

***NAANDAN Drip Irrigation
Systems***

***Management and Maintenance
Guide***

NaanDan's drip irrigation systems are reliable, durable systems which, with proper care, will serve for many years. Meticulous measures have been taken to ensure the quality of the dripline and accessories that protect the drip system and ensure its maximum efficiency. NaanDan's driplines are manufactured with precision, being subject to strict quality control. Following these instructions carefully will afford you trouble-free service from your dripline systems for many years to come. Make sure your system is installed according to the recommendations of NaanDan's design engineers. Use only NaanTIF fittings and accessories.

Filtration

The filter is the core of the system. Keeping it serviceable and clean will prolong the life of the drip system.

1. Examine screens and seams to ensure that they are undamaged..
2. Ensure proper tightness between the screen, cover and body of the filter, in order to prevent lateral water leaks. If using a disc type filter, ensure the disc assembly is properly tightened.
3. Working with a partially clogged filter is detrimental to both the filter and the quality of filtration. When the pressure differential reaches approximately 5 meters, the system should be flushed and cleaned.
4. Avoid entry of dirt into the pipe when the filter is opened for cleaning.
5. Flush the filter before each irrigation. If the filter is very dirty, clean more frequently. Automatic back-flushing may be appropriate.

Gravel Filters:

- Rinse from the back with open top cover. The rinsing should be done under controlled pressure to avoid gravel escape. For removal of aggregates and algae, fill container with chlorine and allow to soak for 24 hours. After rinsing, pour off the water and leave the filter in a dry and ventilated place.
- Regular Maintenance: Greasing of screws and color repairs to avoid rusting.

Flushing the Mainline and Drip Laterals:

- During the installation process and before connecting the drip laterals, flush the main and submain lines. In case of failure and/or burst in the main or submain pipe, it is recommended to flush the dirt from lines by

releasing the ends of the main & submain lines and flushing them for at least 10 minutes.

- Filtration does not prevent the penetration of very small suspended particles and water soluble matter. In the course of time (depending on the quality of the water), a layer of sediment and/or organic matter settles in the main line and drip laterals. The end of the drip laterals experience the greatest accumulation of sediment. It is recommended to carry out the following simple but important steps:
 - a) Flush 2-4 weeks after initial operation; the amount of dirt in the flushed-out water will indicate when the next flushing is due.
Rule of thumb: Flush three times per season when irrigating with clean water, and at least once every fourth operation when irrigating with dirty water.
 - b) The main pipe and drip laterals should be flushed at the end of the season, before storage, and at the beginning of the season.

Flushing Procedure:

- a) Open ends of main pipe (conducting lines and distributors) and flush with water for two (2) minutes.
- b) Close the end of the open main pipe and start flushing the drip laterals gradually, plot after plot. Flushing time should be at least two minutes.
- c) Close the ends of the drip laterals in consecutive order. After closing, check the serviceability of the dripper according to the wet ring surrounding it.

Regulation:

The task of the system's regulator is to maintain a steady output pressure at the flow decline (after the appliance), according to the designer's requirement. This guarantees an even distribution of water throughout the field.

Operating the system under conditions of controlled pressure according to the manufacturer's recommendations guarantees faultless use of the equipment for many years.

Chlorinating:

When the source of irrigation water is a dam, river, irrigation channel, etc., that contains organic matter (algae, bacterial slime, etc.) it is highly recommended to treat the water with chlorine. Chlorine is an oxidizing agent which kills bacteria, algae and other organic matter, and prevents build up.

The most common chlorine compounds are sodium hypochlorite (liquid) and calcium hypochlorite (solid). Sodium hypochlorite (as 10% chlorine) has been used for years as a dairy sanitizer, is relatively safe and easier to use.

There are three main chlorine application methods:

- a) Continuous treatment
- b) Superchlorination
- c) Intermittent treatment

a) Continuous Treatment:

Continuous treatment of the irrigation water is probably the best and in the long run, simplest method of avoiding blockage problems in drip irrigation. The aim is to treat the water all the time to keep the system (filters, laterals, drippers) clean from organic material.

The required concentration will vary according to the water quality. By trial and error, the injection rate must be adjusted so that 1 ppm of chlorine is detectable at the end of the furthest lateral from the pump. The common concentration to begin with is 5-10 ppm (Mg/l).

A chlorine test kit (e.g. swimming pool test kit) may be used to detect the presence of chlorine.

Example:

- Pump discharge: 100 cubic m/hr
- Irrigation time: 15 hr.
- Rate of chlorine required: 5 ppm (mg/l)
- 1 ppm = 1 gram/cub. metre (1000 liters)
- 5 ppm = 500 gram chlorine/hr
= 5000 gram as 10% hypochlorite/hr
- Total hypochlorite required = 15 hr x 5000 gram
= 75 gr.

b) Superchlorination:

When the irrigation system has operated for some time and there is an accumulation of organic matter inside the main line, a superchlorination is needed to dissolve the organic slime.

Chlorine is normally injected at a concentration of 500 ppm. The system is shut down and left for up to 24 hours. The system is then flushed step-by-step, first mainline, then submains and finally through the end of the laterals. Do not flush directly through the drip laterals as this may cause mainline sediment to clog the emitters in the dripline.

c) Intermittent Treatment:

Although the filter system operates properly, micro-organisms such as algae, fungi and bacteria may pass through it into the irrigation system. To prevent a build-up of this organic matter in the lateral, periodic sterilizing by chlorination will be needed. 10-20 ppm for 30 minutes at the



end of an irrigation is recommended. The chlorine is left in the pipes until the next irrigation.

General Instructions:

- a) Inject chlorine upstream of the filter to prevent growth of bacteria or algae in the filter. Precipitates caused by the injection of chlorine can be filtered.
- b) At the end of the injection, it may be necessary to continue irrigation for a short time to wash the chlorine out of the pump and associated valves as it is corrosive to metal.
- c) Sodium hypochlorite must be stored in a corrosion resistant tank.
- d) When using chemical solutions in an irrigation system, a suitable backflow device is required to prevent reversed flow to the water service.

Injection System:

A fertilizer pump such as the Amiad water powered injector are simple to use and accurate. The rate of injection can be controlled by pressure or by flow regulator. The injector will start and stop with irrigation.

Injection of Acid

Precipitated calcium salts appear as a white film or plating on the inner surface of the drip system. With some waters, precipitated calcium salts will eventually block the drip emitters. Injection of acid is an easy solution.

The procedure with 30% hydrochloric acid (HCl) or other acids of similar concentration is as follows:

Caution: Add acid to water. Never add water to acid!

- a) Flush all submains and laterals. It is recommended to divide the irrigated area into small plots and treat each plot individually.
- b) Check the discharge of the system before treatment to compare with treated system.
- c) Dose required: 1 litre per cubic m. discharge of the irrigation system..
- d) Injection method: Use only pumps that are acid resistant (e.g. Amiad fertilizer injection pump).
- e) Test the maximum discharge of the injector pump.
- f) Prepare a solution equal to one tenth (1/10) of the maximum discharge of the injector pump.
- g) Injector should be started with the irrigation system operating.
- h) Check the pH at the furthest lateral with a pH test kit or litmus paper. The required pH is 4.0.
- a) Continue irrigation for 30-60 minutes.

Example:

- Pump discharge: 20 cub. m/hr.
- Max. injector pump discharge: 250 litres/hr.
- Acid required: (1 litre/cub.m): 20 litres
- Total solution required: $250:10=25$ litres
- Water quantity to use: $25-20=5$ litres
- If discharge is higher, use only acid

Caution: Add acid to water. Never add water to acid!

Retrieval and Storage Instructions

The extensive scope of irrigated fields demands updated conveyance methods for dripline, which will ensure satisfactory performance and efficient storage of the valuable equipment. These instructions were prepared bearing in mind our concern for the long-term quality of NaanDan's equipment. Following these instructions will help make the rolling up of dripline more efficient, preventing obstacles and delays and saving time.

Retrieval of dripline using NaanDan's Winder

The winder enables rolling up of drip laterals by one operator. The winder is equipped with a regulator which enables control of the pulling power. There is a substantial difference between the pulling power at the beginning, middle and end of the reel, and suitable operating power must be used accordingly.

Pulling power

NaanTIF 16mm, 20 kg., maximum lateral length 200 meters

NaanTIF 20mm, 30 kg., maximum lateral length 250 meters

Release of Drip Lateral: Before connecting the lateral to the winder, the lateral must be lifted manually to free it from weeds, soil, etc. Move the lateral 2-3 meters to ensure that it can be freely rolled. If the lateral cannot be easily retrieved, it is caught, and must be released manually. (Shake it in several places along the line). The winder must not be used to free trapped laterals!

Pulling power of 25 kg. will stop the winder

If higher power is needed, it is a sign that the drip lateral is trapped and must be released manually. Operation of the reel, changing speed and stopping must be carried out by the operating handle of the winder only! The selector handle on the tractor must be permanently in operation mode. Stopping the reel with the selector handle will damage the winder.

General Instructions

1. Reel in only one lateral length at a time and close off both tubes ends with a plug or by bending and tying up.
2. Pack carefully, layer upon layer and **avoid pressure on the edges of the reel**. Ensure that the dripline is not flattened.
3. When winding, leave 10 cm. at the outer edge of the reel so that the dripline does not touch the soil. The reels sink during storage.
4. It is recommended to store the dripline in an orderly way in a shady place. Store on shelves to keep clean and avoid attack by vermin.

Clear Marking

The year of manufacture and the plot from which the dripline was removed must be marked on the reel. Ensure that you have enough connectors.

Conclusion:

These are instructions for the orderly and correct rolling-up of dripline. Following these instructions step-by-step will ensure that the equipment will be maintained in good condition year after year. Investing time at the end of the season will shorten the time required to lay out the dripline at the beginning of the season, and will make the first irrigation easy.

Laying Out Instructions

1. Enter the row with a tractor and release manually 10-15 meters of dripline from the reel. This will ensure the release of the dripline parallel to the ground and the pressure on the lateral at the beginning of the laying out will be minimal.
2. Start moving gradually and slowly to prevent stretching the laterals.
3. Ensure uniform rotation of the three drums by controlling the speed of the tractor.
4. Brake gradually at the end of the row to avoid damage to the machine.
5. Cut the drip lateral at the end of the row.
6. Leave extra dripline at the end of the row, and take into account that the lateral shrinks 1 meter per 100 meters.
7. When calculating the length of the lateral, take into account paths and entries to the rows that are not straight.

Fertilizing:

Prevent build up of fertilizer residues in the drip system by continuing irrigation for at least one hour after fertilizing. Only recommended soluble fertilizers should be used as other fertilizers may block the system. Recommended fertilizers are:

- * Liquid ammonium nitrate
- * Ammonium sulphate
- * Urea
- * Nitrogenous solution
- * Potassium nitrate, liquid or crystal
- * Potassium chloride
- * Iron chelate
- * Phosphoric acid

Complex Fertilizers:

- * 20-20-20 and other N.P.K (only during the cold hours of the day. solution rate 1:100).
- * 20-0-24 and other N.K.

Always ensure that the fertilizers, pesticides, etc. used will not react with the chemicals in the local irrigation water causing precipitates that may clog the emitters.

Checking the flow rate:

In order to check the condition of the dripline after a few seasons, record the flow rate at the beginning of the first season. Then, after each season, the flow rate can be measured again (at the same pressures and with a clean filter). Should any changes take place, consult NaanDan Irrigation Systems.

Guidelines for the Use of Chlorine In the Drip Irrigation System

Introduction

Dirt components in water, which pass through the filter system, contain many organic components. These components create aggregates that cause filter clogging and may damage the drip irrigation system. This may be prevented by oxidation of the organic components. The most popular oxidizers are those belonging to the halogen group, among which chlorine is the most widely used and least expensive. There are several ways of treatment with chlorine:

- * *Gaseous chlorine*
- * *Chlorine solution.* One of the most widely used solutions is sodium hypochloride.
- * *Solid compounds of chlorine,* such a hypochloritic salt.

Treatment with sodium hypochloritic solution is one of the most popular and widely used methods. This solution is user-friendly and relatively low-priced.

Application

There are two methods of chlorinating:

- * *Permanent chlorinating* - chlorine is injected during irrigation.
- * *Intermittent chlorinating* - chlorine is intermittently injected into the water during irrigation.

In the case of intermittent chlorinating, the dosage is higher than with permanent chlorinating, but the required quantity of chlorine is, in fact, smaller. Chlorine injection may be carried out by means of a fertilizer pump, which simplifies the operation and reduces costs.

The point of injection is generally near the part treated, adjacent to the filter, in case of filtering improvement, or adjacent to the drip irrigation laterals, in case of system cleaning.

In this way, it is possible to reduce the decrease in the free chlorine concentration still remaining in the system, which is caused by discharging processes of chlorine in the water in the flow path.

There are differences in chlorine concentration levels, according to the utilization purposes and the water's purity level.

The concentration for permanent chlorinating is lower by half than the concentration for intermittent chlorinating. The normal concentration for cleaning the drip irrigation system is adjusted in such a way that at the system's end, free chlorine remnant will be obtained, at a level of 3-1 parts per million.

The normal concentration (for intermittent chlorinating) for improving the filtering systems ranges between a level of 2 parts per million to 5 parts per million of free chlorine remnant after the filtering battery, according to the water's characteristics.

In some instances, a higher chlorine level is called for, if there are special problems to be treated. Professional advice and instruction is necessary in these instances.

The calculation of the chlorine level rate is called for if any special problems need to be treated. Professional advice and instruction is necessary in these instances.

The calculation of the rate of chlorine solution supply for injection will be made as follows:

Supply of chlorine solution Per injection liter/hour	=	$\frac{\text{Supply of parcel x desired chlorine concentration}}{\text{Chlorine concentration in the solution (percent) x 10}}$
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Calculation example:

Hourly supply of parcel: 300 m³/h
 Concentration of sodium hypochlorite solution: 10%
 Dilution ratio in storage container: 1:1
 Desired concentration of pure chlorine: 5 parts per million

$$\frac{300 \times 5}{10 \times 5} = 30$$

According to the data, 30 liters of solution will be injected per hour.

General guidelines

- *Chlorine discharge in the storage container*
 The sodium hypochlorite shows limited stability. The concentration of the solution lessens as storage time is prolonged and the higher its concentration in the storage container. Sun radiation and high temperature furthermore accelerate the discharging process. This may be reduced by

relevant storage. The storage container has to be impermeable and protected against radiation. The concentration of the solution in the container should be low, which is achieved by dilution with water. It is recommended to place the container in the shade.

- During chlorine treatment, simultaneous fertilizing should be avoided in order to eliminate possible reactions between the chlorine and the fertilizer.
- A test of the level of free chlorine remnant at the system's end may be carried out by a value customary for swimming pools.
- Care should be taken not to use chlorine solutions producing deposits in the water, such as calcium hypochloride, which might clog the system.
- Should it be necessary to flush the drip irrigation system with chlorine, it is recommended to first open the lateral's ends and to flush without chlorine in order to remove dirt deposits that may have accumulated there.

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