



Micro Irrigation System Maintenance

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Introduction

The life and reliability of a micro irrigation system is not unlike most machinery in that it usually depends upon the quality of the product and a regular routine maintenance program.

For more than thirty-seven years Netafim have researched and developed micro irrigation systems throughout the world. Netafim through its staff of field agronomists, back up their product range with service and advice.

The greatest enemy of a micro irrigation system is blockage. Blockages reduce the irrigation efficiency and uniformity resulting in a reduction in crop value. Water quality varies from area to area and during the season; the following article needs to be considered, along with local experience.

The maintenance of a system really comes back to three main areas.

1. System Design
2. Routine Management practices
3. Chemical injection

System Design

Often overlooked from a practical maintenance perspective, a good design can make a big difference in the operation and maintenance of a micro irrigation system.

Correct selection of the filtration unit is very important, as it will have to protect the emitters from foreign matter that would otherwise cause blockages. For drip and micro irrigation systems Netafim recommend the use of main filters that give you depth of filtration. Gravel or disc filters are generally regarded as providing you with the best form of system protection. Screen filters are used with better quality water or as back up or check filters.

Netafim also recommend the use of backup field filters, especially when there is substantial distance between the filtration system and the block to be watered. These backup filters should be placed at the valve head of every block. Clay and fine organic matter can pass through filtration systems and group together downstream, where they can be deposited on the walls of pipes to eventually cause blockages,

Backup filters are also very good insurance if there is any sort of system malfunction, especially with the main filtration unit, or if breaks in the main occur.

Flushing points for mains and sub-mains need to be provided.

Flushing valves at the ends of laterals are recommended. Netafim markets a variety of line flushing valves, one of these will release approximately 1½ litres of water at the start and completion of each irrigation cycle. This eliminates the need for regular manual line flushing.



Correct emitter selection is also a critical decision; the numerous types of emitters available can be very confusing. In the case of drippers look for an emitter with a good turbulent flow path design; these have been proven over the years to be the best in blockage resistance. The turbulent flow path is the most efficient means of regulating the flow rate from the emitter while allowing solids to stay in suspension and pass harmlessly through the labyrinth. With sprinklers regulated units provide optimum uniformity and blocking resistance. Basically it is a case of "You Get What You Pay For".

Pressures & Blockages

Usually blockages occur at the low pressure zones in a micro irrigation system. Eg it is recommended to operate Netafim button drippers at a minimum pressure of 10m (14.5 psi) to ensure long life of the system. The pressure will ensure that small particles that are designed to pass through the main filter, check filter and dripper filter and labyrinth will be kept in suspension and pass safely out on to the ground. If the pressures get too low for any length of time it will allow particles to settle out in the dripper passage, and blockages will occur.

A completely blocked dripper can be cleared by tapping firmly with a hard rounded object eg a dessert spoon, while the system is pressurized (at 10m or 14.5 psi), until the water starts to flow.

However, regular maintenance (flushing of the main line, sub mains and laterals) and ensuring the minimum pressure in the system is kept to above 10m will prevent this scenario.

Ensure you have numerous pressure check points throughout your system and be aware of the pressures in your system at all times at

- ◆ The pump
- ◆ Before and after your main filter (a pressure differential across your filter of 5m (8psi) tells you the filter is dirty! Clean it immediately.
- ◆ Upstream and Downstream ports of section valves
- ◆ Start and ends of laterals
- ◆ Lowest and highest emitters

Routine Management practices

Filtration systems require periodic inspection and maintenance. All filters should be checked and cleaned at the beginning and end of each season.

Gravel filters need to be checked to ensure that sufficient time is allowed for back washing and that the back wash water appears clean at the end of a cycle. Refer to the manufacturers' specifications for back wash flows and times. At the commencement of each season the media should be checked to ensure that it is coarse, clean and sharp. Clean with sodium hypochlorite or replace as necessary.

With *Automatic Disc filters* (eg ARKAL Spinklin®) inspect and clean the hydraulic command filter. Inspect filter discs - if necessary remove and wash with pressurised water. In case of slime or carbonate build up, chemical washing with acid or chlorine is recommended – refer to manufacturer's guidelines.



Screen Filters if fitted, should be checked continually. Remove the screen and check for punch holes or other problems, also examine the screen for signs of corrosion.

Back up filters need to be inspected and cleaned at the beginning and end of each season. *Control valves and pressure reducing valves* should be checked at the same time for operation and correct pressure settings.

Regularly check the block and valve flows by means of the *water meter* – see how flows compare to Day One readings. Lower flows suggest blockages in the emitters – flushing of the system is called for. Higher flows suggest breaks in the pipe or fittings that have come adrift.

Flush the *mains and sub-mains* ensuring that there is a good pressure and velocity to enable cleaning of the internal pipe. A high velocity is required to ensure an adequate cleaning action.

Lateral flushing should be carried out at the beginning and end of each season at the minimum. Local conditions will dictate the frequency of flushings but frequent lateral flushings is often considered to be one of the most important practices.

Flushing blocks should be smaller than the normal irrigation blocks to ensure good available pressure and velocity.

Chemical Injection

Remember Safety First when working with chemicals!

Wear safety clothing such as eyeglasses, gloves and long sleeved shirts and long trousers. Have a source of clean water close at hand.

Periodically a flushing program in the system may not necessarily clean the emitters to their Day One level. It may be necessary to carry out chemical maintenance.

There are two main types of chemicals commonly used in the maintenance of irrigation systems.

- ◆ Acids
- ◆ Chlorine

Acids are used to dissolve deposits of scale such as Carbonates, Hydroxides and Phosphates. Organic matter is not effectively treated by acids and hence the wide use of Chlorine.

Chlorine is a very useful treatment for organic matter such as algae and bacteria. The strong oxidising action of chlorine kills and decomposes organic matter and accumulated slime.

Local conditions and practices will often be the best indicators for the use of chlorine. Keep in mind that chlorine can be detrimental to crops and the environment; because of this we try to keep the use of such treatments to a minimum.

1. Acid Treatment

The injection of acids into an irrigation system is usually on an intermittent basis and not continuous. The most commonly used acids are Hydrochloric, Sulphuric,



Nitric and Phosphoric. These acids have different marketable concentrations, and are of differing valences between types.

Pretreatment flushing

Prior to any acid (or chlorine) treatment it is very important to carry out a thorough flushing of all the mains, sub mains and laterals.

Acid treatment will loosen up a lot of deposited debris within the system and can cause problems down stream, if not flushed beforehand. A thorough flushing will clear much of this material before the acid program commences.

Method

Inject the acid for 10 - 12 min then allow the system to run for another hour.

Acids should be injected after the filtration system.

Concentration

The concentration of acid in the treated water will vary according to the water itself, type of acid, its marketed concentration and valence. It is highly recommended to perform a titration in order to determine how much acid is required to lower the pH to 2. Otherwise the "Rule of Thumb" method calls for 0.6% of acid in the water – this is very high. The titration method will reduce acid use (and cost) to a half or a third.

Type of Acid	Marketed concentration %
Hydrochloric	33
Sulphuric	70
Nitric	60
Phosphoric	85

Caution

Acids are very corrosive to steel, cement and aluminium. Only acid resistant components should be used in the injection system. Proper back flow prevention needs to be installed.

Acids can cause burns to skin and blindness to eyes. Protective clothing should be used, **and any** contact with the skin should be washed off immediately.

Always add acid to water – **never** add water to acid.

2. Chlorine Treatment

Chlorine is useful in preventing the blocking of drippers by organic matter, the cleaning of systems from organic sediments and improving filtration efficiency.

Chlorine concentration decreases with time and the distance from the injection point. The lowest concentration will then be found at the furthest emitter. If chlorination is being used to improve the efficiency of the filtration system, then the injection point should be immediately before the filtration unit.

The presence of Ammonium or Urea in the irrigation water should be avoided as this reduces the efficiency of the chlorination process.



Types of Chlorine	Form	Marketed concentration % Cl
Sodium Hypochlorite	Liquid	10
Calcium Hypochlorite	Solid	50 - 70
Gaseous Chlorine	Gas	100

Sodium Hypochlorite is often used through the fertiliser injectors used by the grower. Chlorine gas, liquefied in pressurised steel containers is the most economical method of injection although the cost of injection equipment is very high.

There are 3 main chlorination methods.

Continuous Chlorination

Intermittent Chlorination

Super Chlorination

Continuous Chlorination

This method is employed where a serious algal or bacterial problem is encountered. Chlorine is injected at a low rate but throughout the whole irrigation period. A simple swimming pool test kit is used to test the last dripper in the system, and a level of 0,5 ppm of available chlorine is desired - the injection rate needs to be adjusted until the desired level is achieved. Netafim does not recommend this method.

Intermittent Chlorination

An interval of 3 to 14 days between chlorination is most common. Tests in Israel on effluent water have shown that intervals of 3 to 5 days to be the most effective. If regular preventative injection is carried out, then a rate of 10 ppm at the system head and 1 ppm at the last emitter is required.

If the system needs to be cleaned then 15 ppm at the system head and 3 ppm at the last emitter is required. This is the preferred method.

Super Chlorination

Super chlorination is used when a serious algal or bacterial slime problem threatens the system's integrity. Concentrations of 100 ppm or higher of chlorine are injected into the system and left for 24 hours. The whole system is then flushed thoroughly with clean water.

*Care needs to be taken when such high concentrations of chlorine are used, as they can be detrimental to plant tissue.



Calculation of concentration

The following formula will help in injecting the required dosages

$$q = (C1 \times Q) / (C0 \times 10)$$

Where q discharge of injected chlorine solution (litres per hour)
 C0 %age of active chlorine in injected solution (%)
 C1 desired concentration in the system (ppm)
 Q discharge of the treated system (m³/hour)

Example Q = 125 m³/hour
 C0 = 10% (Sodium Hypochlorite)
 C1 = 8 ppm

Calculation $q = (8 \times 125) / (10 \times 10) = 10$ litres per hour of Sodium Hypochlorite

Caution

Chlorine solutions are dangerous to humans and animals.

Comply with all manufacturers recommendations.

Contact between chlorine and acid and fertilisers produces explosions.

Summary and Conclusion

Maintenance is simple and easy, though often neglected. It is cost effective and will save you money, heartache and time. For more detailed information contact your Netafim dealer or local Netafim representative.