

Universal Indicator colour / PH Chart of Acids

1	2	3	4	5	6	7
Digestive Acids	Car battery Acid	Lemon Juice	Vinegar	Acid Rain	Tap water	Pure water

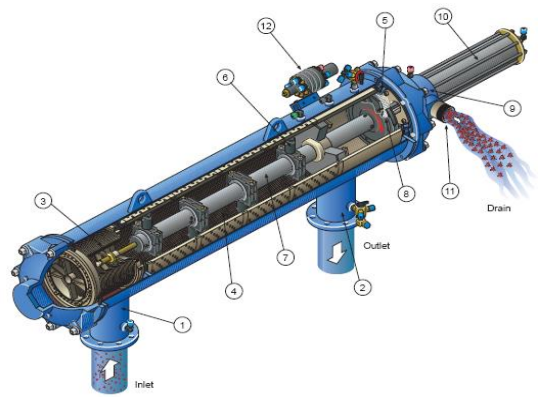
Universal indicator colour / PH Chart of Bases

8	9	10	11	12	13	14
Pure water	Soap	Bleachwater of acids	Disinfectant	Household Cleaner	Calcium Hydroxide	Sodium Hydroxide



IRRIGATION

MUNICIPAL



Water Quality

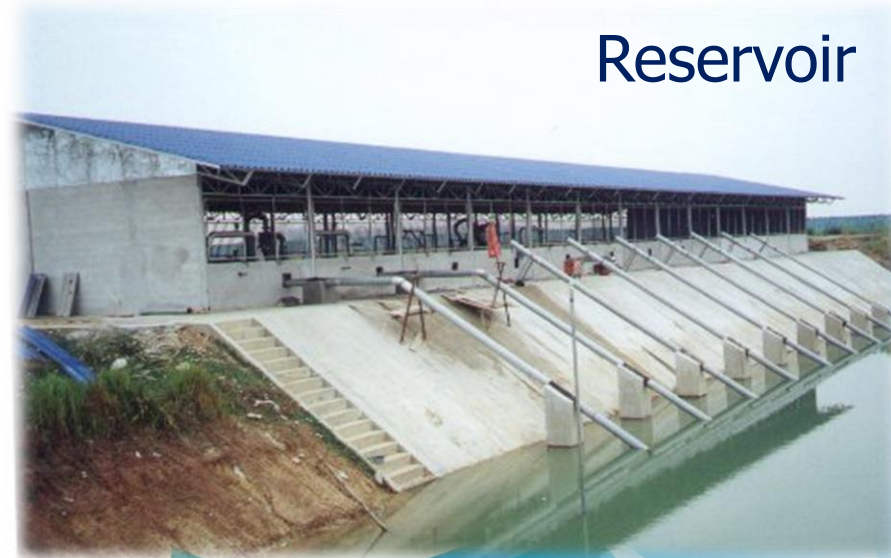
Water may contain many clogging factors of different nature and origin.

These factors are predictable according to:

- 1. Water source**
- 2. Environmental conditions**
 - a. Knowing which factors need attention**
 - b. How they can be diagnosed and treated**

Will protect micro-irrigation systems.

WATER: Source & Quality



WATER QUALITY DIVIDE TO THREE GROUPS

Physical characteristics – **Specific-gravity, particles-size turbidity**

Chemical components – **PH, EC (minerals, metals etc.)**

Biological factors - **micro-organisms**

Water as a Solvent

Water dissolves minerals and salts from stone and rock layers, nutrients and organic substances from soils, and gases from the air.

Filtration does not remove dissolved substances.



Water as a Solvent

Dissolved-Solids may cause mineral deposits in the irrigation system.

Minerals & Salts

Sodium Na^+ , Potassium K^+

Calcium Ca^{2+} , Magnesium Mg^{2+}

Iron $\text{Fe}^{2+/3+}$, Manganese Mn^{2+}

Chloride Cl^-

Sulfate SO_4^{2-} , Sulfide S^{2-}

Silica SiO_3^{2-}

Soil Hardness

Mineral Deposits
(mostly acid soluble)

Salinity

Mineral Deposits
(mostly insoluble)

Universal indicator colour / PH Chart of Acids

1	2	3	4	5	6	7
Digestive juices	Car battery Acid	Lemon juice	Vinegar	Acid Rain	Tap water	Pure water

Universal indicator colour / PH Chart of Bases

7	8	9	10	11	12	13	14
Pure water	Soap	Bicarbonate of soda	Disinfectant	Household Cleaner	Calcium Hydroxide	Oven Cleaner	Sodium Hydroxide

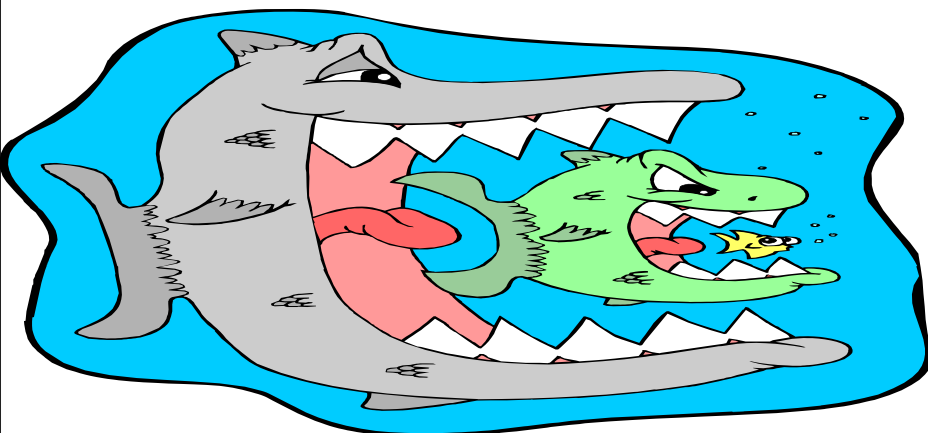
Water as a Solvent

Dissolved substances in the water are essential for the development of living organisms.

Gases

Oxygen O₂

CO₂



Nutrients

Phosphorus (as PO₄²⁻)

Nitrogen (as NH₄⁺, NO₂⁻, NO₃⁻)

organic matter

Suspended Solids

Water washes mineral particles out of the soil and earth layers and carries them away.

1 mm = 1000 μ m (micron)

Water - The Source of Life

There is no life without water. Where water is, there are living organisms.

Plants

Water Weed

Algae

Molds and Fungi

Cyanobacteria / Bluegreen Algae

Bacteria

1

10

100

1000

Size (micron)

Protozoa (Ciliates, Flagellates)

Porifera

Crustacea

Insects and larvae

Animals

Bryozoa

Algae



- Large and filamentous algae may cause clogging of emitters and drippers.
- Some algae have gelatinous sheaths and may cause bio-fouling.
- Seasonal blooming cause high particle loads and add organic matter to the water.

Protozoa



- Colony-forming protozoa develop in water rich in nutrients (as wastewater)
- They may develop in the pipes and clog irrigation equipment.

50 micron

ASM Digital Image Collection. Durr

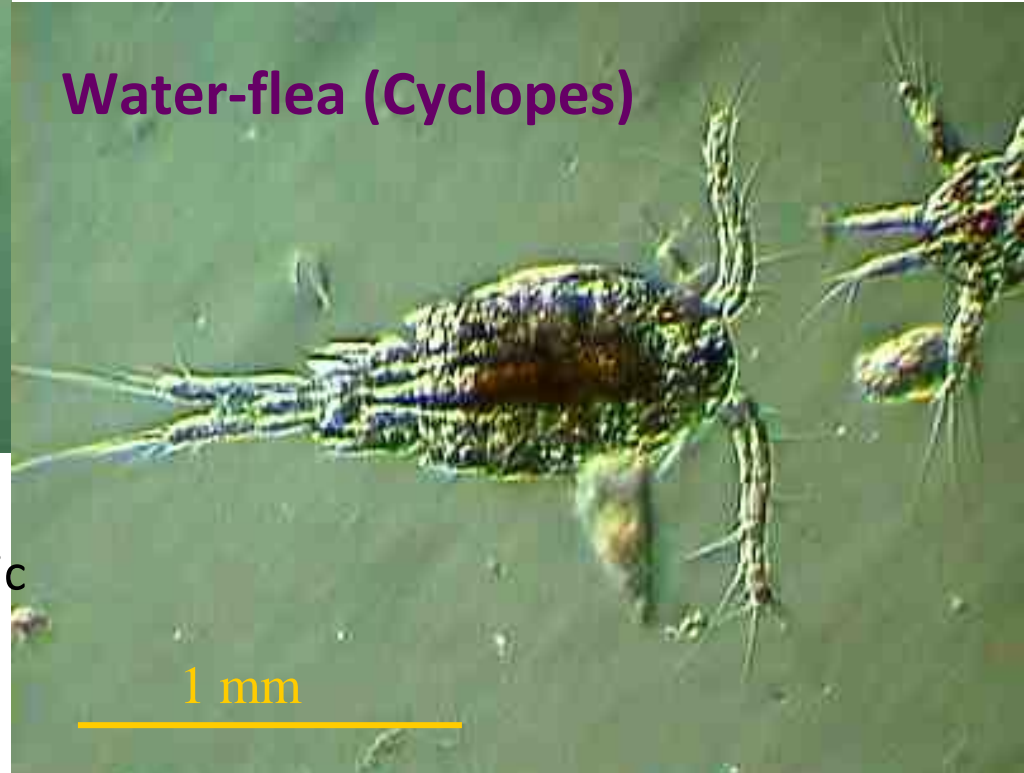


Water-flea (Daphnia)



- Crustaceans are large organisms an invertebrate animal with several pairs of jointed legs, a hard protective outer shell, pair of antennae and eyes
- Mass development after algal blooming

Water-flea (Cyclops)



- Clog filtration.
- Dead organisms release sticky organic matter that cause clogging

Picture no. 13 : Sulphur bacteria in a gravel filter





Oxidation Iron Treatment

*Information about the water quality of your water source
can be obtained from:*

Local Water Authorities
Research centers

End user



**Laboratory
Tests**



Irrigation water quality

Filtration is essential when using micro irrigation.
The type and size of filtration determined by:

1. Emitter type
2. Water source
3. Water quality
4. Total flow-rate required
5. Energy type

Basic classification of water source

Good:

Well water – with out presence of bacteria, iron, manganese or limestone.

Average/Bad:

Rivers/streams, canals and reservoirs with low-biological-growth.

found in cold climates

Avarage/Bad:

Rivers/streams, canals and reservoirs with high-biological-growth.

found in hot climates

Very Bad:

Rivers/streams, canals (affected by flood) and reservoirs with HIGH biological growth

Water quality basic classification (rule of thumb)

- | Water quality | Levels of TSS | Clogging (minutes) |
|---------------|---------------|--------------------|
| Good | 0-20 ppm | $T > 15$ |
| Medium | 20-50 ppm | $T = 5.0 - 15$ |
| Bad | 50-80 ppm | $T = 2.5 - 5.0$ |
| Pre treatment | above 80 ppm | $T = 1.5 - 2.5$ |
- On site test to determine water quality.

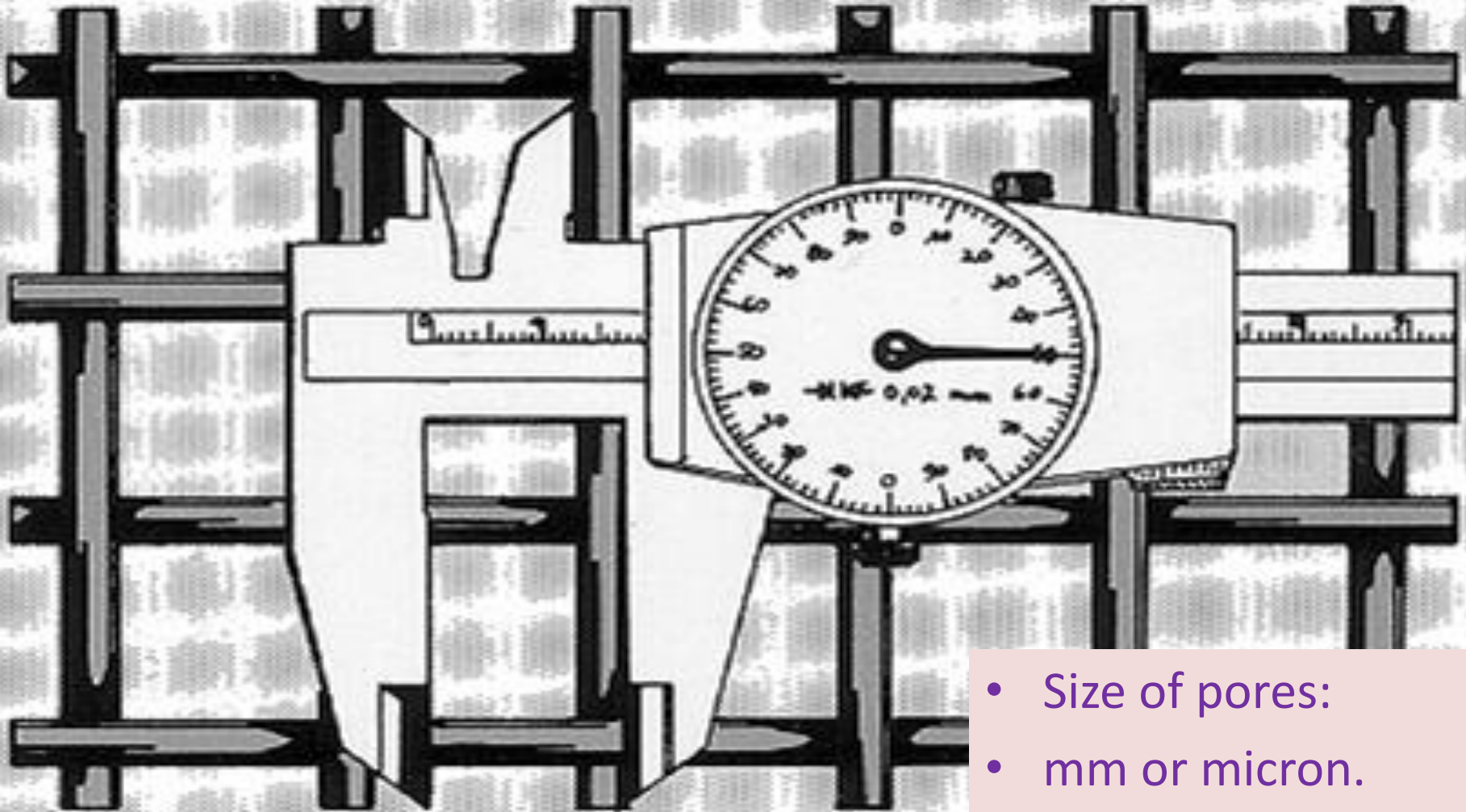
Other Factors to consider

- pH Value
- The accepted pH value for the majority of water sources does not usually exceed the 6-9 boundaries.
- Algae and Chlorophyll
- develop in surface water that is exposed to sunlight
- Zooplankton
- greatly affects the functioning of irrigation filters
- Biochemical Oxygen Demand (BOD)
- expressing the concentration of organic material

• **Filtration in irrigation-system**

- The process of removing solid particles from liquid by forcing them through a porous medium.
- **Common filtration at agriculture-water-system:**
 - Media filtration gravel
 - Disc filtration

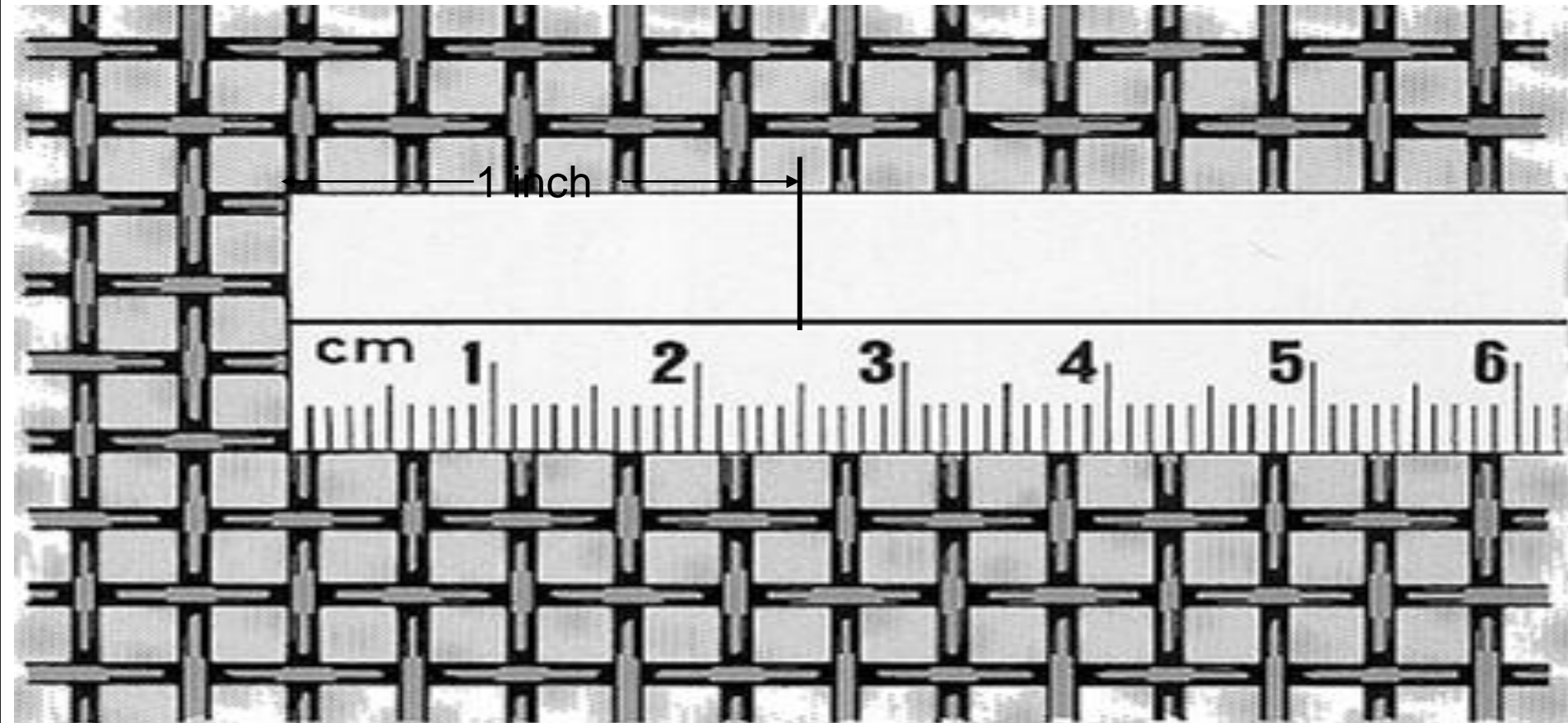
Filtration Degree



- Size of pores:
- mm or micron.

Density in mesh

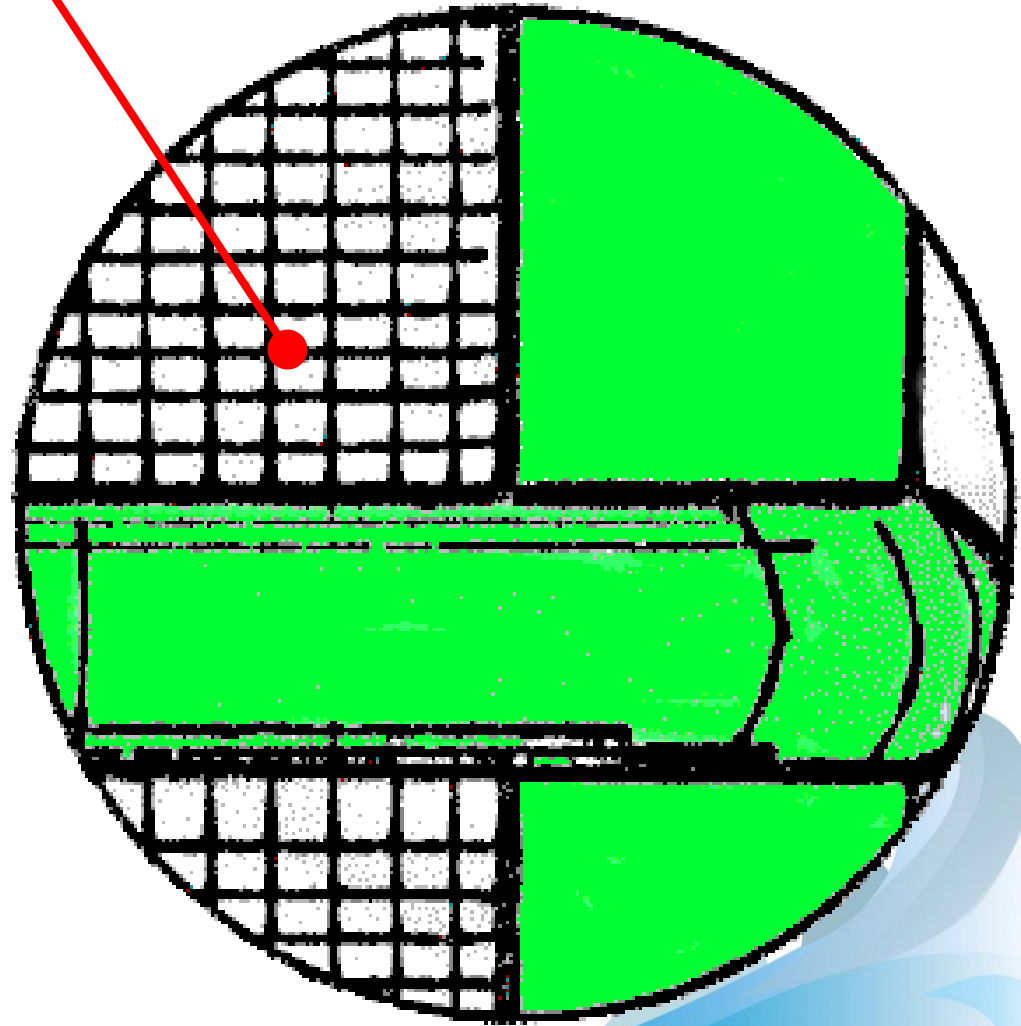
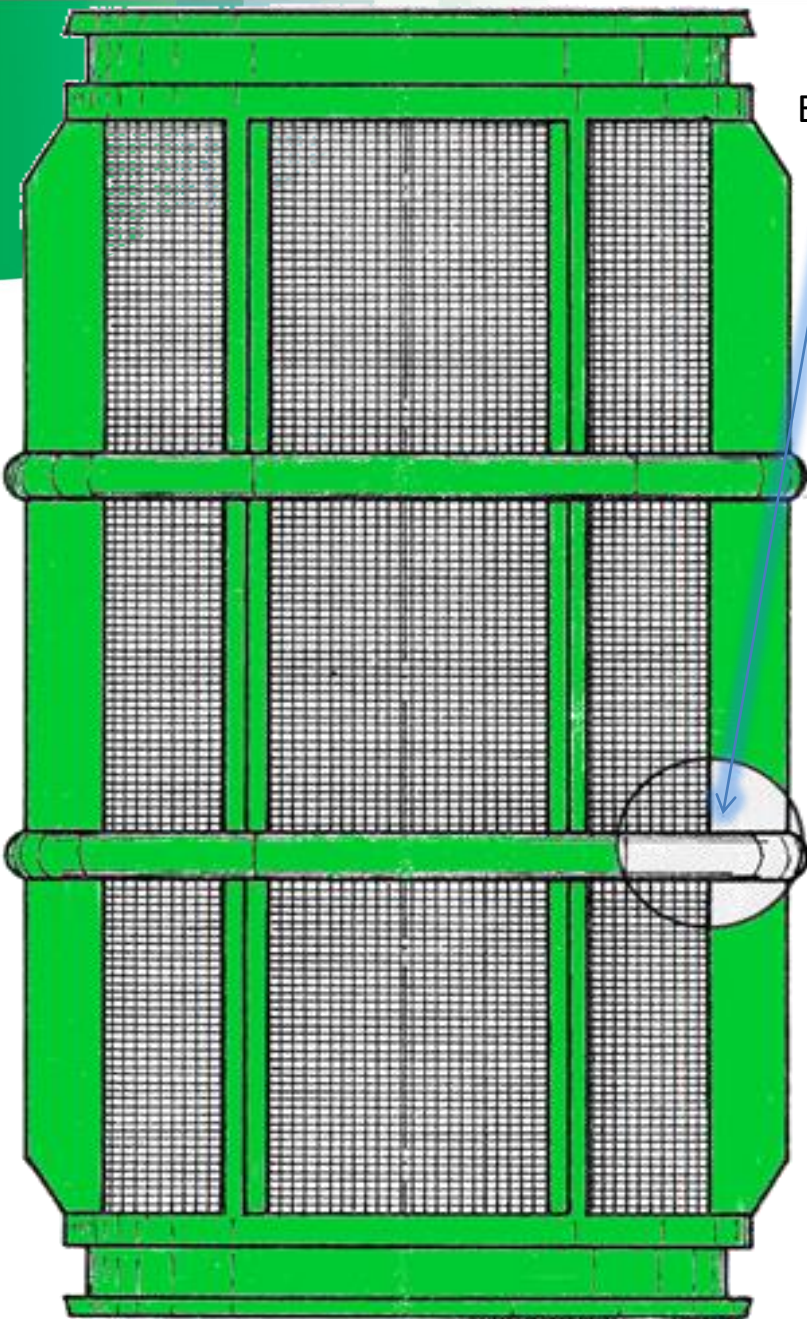
Number of pores per length of one inch.



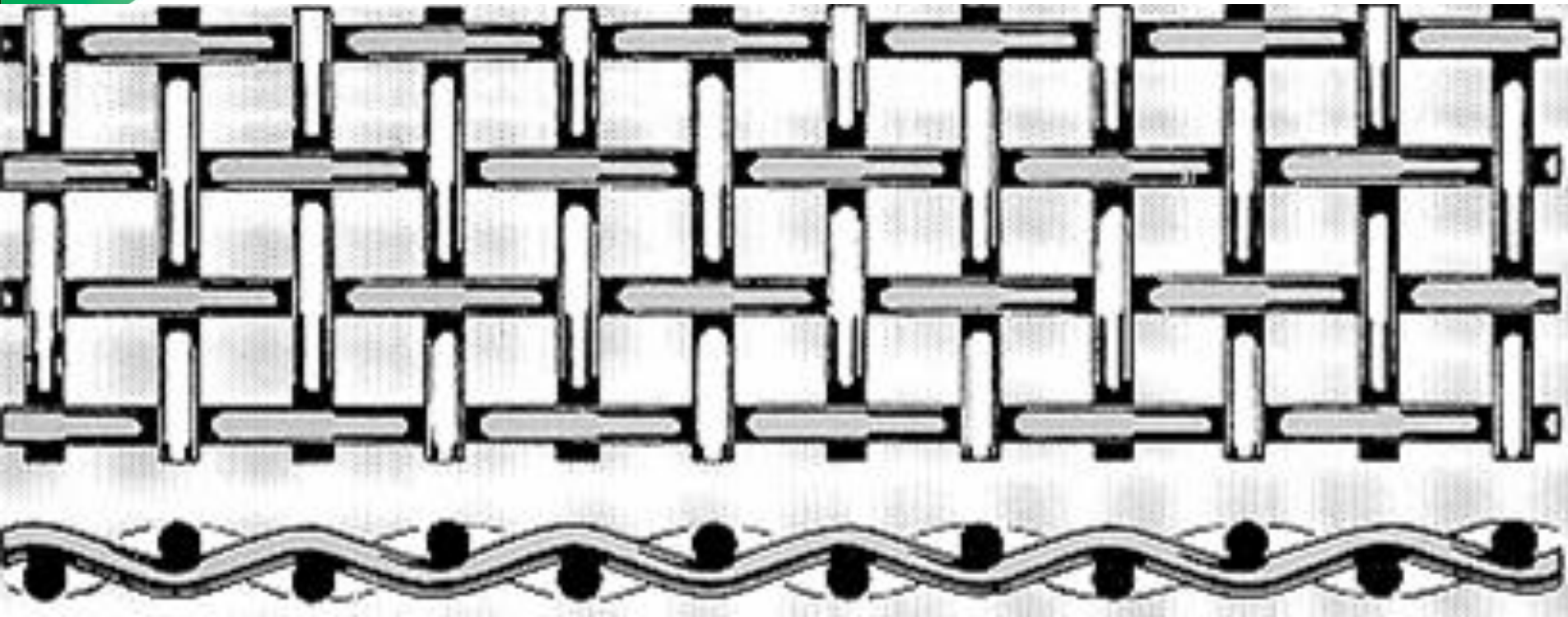
EFFECTIVE FILTRATION AREA

The total area of the Filter which is exposed to flow and is **usable** for the filtration process.

Effective Filtration Area



Surface Filtration

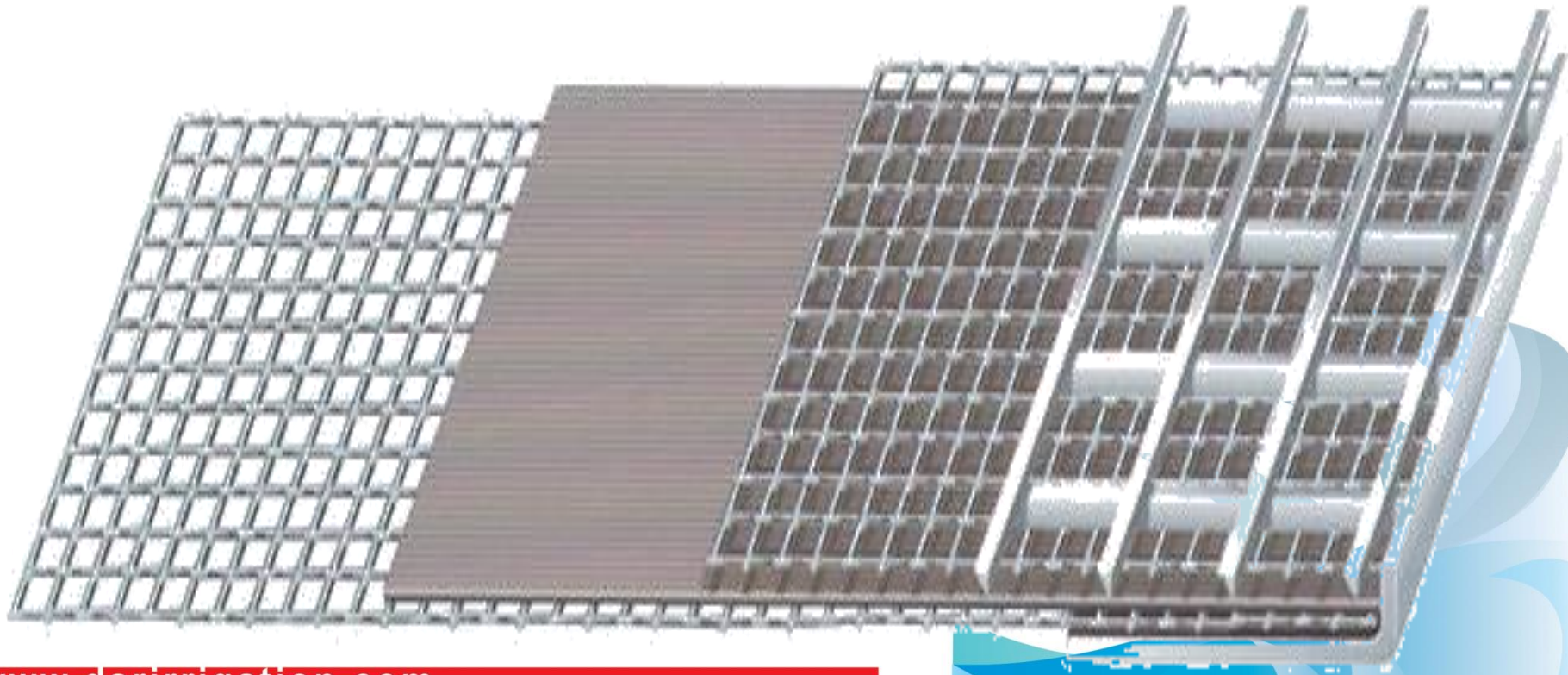


Plain weave

Particles larger than the pore size of the medium are stopped at the upstream surface of the filter.

Four-layer-screen

- The four-layer screens use in automatic-self-cleaning, as scan away Screen-filtration
- filtration degrees from 800 to 10 micron (0.800mm to 0.010mm)



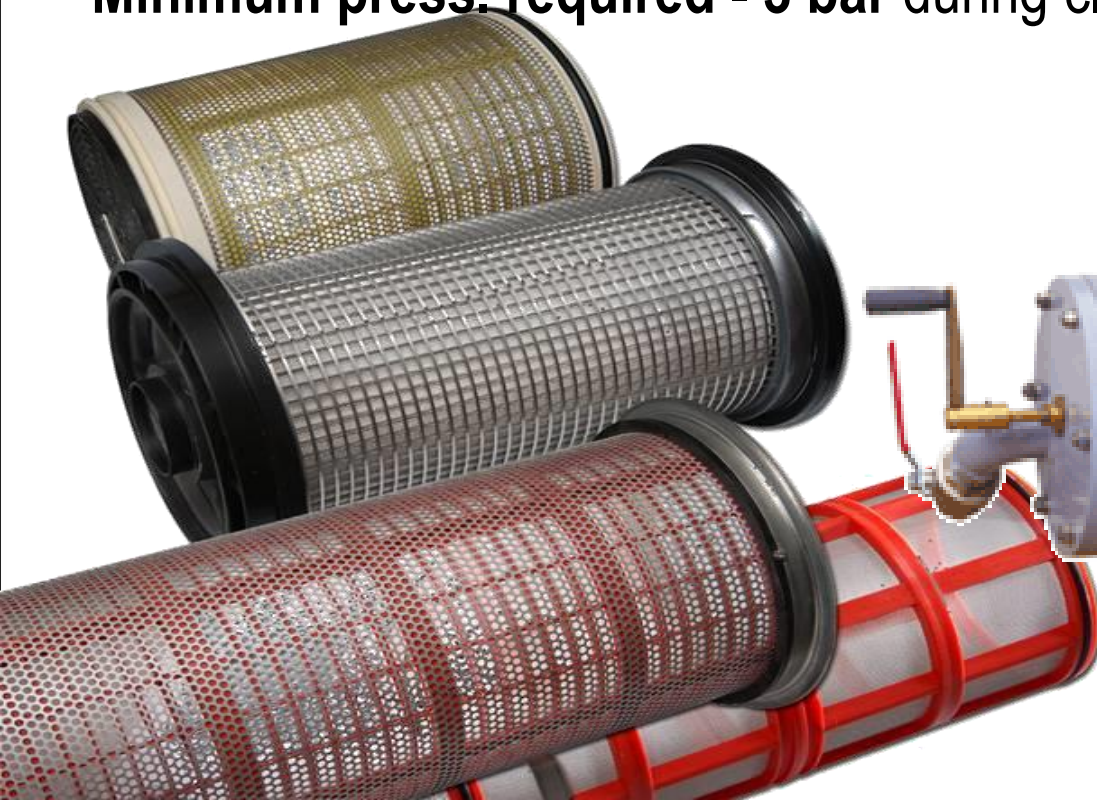
Plastic screen filtration

- Mainly using for “control” or “inspection”
- Use as S.H.C in irrigation system



Screen Filtration

- The lowest cost among the filters groups for irrigation
- New popular product: Sami automatic
- **Minimum press. required - 3 bar during cleaning**



COMMON CLEANING METHODS

- *Manual cleaning: Rinsing, Soaking*
- *Mechanical cleaning: Brushing, Scraping*
- *Direct washing: Jetting*
- *Back flushing: Reversing flow*
- *Suction Scanner: Vacuum*

Manual Cleaning

- Rinsing
- Soaking



Plastic Filters $\frac{3}{4}$ " – $1\frac{1}{2}$ "



Plastic Filters 2" – 3"



Steel Filters 2" – 4"



Steel Filters 4" – 14"



Semi-Automatic Cleaning

1. **Brushing/Scraping**
2. **Scanning**



Best filter

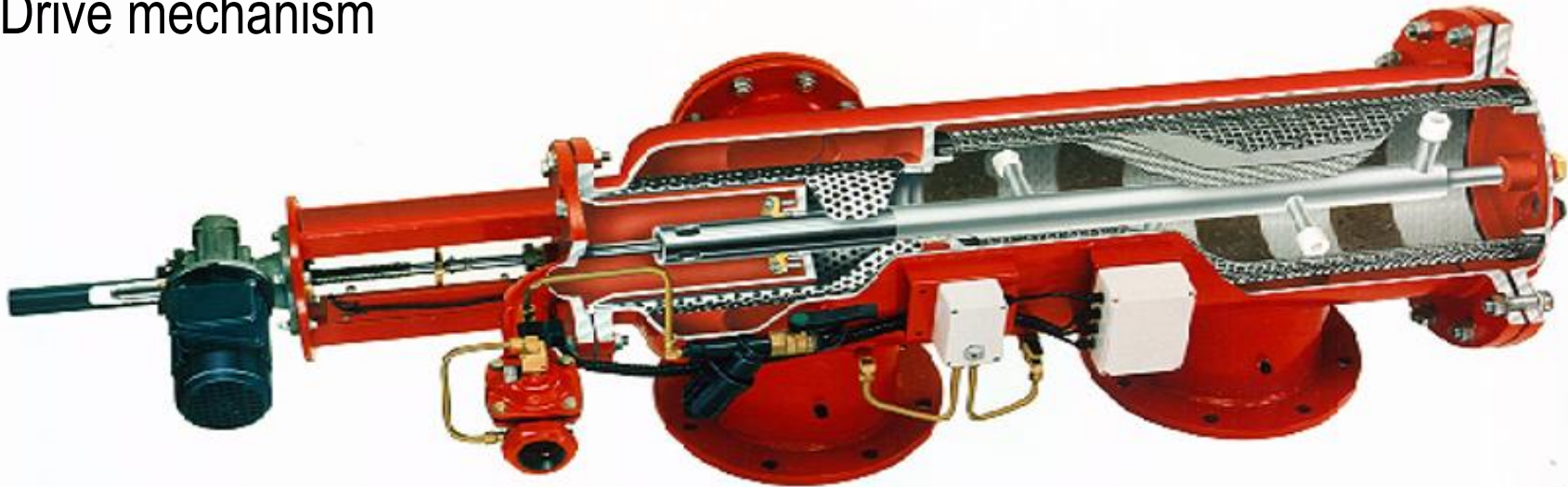
Removes **ALL** suspended solids from the water and **NEVER** blocks.

Or a filter that cleans itself **AUTOMATICALLY** whenever it needs to.



Suction Scanner Mechanism

- Principal of operation
 - Suction scanner
 - Flushing chamber
 - Exhaust valve
 - Drive mechanism

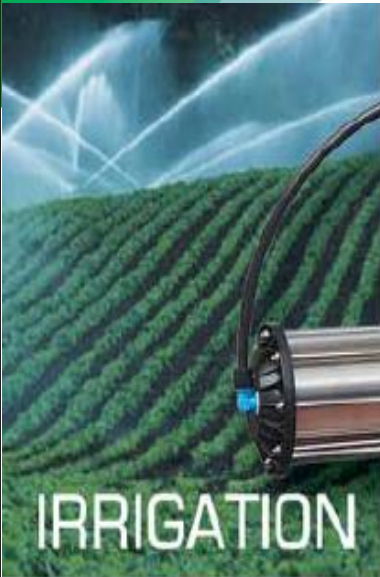


Suction Scanner Mechanism

- Main features
 - Cleaning without compressing the solids
 - Complete cleaning with one scanning
 - Minimal wasted flushing water

Cleaning Ability

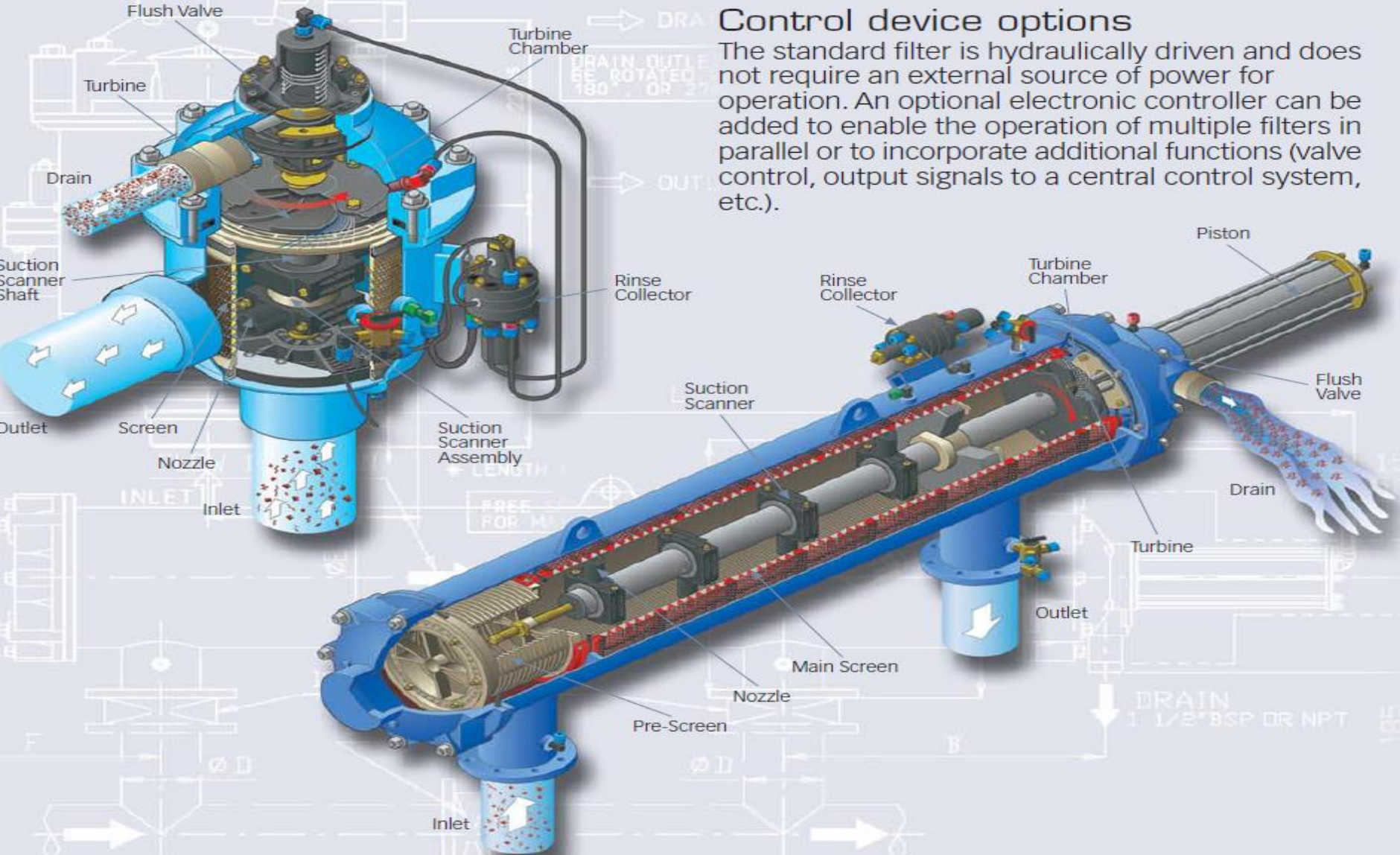
- The cleaning ability of an automatic filter depends on:
 - Velocity of water through the nozzle
 - Distance between the nozzle and the screen
 - Differential pressure across the screen
 - Suspended solids characteristics



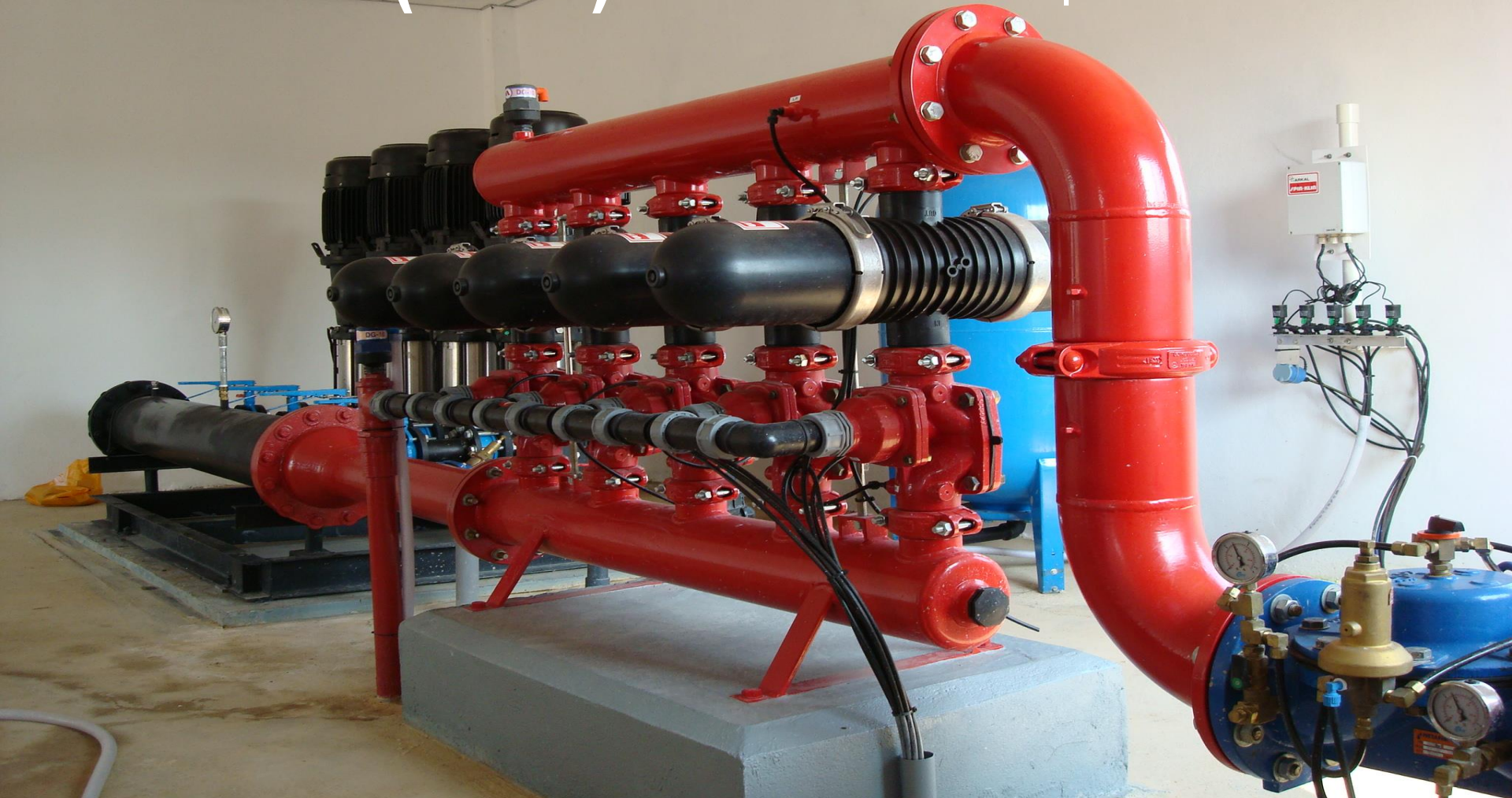


Control device options

The standard filter is hydraulically driven and does not require an external source of power for operation. An optional electronic controller can be added to enable the operation of multiple filters in parallel or to incorporate additional functions (valve control, output signals to a central control system, etc.).



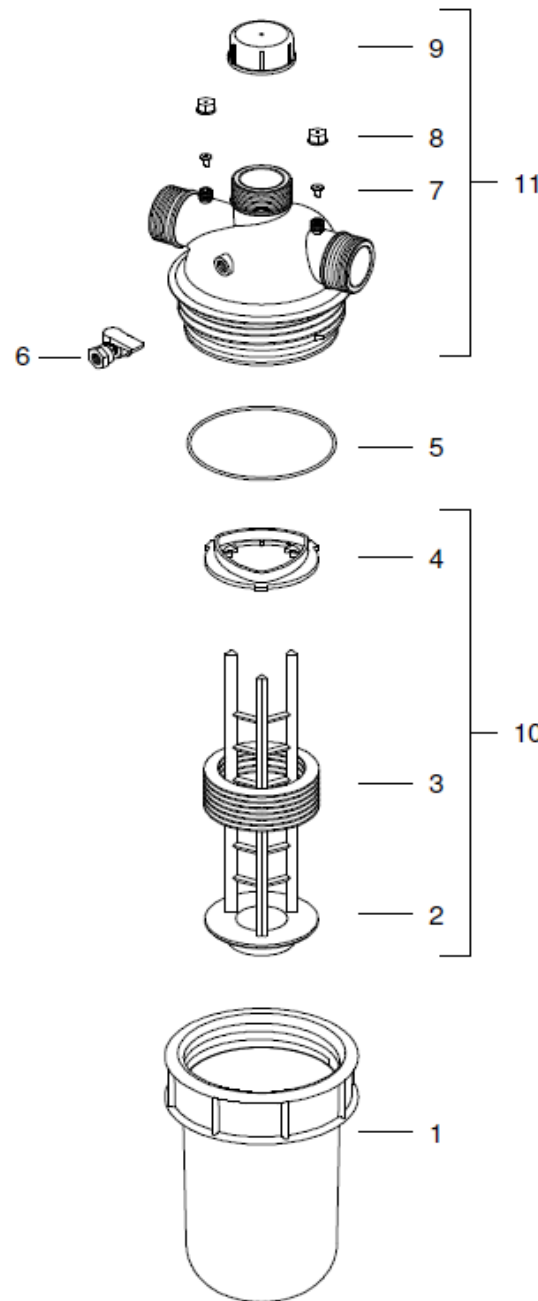
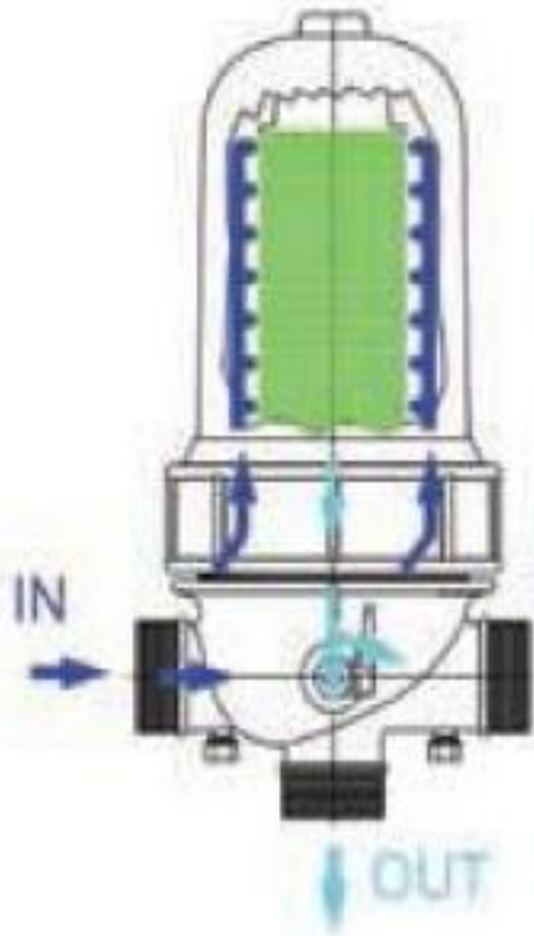
Filtration (Disk) at Control & Pump station



Grooved disc filter elements



Disc filtration

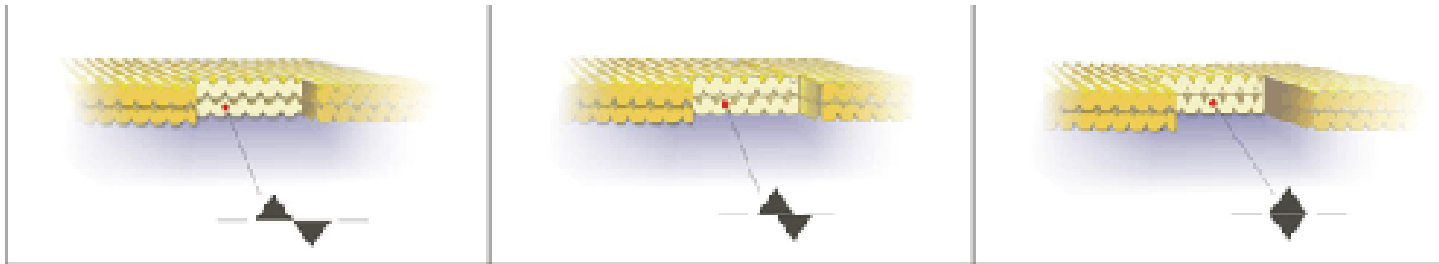


Disc filtration

- Filtration occurs while water is percolation from the outer diameter to
- the inner diameter of the element

TABLE OF FILTRATION GRADES OF THE DISCS AND COLOR CODE

	Blue	Yellow	Red	Black	Brown	Green	Purple	Gray
Color Code	Blue	Yellow	Red	Black	Brown	Green	Purple	Gray
Micron	400	200	130	100	70	55	40	20
Mesh	40	80	120	140				
PP								
Nylon								



The groove on top runs opposite to the groove below, creating a filtration element with a statistically significant series of valleys and traps for solids

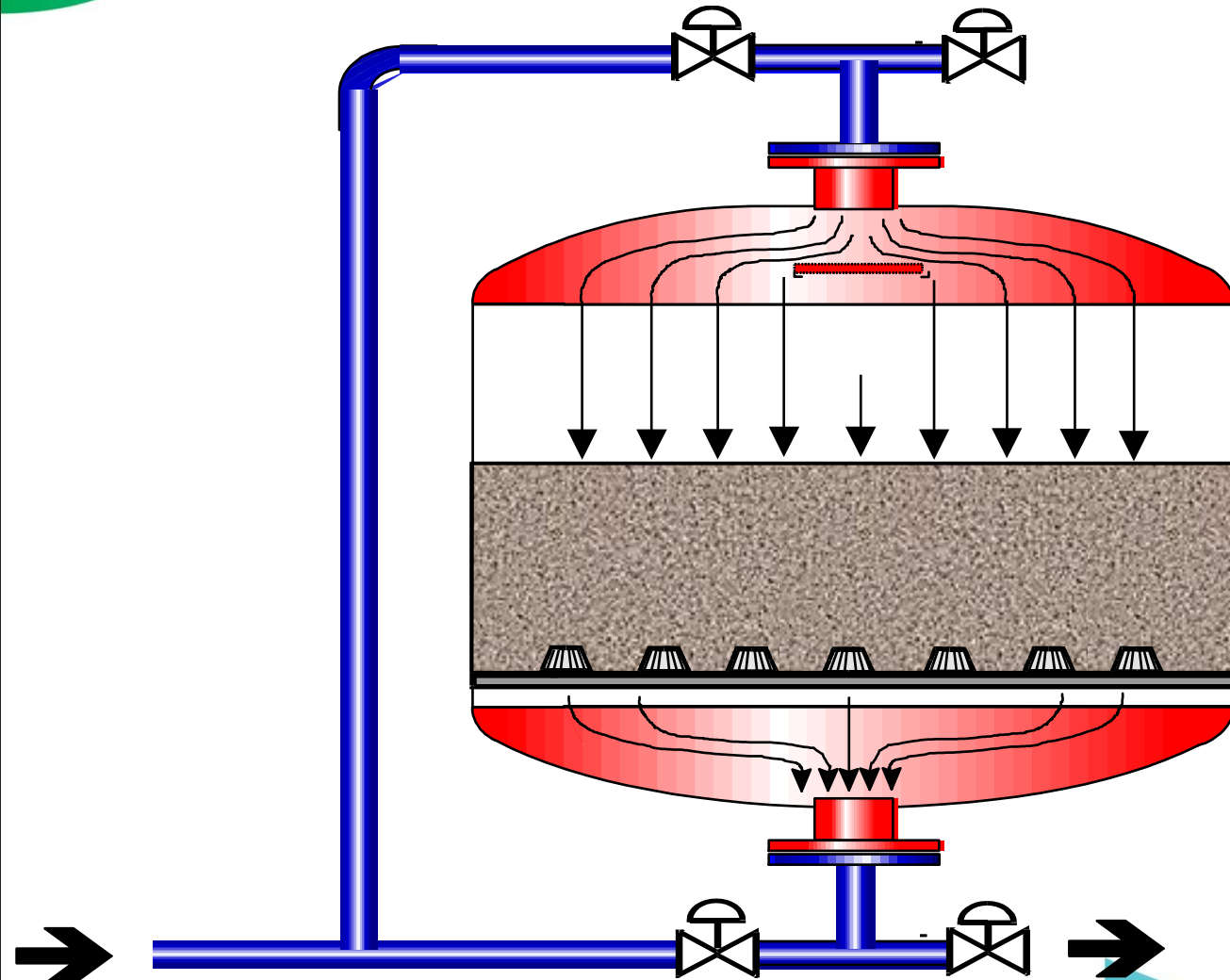


Media Filtration (gravel) provide:

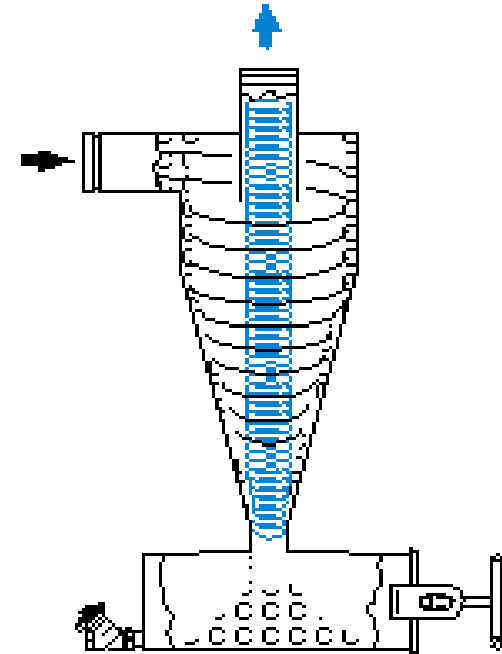
The highest degree of filtration
due to the size of the filtration media.



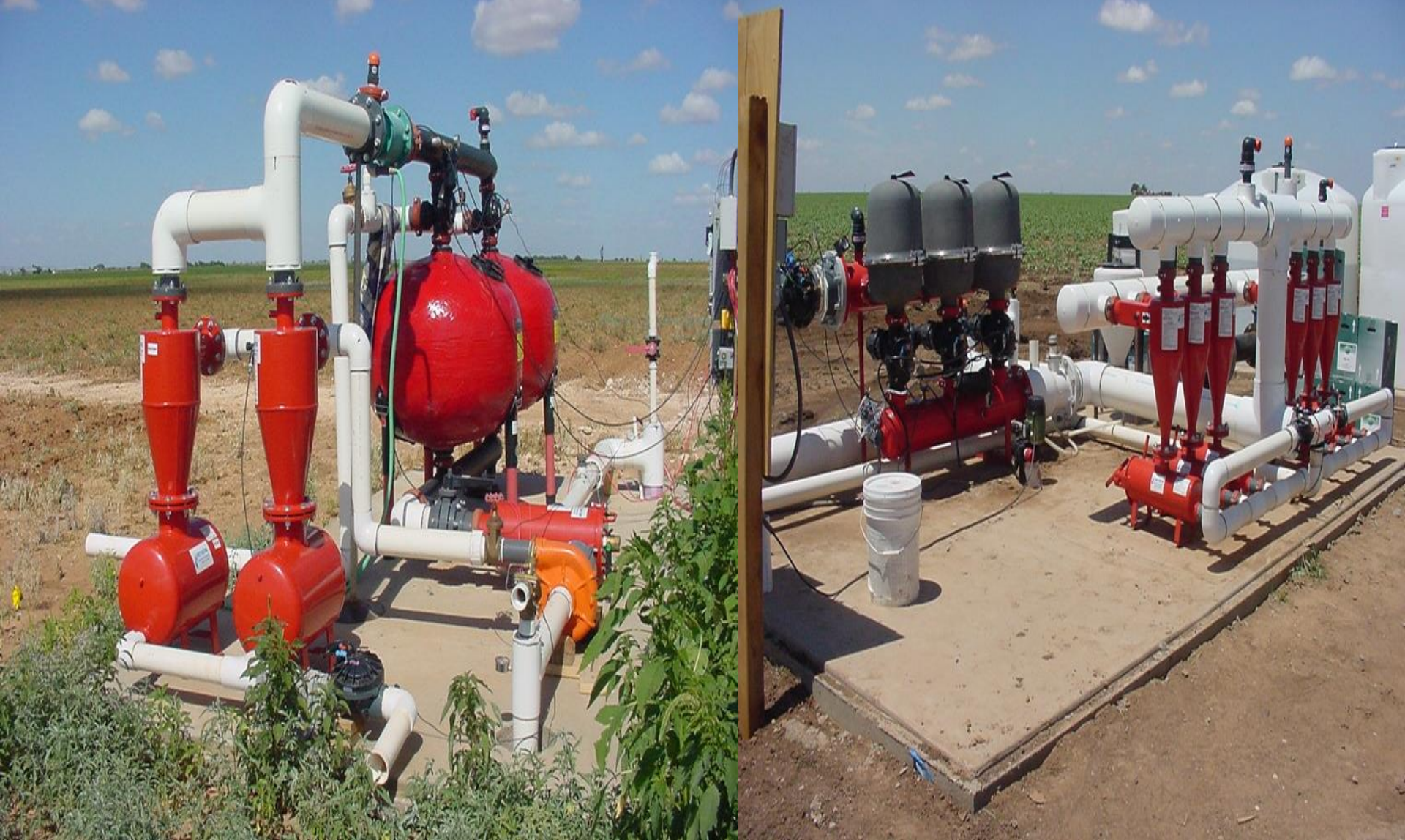
Depth filtration process




Hydro cyclone or Sand-separator (is not a filter)



- Use for well water - If the sand load is between 1 – 10 ppm
- Must work in the proper flow rate according to manufacture spec.
- efficiency depending on relatively equal flow design in the irrigation operation system
- Not effective in low flow rate (regarding to specifications)





***Water is ever changing
and not always
what it seems to be!***

Electromagnetic conditioning water treatment by Aqua 4D

UV Water treatment by INTA

Thank you