Water for Profit

FILTRATION OPTIONS FOR MICRO-IRRIGATION SYSTEMS

WATERFORPROFIT

Micro-irrigation requires good quality water free of all but the finest suspended solids and free of dissolved solids such as iron, which may cause precipitation problems in the system.

Introduction

Regular maintenance of the system is the best means of controlling blockages. A trickle system that is not maintained may eventually block and fail. Do not jeopardise an expensive irrigation system by installing a cheap or inappropriate filter. Approximately 10 per cent of the total cost of a system should be associated with the filtration unit.

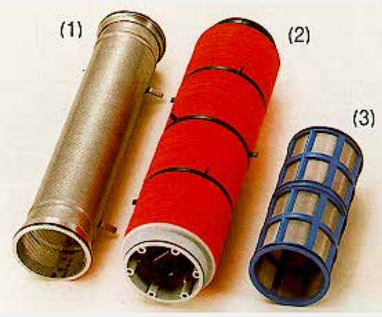

Figure 1: filtration elements - (1) perforated cylinder; (2) grooved disc element; (3) weavewire screen

Irrigation water quality and maintenance

The quality of irrigation water has a large influence on the type of irrigation system used and the potential for blockages. A chemical analysis of the water will help determine the design of the system and the type of treatment needed to prevent or control blockages. Test for salinity, pH, calcium, magnesium, potassium, manganese, boron, bicarbonate, carbonate, chloride, sulphate, sulphide and the quantity and size of suspended solids.

Pre-treatment

Pre-treat the water supply when it is impossible or impractical to remove contaminants by filtration and chlorination.

- iron: for iron of between 0. 1 and 1 mg/L, no pre-treatment is effective; see the sections on chlorination and pH adjustment below. For more than 1 mg/L iron, aeration and settling is highly effective, with the addition of lime to raise pH to 6.5 to 7.5 if necessary. If the iron is still more than 0.1 mg/L after pre-treatment, inject chlorine or sodium silicate. In most cases, treatment with chlorine or sodium silicate can replace the need for pre-treatment, but pre-treatment may reduce the cost of chemicals.
- fine sand, silts: allow to settle out.
- colloidal clay and silt: flocculate with alum and allow to settle.
- algae: treat chemically at the source. Pre-treatment with alum or lime can be done in several ways. For small scale operations, inject the chemical into the water before it is aerated, using either a one or two tank aeration and settling system. For larger operations, spray the chemical over the surface of a large storage darn. This technique is less effective and more care should be given to subsequent treatments.

After pre-treatment, final filtration and injection of chlorine or acid is necessary.

Filtration

As a guide, the filter orifices should be one seventh the size of the emitter orifices (Table 1). Too coarse a filter will result in frequent emitter blockages and too fine a filter will result in frequent filter blockages. Filter orifice size is specified by the micrometre (or micron) size of the openings or by a mesh number (the number of wires in one inch).

Coarse sand has particles sized 1000 to 500 micron. The recommended filter sizes are 152 to 74 microns or 100 to 200 mesh. Finer particles than this range are very difficult to filter: e.g. fine sand, with particles sized 250 to 100 microns; very fine sand, 100 to 50 microns; silt, 50 to 2 microns; clay, below 2 microns and colloidal clay, below 0.2 microns in size. The finer particles down to the size of silt cannot be filtered, but will settle out in still water. Pre-treatment should be considered if they are present.

Table 1: mesh number and diameter of the orifice for filter materials

Mesh number	Orifice diameter, microns (micrometres)
50	300
80	180
100	152
120	125
150	105
180	89
200	74

- use sand separators ('cyclones') where water supplies (e.g. some bore waters) carry medium to heavy loads of fine sand
- use self-cleaning suction screens where water supplies contain a medium to heavy loading of organic material such as algae. If suction filters cannot be used, place a self cleaning primary mesh filter (50 to 80 mesh) in the discharge upstream of the secondary filters.
- use media filters and screen filters where water supplies contain medium to high concentrations of organic matter and medium to high system flow rates are required. Media filters are also recommended where supplies carry medium to heavy loading of silt or clay in suspensions
- where media filters are used, always place a screen or disc filter of about 80 to 100 mesh downstream to collect the particles of sand that are invariably dislodged from the media filter.

Where heavily contaminated water supplies need extensive filtration systems, pre-treat the water to remove medium to high loads of sand, silt or clay. This will reduce some of the burden on the filtration system. The additional costs involved may be offset by the savings in filtration equipment needed, especially where organic content is low. The removal of abrasive debris by pre-settlement also reduces wear in pumps and valves.

Install filters in sufficient size and numbers such that the head loss through each filter bank (when clean) is no more than 0.5 metres (50 kPa) for screen, mesh or ring filters, and 1.0 m (10 kPa) for media filters.

Backwash or clean filters when the head loss through any filter bank doubles. Less frequent cleaning or backwashing leads to material being imbedded in filter orifices and not being removed by normal backwashing or cleaning, to inefficient filtration, and to possible damage to the filter screen or medium.

Media filters also have certain criteria regarding maximum flow per unit area, media graduation and backwashing flows. 'These must be adhered to for efficient operation.

For very dirty water supplies, hydrocyclones are available for separating grit from water. Mesh filters can be made to 325 mesh, giving an opening size of 44 microns. Sand filters can use a finer gravel and prevent some colloidal clay getting into the system. Automatic back flushing of filters may be desirable in areas of heavy algae or silt contamination.

Information contained in this sheet has been sourced from Agriculture WA, the Hardie Micro-irrigation Design Manual *by M Boswell,* Fertigation *by C Burt, K O'Connor and T Ruehr or the Netafim Australia Drip Irrigation Maintenance Manual and is gratefully acknowledged. The figure is from the Amiad Irrigation Product Catalogue.*

For more details contact Growcom on 07 3620 3844.

Table 2: Filter combinations for various levels of contamination and flow rates

Solids concentration* inorganic	Solids concentration* organic	Flow rates (L/s)	Recommended filters, in order of placement**
L	L	All	A
L	M or H	Up to 12	B+A
L	M or H	More than 12	B+D+A
M or H	L	All	C+A
M or H	M or H	Less than 3	B+C+A
M or H	M or H	3 or more	B+C+D+A

** L = less than 5 mg/L solids; M = 5 to 50 mg/L; H = more than 50 mg/L*

*** A = screen or disc filter; B = suction filter (screen); C = sand separator; D = media filter*

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