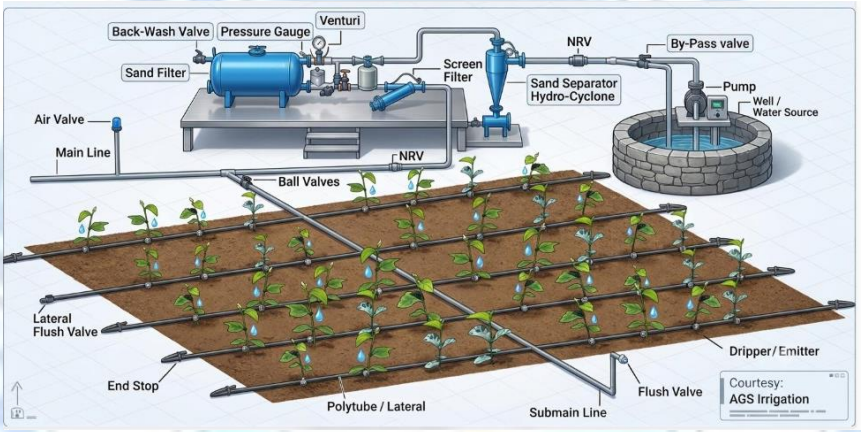
FILTERS IN IRRIGATION

FILTERS USED IN IRRIGATION

1. Introduction to Filters

A filter is a device used to remove suspended impurities, sand, silt, algae and other unwanted particles from irrigation water.

Filters are particularly important in drip and micro-irrigation systems because small particles can block emitters, drippers and sprinkler nozzles.



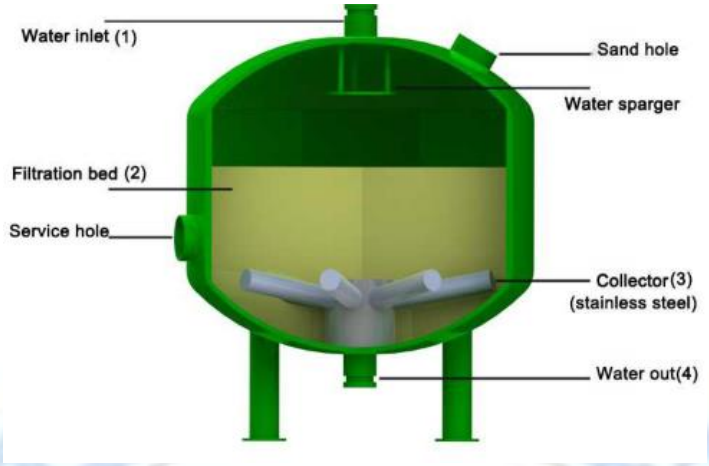
2. Objectives of Filtration

1. To remove suspended particles from irrigation water.
2. To prevent clogging of drip emitters.
3. To protect irrigation pipelines and equipment.
4. To improve irrigation system efficiency.
5. To reduce maintenance costs.
6. To ensure uniform water distribution.

3. Types of Filters Used in Irrigation

There are four major types of filters commonly used in agricultural irrigation.

A. Sand or Media Filter



A sand filter consists of a tank filled with sand or other suitable filter media. Water passes through the media, which traps suspended particles and organic impurities.

Working Principle:

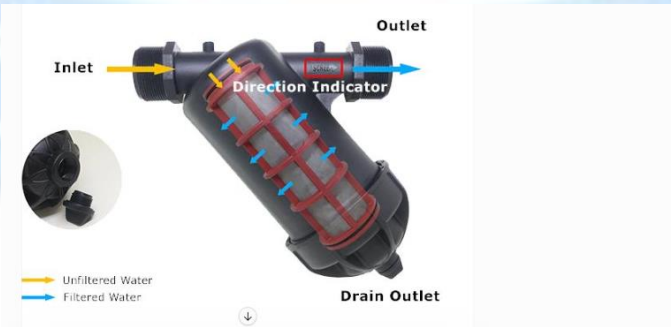
- Water enters the filter tank.
- Water passes through the sand media.
- Suspended particles are trapped within the media.
- Filtered water is collected at the bottom.
- Clean water is supplied to the irrigation pipeline.

Advantages:

- Removes organic matter.
- Suitable for water containing algae.
- Effective for surface water sources.
- Used in drip irrigation systems.

Applications: Canal water, pond water, reservoir water and surface water irrigation.

B. Screen Filter



A screen filter consists of a fine metal or plastic mesh that removes suspended particles from irrigation water.

Working Principle:

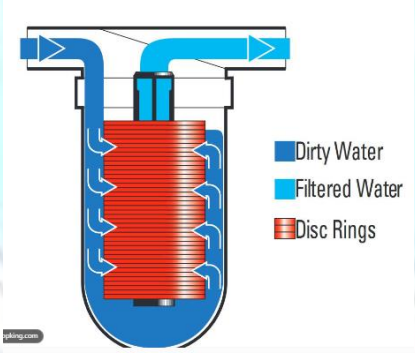
- Water enters the filter body.
- It passes through a fine mesh screen.
- Suspended particles are retained on the screen.
- Filtered water flows through the outlet.

Advantages:

- Simple construction.
- Low cost.
- Easy cleaning.
- Requires less maintenance.

Applications: Drip and sprinkler irrigation systems, particularly where water contains relatively low quantities of suspended solids.

C. Disc Filter



A disc filter consists of a series of grooved plastic discs arranged in a stack. The grooves trap suspended particles during filtration.

Working Principle:

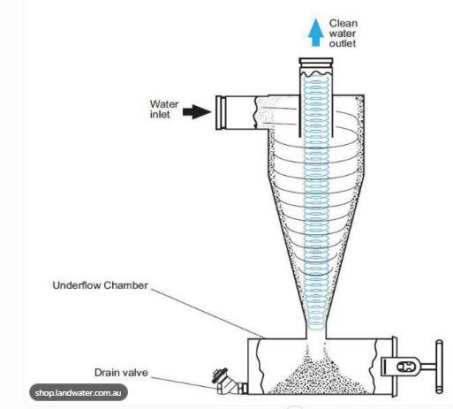
- Water enters the filter housing.
- Water passes through the grooves between the discs.
- Particles are trapped between the discs.
- Clean water flows towards the outlet.

Advantages:

- Effective filtration.
- Compact design.
- Easy cleaning and maintenance.
- Suitable for drip irrigation.

Applications: Micro-irrigation systems and agricultural water filtration.

D. Hydrocyclone Filter



A hydrocyclone filter is used to separate sand and other heavy particles from water using centrifugal force.

Working Principle:

- Water enters tangentially into the hydrocyclone.
- A circular or swirling movement is produced.
- Heavy sand particles move towards the outer wall.
- Sand particles move downward and collect in the bottom chamber.
- Relatively clean water moves towards the outlet.

Advantages:

- Removes sand effectively.
- No filter mesh is required.
- Suitable for continuous operation.
- Reduces the load on secondary filters.

Applications: Borewell water containing sand and other heavy particles.

4. Comparison of Irrigation Filters

Characteristics	Sand filter	Screen filter	Disc filter	Hydrocyclone
Principle	Media filtration	Mesh filtration	Disc filtration	Centrifugal separation
Removes	Organic matter and suspended solids	Physical particles	Fine suspended particles	Sand and heavy particles
Construction	Sand-filled tank	Mesh screen	Grooved discs	Conical chamber
Cleaning	Backwashing	Manual/automatic	Manual/automatic	Flushing

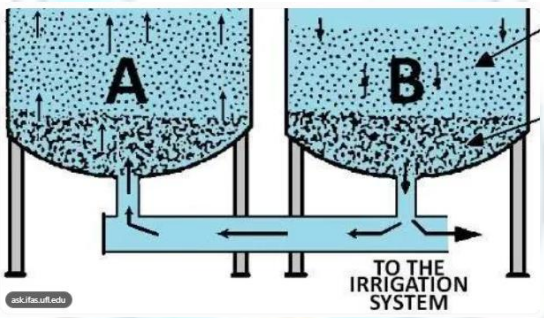
Main use	Surface water	Drip irrigation	Drip irrigation	Sandy borewell water

5. Filter Selection Based on Water Source

Water source	**Recommended filter**
Open well	Screen or disc filter, depending on water quality
Borewell with sand	Hydrocyclone followed by screen/disc filter
Pond water	Sand/media filter followed by screen/disc filter
Canal water	Sand/media filter followed by screen/disc filter
Reservoir water	Media filter, depending on suspended impurities

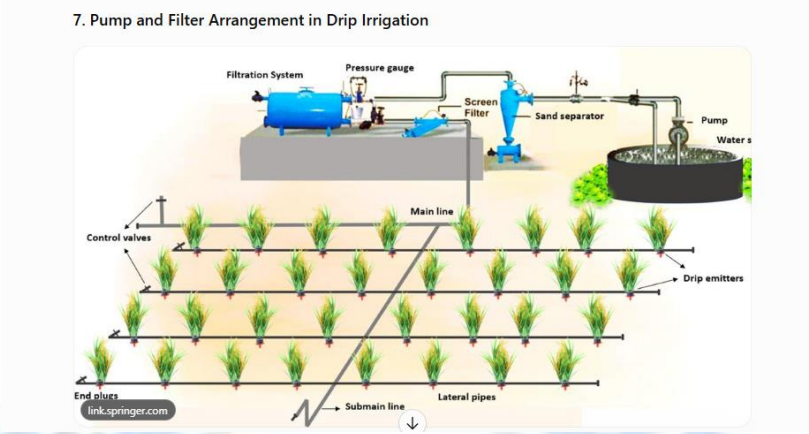
6. Backwashing of Filters

Backwashing is the process of cleaning a filter by passing water in the reverse direction to remove accumulated dirt and suspended particles.



Steps involved:

1. Stop normal filtration when cleaning is required.
2. Open the backwash valve.
3. Allow water to flow in the reverse direction.
4. Remove accumulated dirt and sediments.
5. Discharge dirty water through the waste outlet.
6. Return the filter to normal operation.
7. Pump and Filter Arrangement in Drip Irrigation



The pump and filter units are important components of a drip irrigation system.

Sequence of operation:

1. Water is collected from the source.
2. The pump lifts and supplies water under pressure.
3. The hydrocyclone removes heavy sand particles when necessary.
4. The media filter removes organic matter and suspended solids.
5. The screen or disc filter performs secondary filtration.
6. Filtered water flows through the main pipeline.
7. Water reaches the sub-main and lateral pipes.
8. Emitters discharge water near the plant root zone.

8. Maintenance of Pumps and Filters

Pump Maintenance

- Check motor connections regularly.
- Inspect suction and delivery pipes.
- Check bearings and seals.
- Ensure proper priming where required.
- Monitor discharge and operating pressure.
- Avoid dry running.
- Lubricate moving parts according to manufacturer recommendations.

Filter Maintenance

- Clean screens and discs regularly.
- Perform backwashing when required.
- Remove accumulated sand and sediments.

- Check pressure differences across filters.
- Inspect valves and connections.
- Replace damaged filter elements.