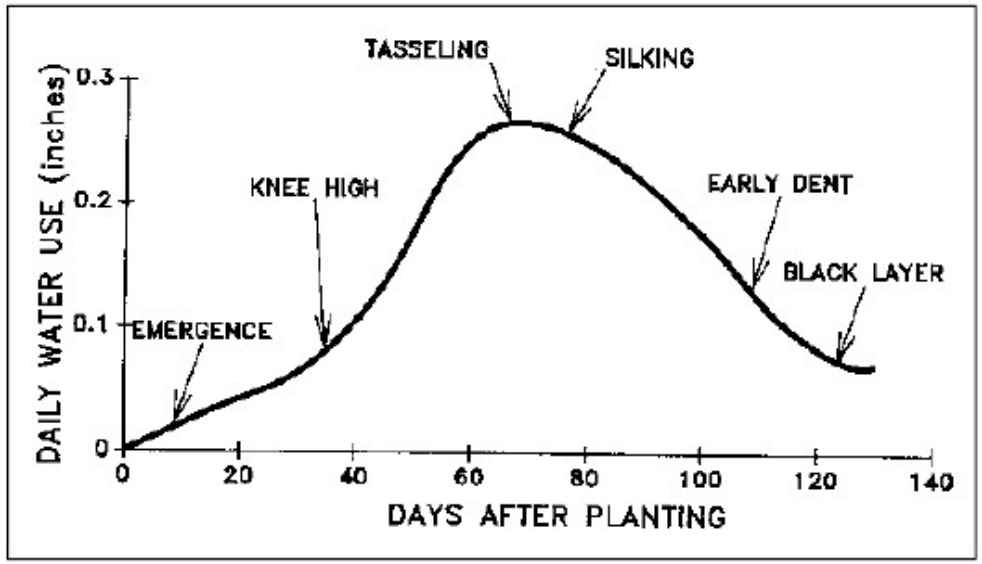
- **Crop**
- **Climate**
- **Soil**
- **Farmer / conditions**




Crop :

What is the water need ?

- Specific need / crop type (Sugar cane vs olives)
- Crop stage (germination vs maximum vegatation)



Climate :

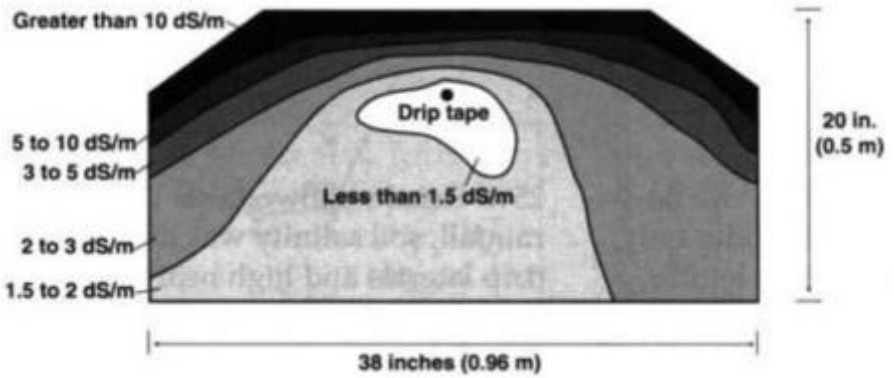
- Rainfall - Effective (!)-
- Evaporation =>
- Radiation
- Sunshine duration
- Temperature
- Humidity
- Wind

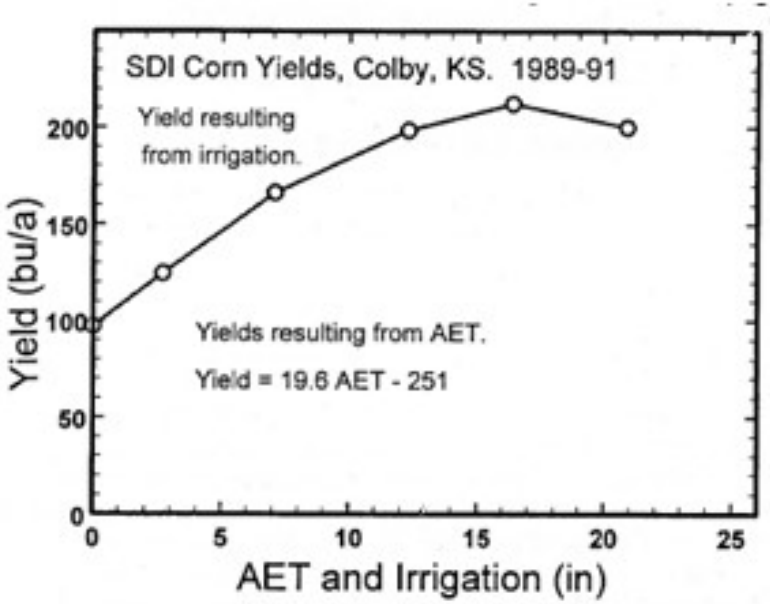
Soil :

- Rooting volume
- Water holding capacity
- Surface evaporation
- Drainage
- Homogenity

Conditions

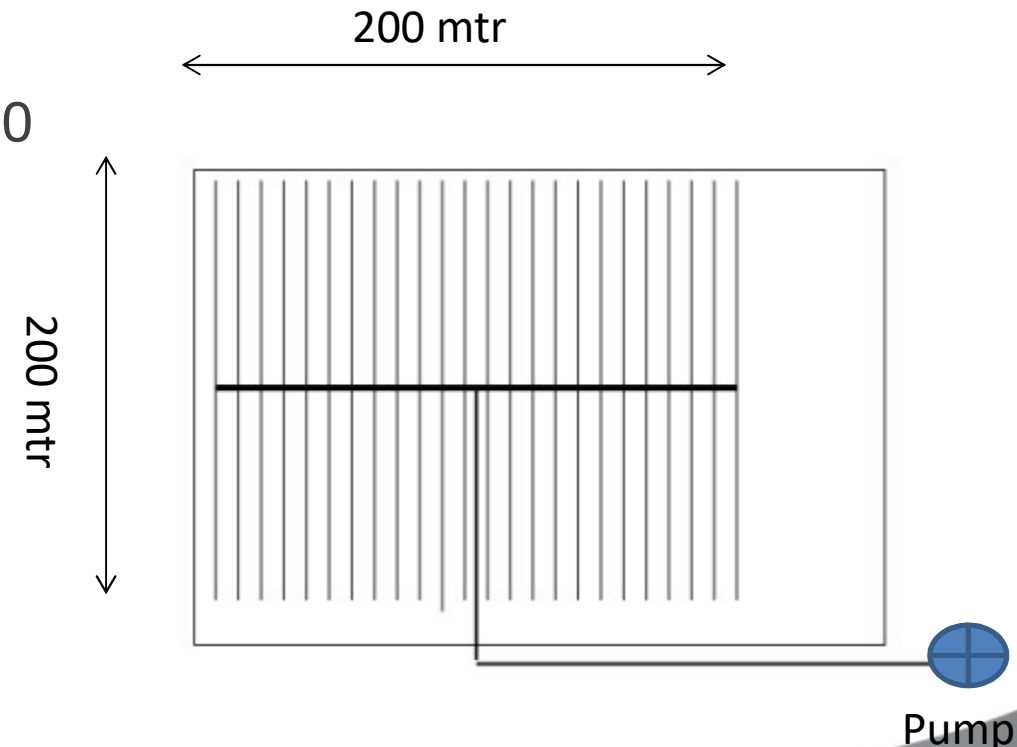
- Salinity
- Water availability
- Crop management





System design example

- 4 ha strawberries
- Max ETo: 5 mm
- Pump capacity: 20 M3/H
- Dripline: T-tape 508-30-340



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Water calculation

- ETo=5mm
- f=1.2

➡ Etc = 5 x 1.2 = 6 mm

- 6 mm = 6 ltr/M2 = 60 M3 / ha /day Etc
- 60 M3/ha x 4 ha => 240 M3 / day total water use at peak periods

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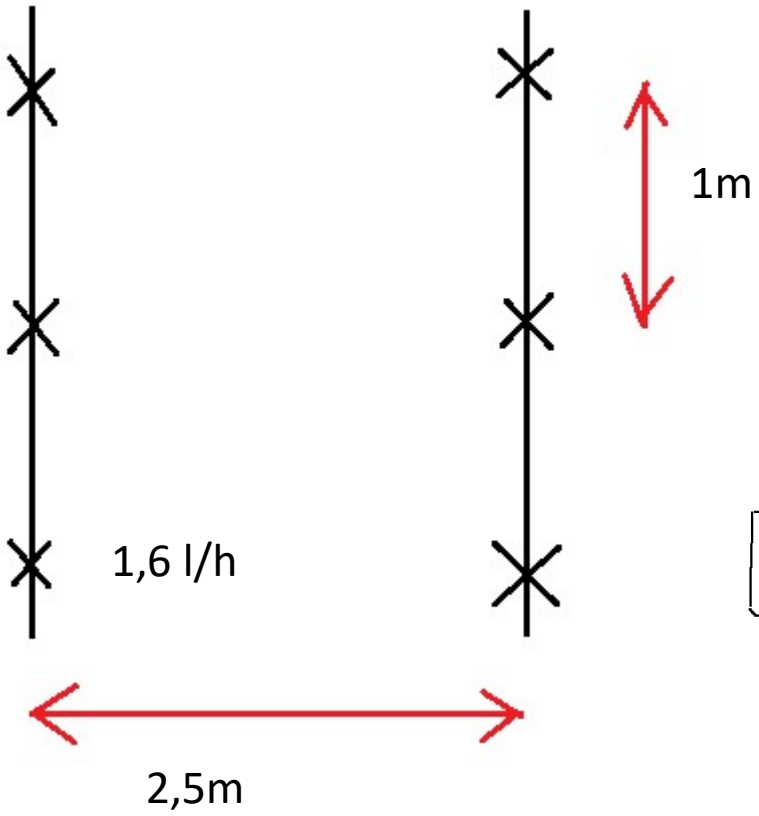
Capacity

- 240 M3/day / 20 M3/H => 12 H /day irrigation time for total field
- T-tape 508-30-340 => Application rate = 40M3/ha/h
- Pump =20M3/H => 0,5 ha at once
- Field =4 ha => 8 valves @ 0,5 ha
- Application rate = 40 M3/ha/h = 4 mm/h , Etc =6 mm => 6/4 = 1,5 h irrigation time / valve

How to calculate application rate?



$$D_a = \frac{1{,}6\ l/h}{1 \times 2{,}5} = 0{,}64\ l/m^2$$

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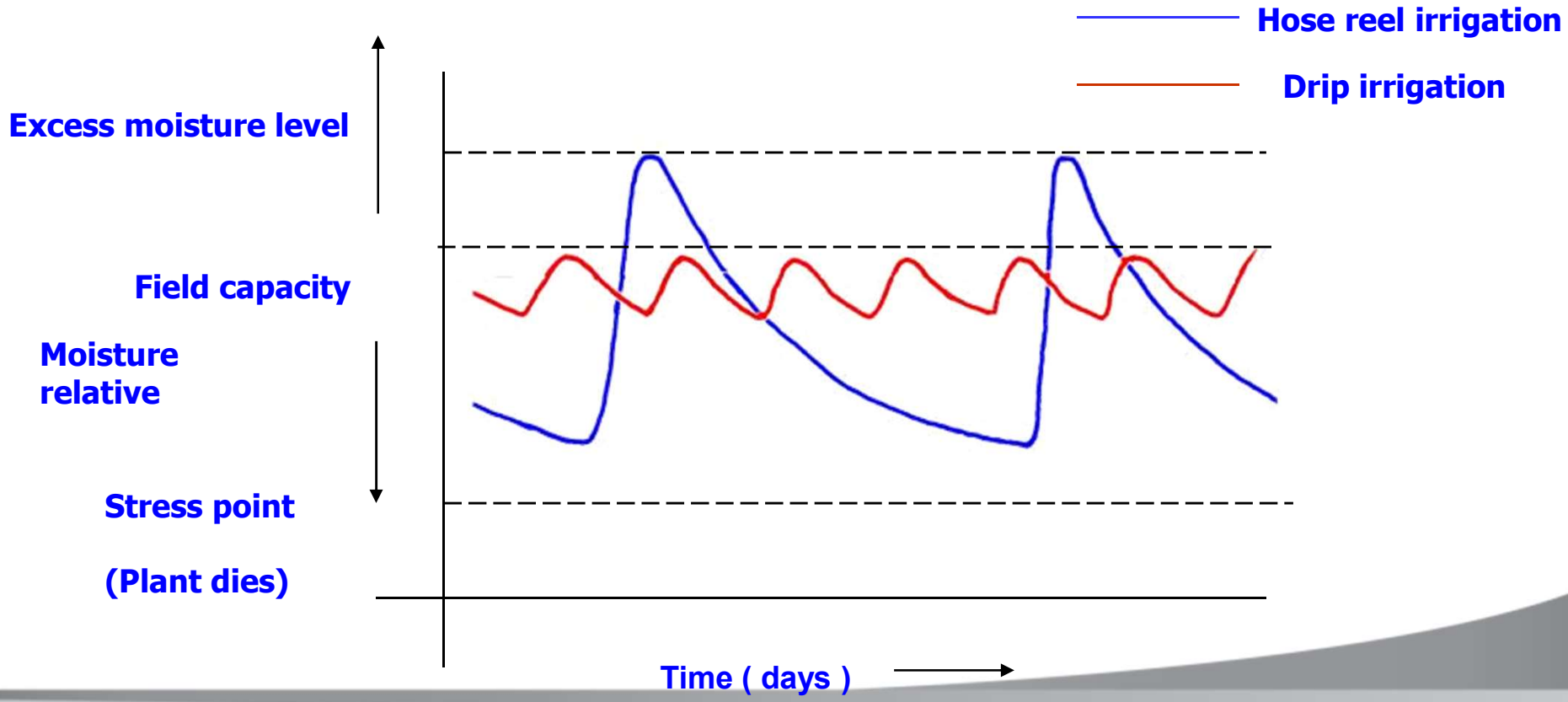
Drip irrigation Characteristics

- Optimal and constant water distribution
- High water efficiency
- Small water applications easily possible
- Very suitable for fertigation, chemication, aeration, bio treatments
- Low system pressure => Low energy requirement
- More regular soilmoisture content => Better mineral availability
- Crop stays dry during irrigation
- Row application of water and nutrients => field access , controlled water placement => inter rows and tracks dry
- Easy to automate
- Intensive => more crop and soil control
- More expensive

Soilmoisture trend differences



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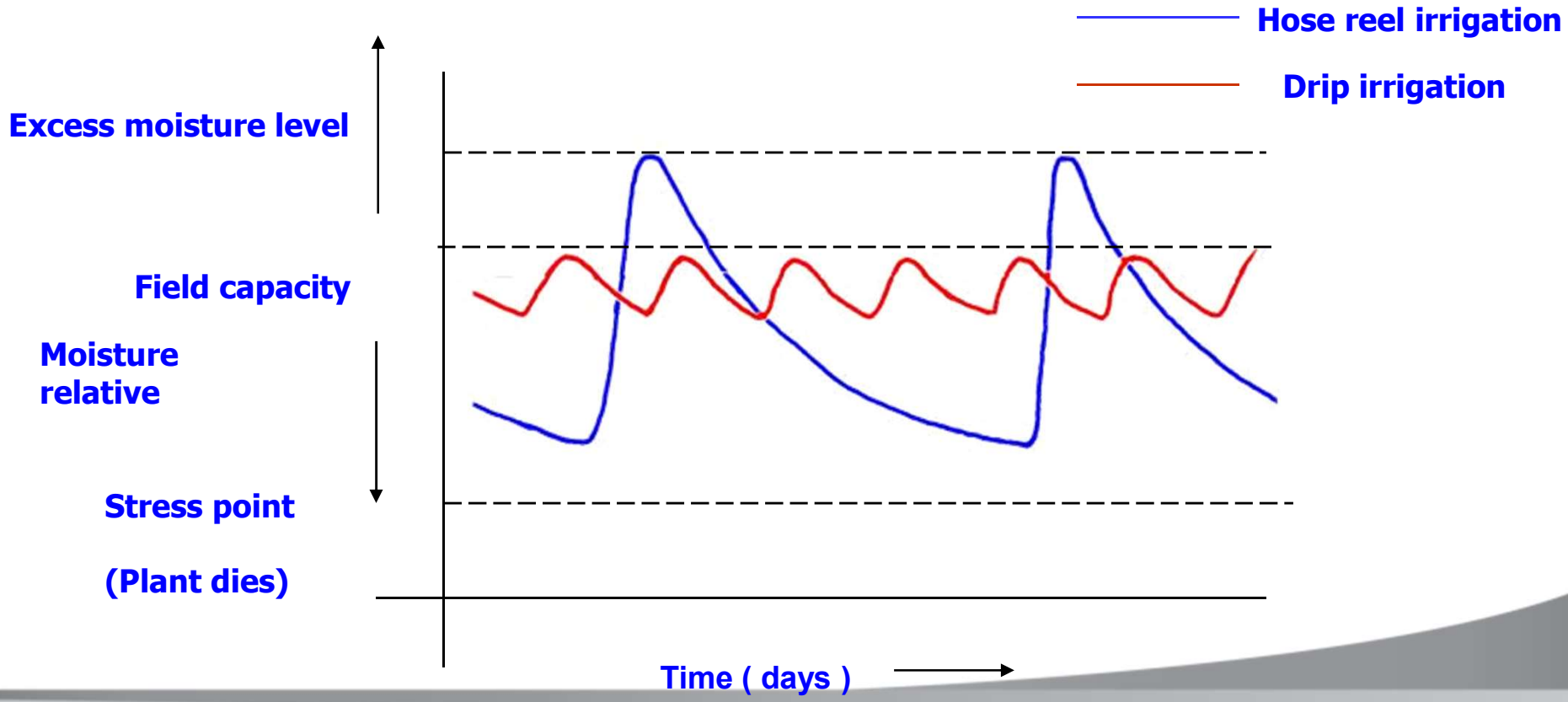


Thin Wall Drip Lines

Applications

- Agriculture multiple year crops
- Agriculture seasonal row crops
- Portable reuse systems

Example: Strawberry, raspberry

T-Tape 508-20-250

16mm/8mil/20cm/250l (0,5l/h)

(Description on next pages)

Locations

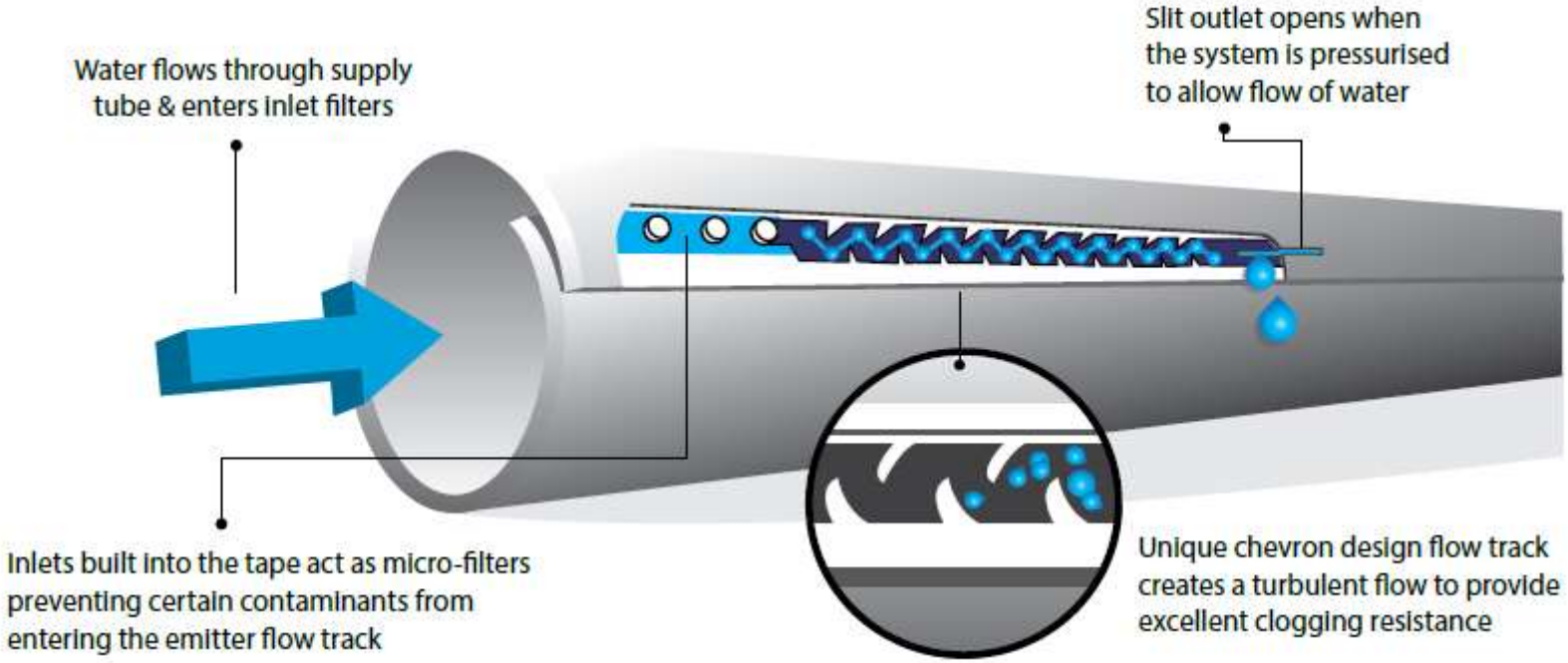
- Above ground
- Under mulch
- Sub-surface

T-Tape overview

T-Tape is a thin wall drip line with high tensile strength and features a white stripe for ease of application

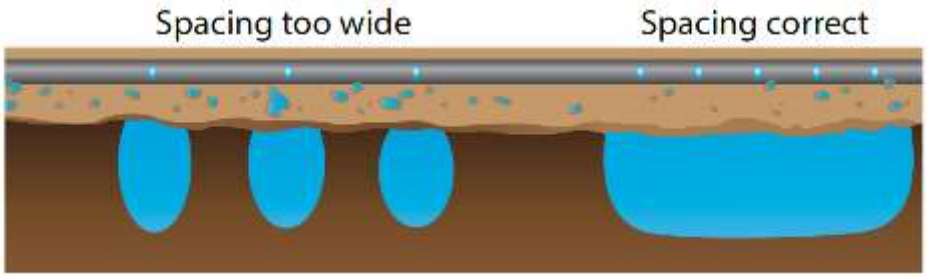
	Metric Units
Diameters	16, 22, 29, and 35 mm
Wall Thickness	5 - 15 mil (8mil)
Dripper Spacings	10 - 75 cm (20cm)
Flow Rates	125 - 1350 lph / 100 m (at 0.55 bar)

T-Tape overview



Guidelines for Selecting Wall Thickness

Thickness	Application and Features
5 mil	• Minimum number of rocks and pests • Applications where installation cost is very important
6 mil	• First time drip tape users who desire a thin-walled drip tape • Experienced drip tape users in multiple season applications
8 mil	• First time drip tape users • Experienced drip tape users in multiple season applications
10 mil	• Portable applications (may be relocated) • Multiple year buried applications
12 mil	• Portable applications (may be relocated) • Multiple year buried applications • Maximum resistance to pests and mechanical damage
15 mil	• Portable applications (may be relocated) • Multiple year buried applications • Maximum resistance to pests and mechanical damage



Too wide spacing

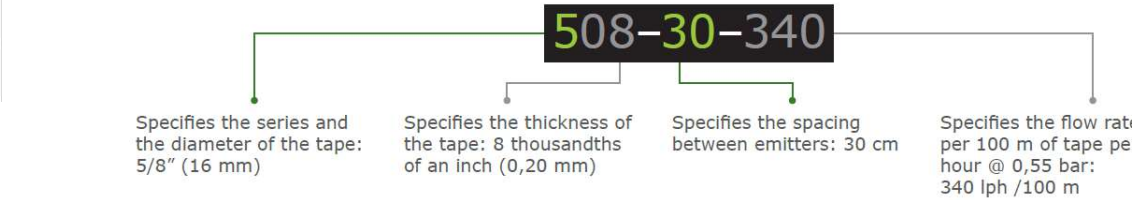
Good spacing

T-Tape overview

Length of Run (m) at 90% Emission Uniformity

Emitter Spacing (cm)	Flow Rate (lph / 100m)	Emission Uniformity Pressure (0,55 bar)	0% Slope (m)
16 mm			
10	1350	90%	61
15	1000	90%	82
20	125	90%	245
20	250	90%	178
20	380	90%	138
20	500	90%	115
30	170	90%	233
30	250	90%	180

Easy Product Identification



Medium and Thick Wall Drip Lines

Applications

- Agriculture permanent crops
- Agriculture row crops
- Greenhouse
- Landscape

Example: Orchards, Blueberry

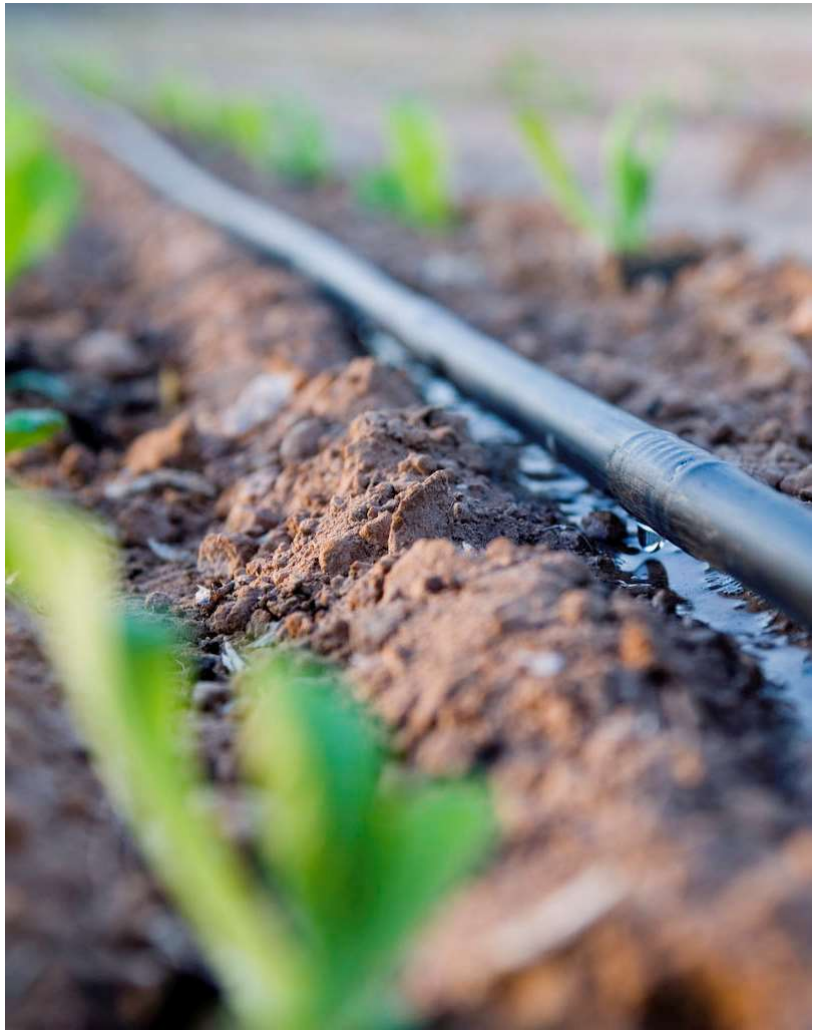
Hydro PC/ Hydrogol

(description on two next pages)

Locations

- Above ground
- Hanging (thick wall only)

Hydrogol overview



Hydrogol is a thick wall drip line featuring a cylindrical dripper with two-orifice outlets

	Metric Units
Diameters	8, 12, 16, 18, and 20 mm
Wall Thickness	25 - 45 mil
Dripper Spacings	15 - 90 cm
Flow Rates	1.0 – 8.0 lph (at 1 bar)

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Hydro PC Overview

Hydro PC is ideal for sloping terrain or long run length and features two outlets per dripper. Regulates and maintains a constant flow rate.

	Metric Units
Diameters	12 – 20 mm (16mm)
Wall Thickness	30 – 47 mil
Dripper Spacings	20 cm – 100 cm (50cm)
Flow Rates	1.05, 1.2, 1.6, 2.2, and 3.6 lph (at 0.8 – 3.5 bar)

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Thin, Medium and Thick Wall Drip

Features	Benefits
Wall thickness	• Cost effectiveness for the designed life expectancy
Reliable product	• Very forgiving and can survive the changing environments
Design of the labyrinth	• Ensures high resistance to clogging
Chemical resistant material	• Easy to clean • Flushing with chemicals will not damage the drip line
Product range	• More options of flow rates and sizes for the user to select the proper match for his crop
Filtered inlet	• Reduces debris from entering the labyrinth • Means longer time without plugging
Designed outlet	• Outlet (or slit) reduces the soil from being ingested back into the labyrinth referred to as soil ingestion

Filtration!

Similar requirements for most of applications:

- > 0.5 l/h : 130 micron / 120 mesh
- ≤ 0.5 l/h : 100 micron / 150 mesh

Filtration degree depends on:

- Water quality (well, open source)
- Number of organic particles
- How long we irrigate
- Frequency of flushing

Semi-authomatic filter F6400

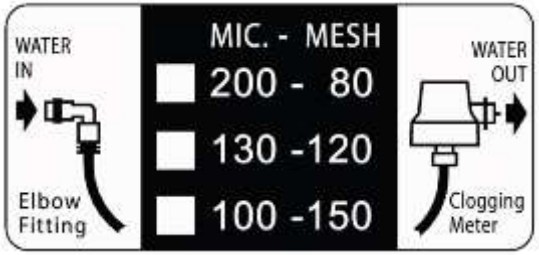
Inlets 2” and 3”

Semi-authomatic filter F6400

Flushing handle

Clogging indicator

Filter parameters



Manual

Drain valve

Higher flows

Pararell installation

2’’= 25m³

3’’= 40m³

Dripline maintenance
Flushing

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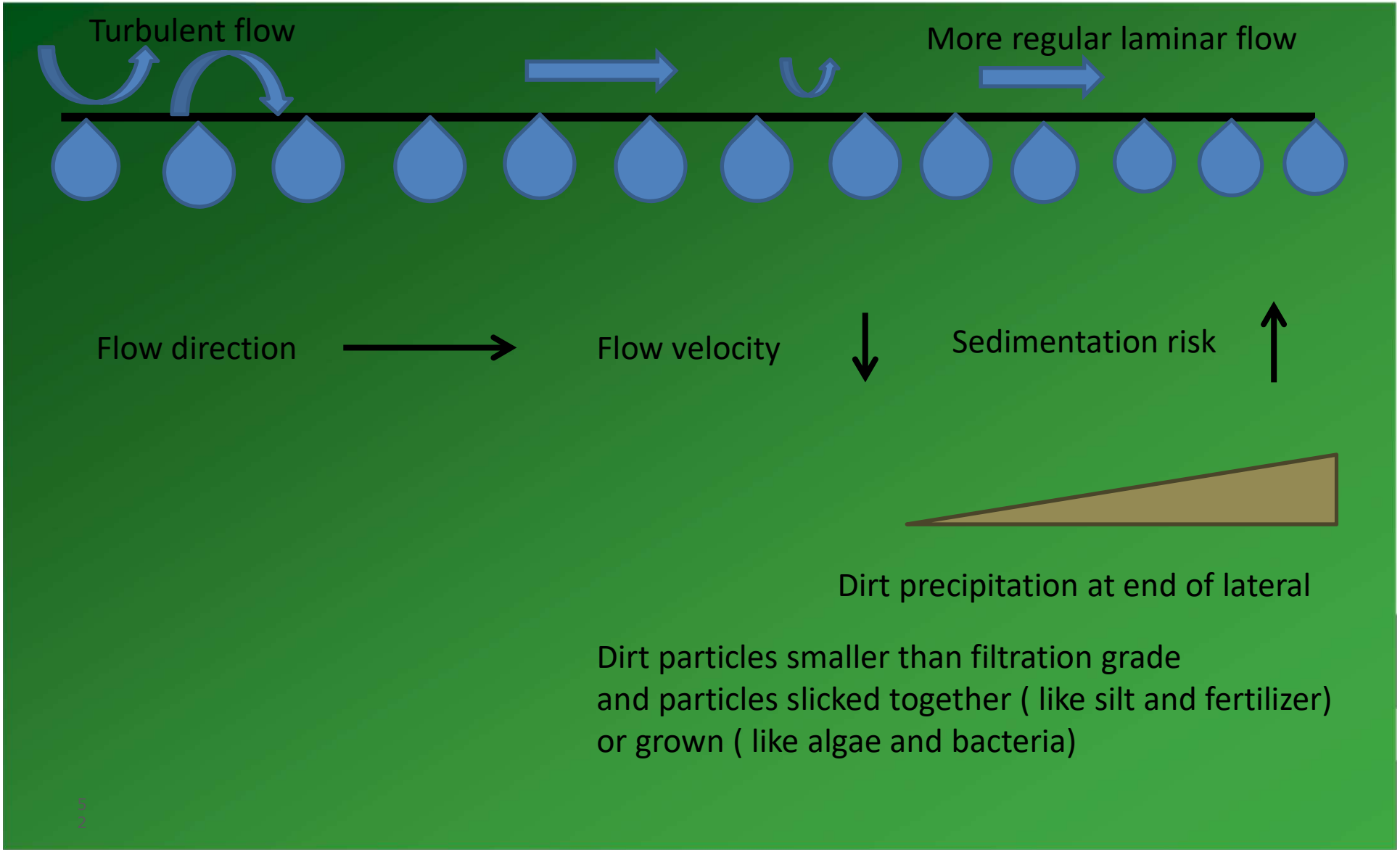
Water Flow inside lateral



Solution : Flushing

Manual =>

Automatic =>

Automatic
flush valve

Semi-automatic centralized =>

In combination
With collector
Pipe

Automatic Centralized =>

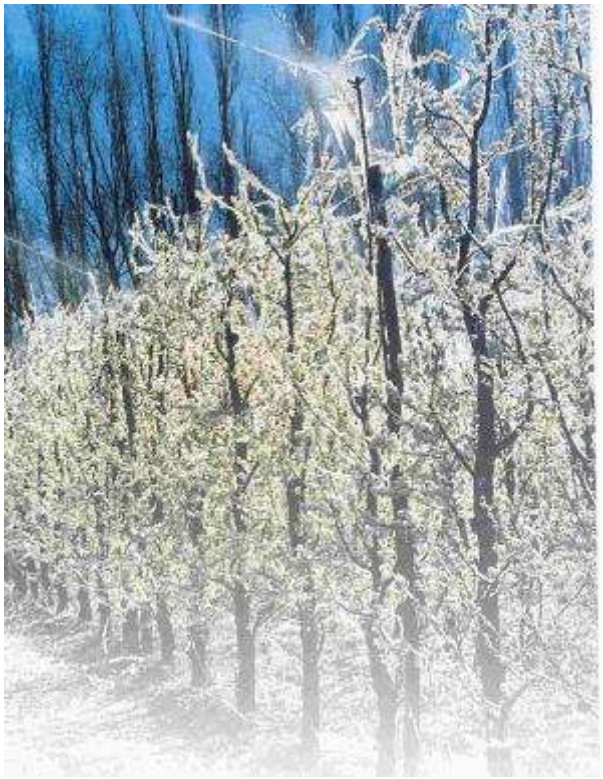
Valve controlled by
irrigation controller
instead of manual

Frost Protection

What is Frost?

When the temperature drops down of 3^0C within short time

For short time (10-12 hours)



Conditions for Frost & Damage

1. Clear Sky with cold night
2. Dry Air
3. Strong Radiation
4. Strong Inversion
5. Low Land-Basin

Active Frost Protection

- Sprinkler :for frost protection
- Fanes : for mixing air layers
- Helicopter: for mixing air layers
- Heaters

Super XL Sprinkler

200-340LH

up to 9.0mX9.0m For over head full cover

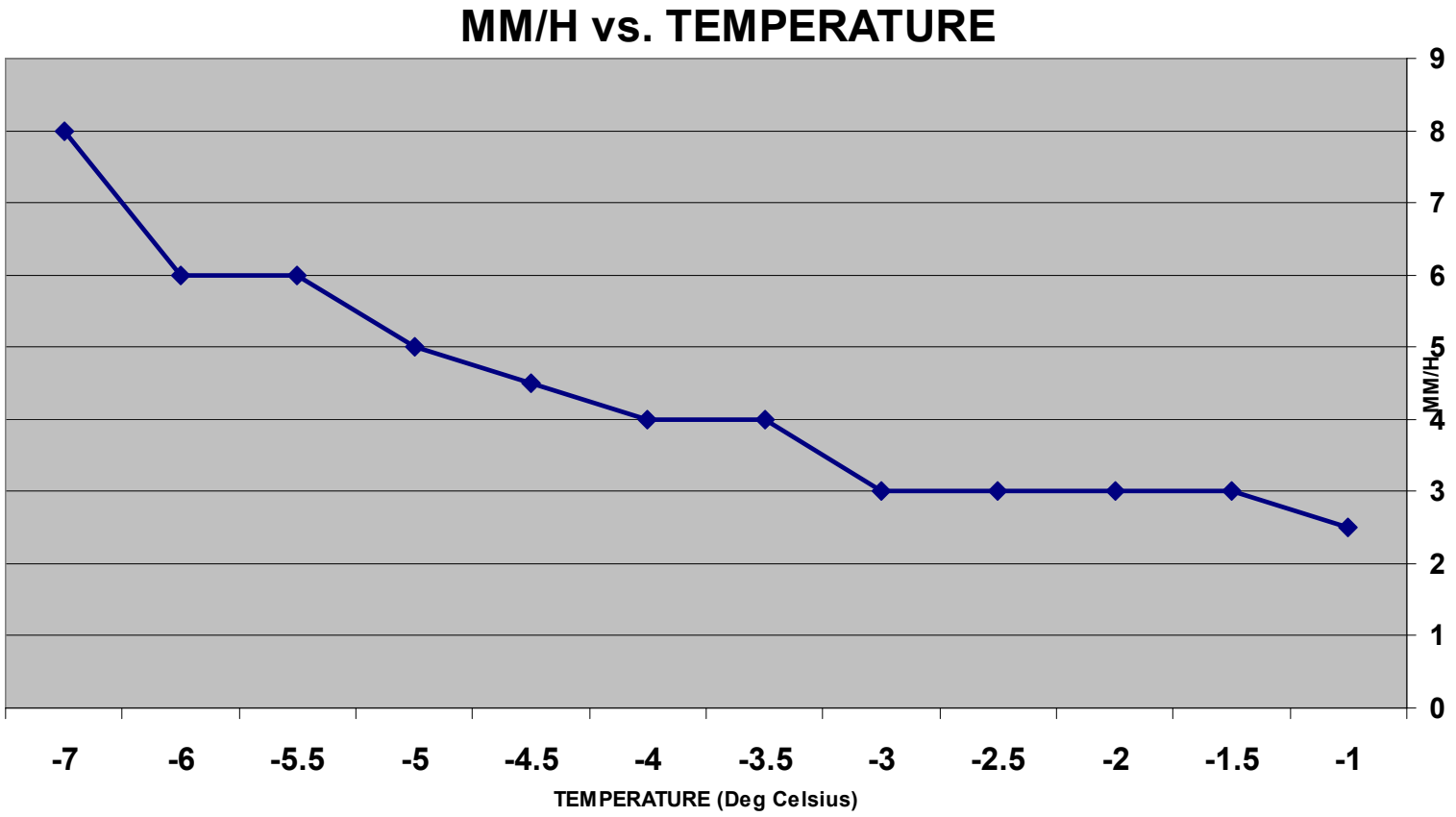
The physical principle of frost protection

Process	Heat Exchange
	Calories per gram
Water cools from 20°C (68°F) to 0oC (32°F)	+20.0
Water freezes at 0°C (32°F)	+79.7
Ice cools from 0°C (32°F) to -5 °C (23°F)	+2.5
Water evaporates at 0 °C (32 °F)	-597.3

General guide (no wind)

Water Application rate: mm\h

- Temp: 0° to (-3°) = 2.5mm
- Temp: (-2°) to (-4.4°) = 3.0mm
- Temp: (-3°) to (-5.5°) = 4.0mm
- Temp: (-4°) to (-6°) = 5.0mm



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Distribution uniformity

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Thank you for coming ☺