



We have provided this guide to help you operate your system for the longest period of time and with the best possible results. Please read it carefully before installing your system.

### **1. Avoid any mechanical damage**

When you receive the equipment and set it up in the field, do your best to avoid damaging it. Take care not to drive over the pipes when they are being unrolled. Keep all products under cover and out of the elements.

### **2. Match the design map to the field**

Compare the actual field dimensions, topography, number and length of rows with those in any irrigation plan. If modifications are required, they must include additional hydraulic calculations.

### **3. Head control assembly**

Make sure you have a detailed design of the head control assembly. You may need a contractor, plumber and electrician to complete the project.

### **4. Installing main pipelines**

PVC main pipeline (>110 mm) must be at least 1.0 m deep (measured at the top of the pipe when it is in the ground) so that the trench is 1.1-1.5 m deep. If the temperature in the area falls below zero degrees install the main pipe at a depth of 1.5 m to protect it. The backfill should be stone-free. If the soil is sandy, cover the trench after laying every 20 m. It is recommended to cover the pipe every few meters before the final cover.

### **5. Installing sub-main pipelines**

Prepare the trenches. Their location and depth should comply with the plan and specifications. The recommended depth for PE pipes is 50 cm. The recommended depth for PVC pipes (sub-main only) is 70 cm. Distribute pipe sections along the trenches. Make sure the backfill is stone-free. Try to avoid leaving the trenches open overnight. If you must leave trenches open, cover the pipe every few meters and at every outlet when the pipe is inside the trench. If there are chances of rain at night avoid leaving the trenches open at all costs.

### **6. Flushing head control, main and sub-mains**

Flush the head and pipes thoroughly until the water is clear. Be sure to flush out all plastic and rubber cuttings, grit, stones, etc. It is recommended to flush just before the installation of the laterals. Connect the laterals to the sub-mains as soon as possible to prevent the intrusion of insects and dirt. Flush the laterals thoroughly until the water is clear, then immediately install the end plugs.

Note: Flush the laterals in small groups to ensure full flow. Start flushing from upstream (start with the laterals closest to the head) and proceed downstream.

Plug the lateral ends in the same order. Note: Do not leave pipes or connector outlets open for more than a few hours so that no dust or insects enter the system.

## **7. New plantations**

In new plantations, the accurate positioning of the drippers beside the plant is vital in the first 2 to 3 months.

## **8. Start-up**

Check the recommended working pressures for the system. Any deviation from the allowed working pressures may cause dysfunction of the system. Check the approved chemicals for the system (see table on page 8). It is highly recommended to do water analysis for the main mineral components: Ph, EC, Carbonates (CO<sub>3</sub>), Bicarbonate (HCO<sub>3</sub>), Calcium (Ca), Magnesium (Mg), Sodium (Na), Sulphate (SO<sub>4</sub>-2), Phosphate (PO<sub>4</sub>), Iron (Fe), Manganese (Mn), TSS, TDS and water hardness.

Follow the installation and operation manual supplied by the filter manufacturer.

Start the newly-installed filtration system and flush it thoroughly. Wash out the dust and debris from the filters. Use manual operation mode to flush the automatic screen/disc filters. Make sure that the correct valves are open and that all sub-mains and lateral ends are closed. Do not apply excessive pressure. Methodically, start and check one irrigation block at a time. Compare the designed pressures at different points to the actual pressure. Evaluate dripper operation by checking the formation of the wetted areas around them.

Note: It is recommended to log the initial flow rates and pressures at certain points.

Maintaining a log book is very useful in helping you to detect changes and potential problems.

## **9. Installation and Start-up (Filters)**

The filter is the heart of the irrigation system and should therefore receive frequent attention. The filtration system should protect the irrigation system from clogging and erosion of components and should be designed according to the water source and the type of irrigation system installed in the field. The recommended filtration level is expressed in Microns or in Mesh, and is dependent on the type of emitter used. The required filtration levels are specified in the product catalogue pages of the drippers, micro-sprinklers and sprinklers. If there are no recommendations for the emitter you are using, use a filtration level 5 times smaller for sprinklers and 10 times smaller for drippers than the nozzle/outlet of the emitter. Note: The most important trait of a filter is its effective filtration area—not just the filter in-let size!

## **10. Main filtration heads and automatic filters**

Install filters and filtration systems according to the manufacturer's operation and installation manual. Pay special attention to diameter and length of the drain tubes—follow the manufacturer's specifications.

## **11. General instructions for start-up and the beginning of each season**

Ensure that all the electrical connections and hydraulic command tubes are in working order. Install new batteries (for back flush controller). The system's controller DPI should be



adjusted to flushing at P of 0.5 bar (7 psi) as a default. Set the controller to flush according to P, as well as to flush according to time. The common interval is 1-3 hours. Interval is

dependent on water quality. Before the first operation, do a few flushing cycles to wash dirt and debris from the system.

#### **12. Media filters:**

- Ensure the media level meets the manufacturer's specifications. Ensure the media is clean and loose. Ensure the media type corresponds to the manufacturer's specifications.
- During back flush, make sure the back flush flow meets the manufacturer's specifications, and that no media is flushed out of the tanks. Adjust the flow control valve if needed.
- Replace the media every 2 years. Follow manufacturer's instructions for media replacement.

#### **13. Main filtration heads and automatic filters**

Verify that the differential pressure does not exceed 0.5 bar (7 psi).

Check the intervals between flushes. If the interval is less than 1 hour for gravel filter and less than 15 minutes for screen and disc filters, this may indicate that the dirt load is too heavy for the system or that the back flush is ineffective. Follow manufacturer's instructions to correct the problem.

#### **14. General maintenance (filters)**

Follow manufacturer's operation and installation manual for detailed maintenance instructions. Minimum pressure required for automatic or media filtration is at least 30 m (3 Bars).

#### **15. Back-up filters**

Check and clean back-up filters at least once a week and preferably after every irrigation cycle. Check for any damage to the screen element or deformation of the discs in disc filters. Note that clogged back-up filters may indicate a problem in the main filtration station. Clean screen filters with a soft brush. Do not use a metal wire brush. Clean the disc filters by releasing the discs inside the element and washing the discs. Do not release the discs all the way. This will prevent them from coming loose.

If the discs have accumulated carbonate sediments, you may need to clean with acid. Follow the manufacturer's instructions for cleaning.

#### **16. Preparation for the off-season (filters)**

Drain all filters. Check the interior components, media, screens and discs for wear, damage, corrosion and other signs of deterioration. Check seals, gaskets and valve seats for wear. Lubricate bolts and axles. Paint or renew damaged protective coating. Disconnect irrigation controller power source or batteries. Check the electrical wire and hydraulic command tubing for damage. Service the filtration system and valves, according to the manufacturer's recommendations. The control valves enable automatic operation of the irrigation system, as well as regulation of pressures according to the hydraulic design.

## 17. Start-up

Verify that the tubes and control components are undamaged before opening the water. Connect the solenoid's electric wires and pressure tubes, according to the design. For

pressure-reducing valves, release the pilot adjustment screw all the way before opening the water, and then slowly tighten it until the pressure reaches the required level. This will prevent high pressure damage caused by inadequate pilot set-point at first operation. Note that the valves might be pre-adjusted, according to the hydraulic design. Verify that the pressure levels at the various valves correspond to the hydraulic design. Adjust, if necessary.

## 18. Winterization

In areas subject to low winter temperatures (below 0°Celsius), it is vital to drain the water from the system to prevent water from freezing inside and breaking the components. Make sure that there is no water left in the valves, control chamber, tubes, pumps, filters and air valves. When water freezes inside the system, it increases its volume while turning into ice, and therefore breaks any system component that contains it.

## 19. Pipes

Check that the grade of the pipe matches the designed pressure of the system.

Do not cover PVC with concrete! On PVC pipes, use the correct amount of glue as recommended by the glue manufacturer. **Do not** over use solvent cements as this will weaken the joints not strengthen it. Ensure you are using the correct type of glue as recommended.

On PE pipes check for kinks and marks. Cut out any areas of concern and repair with a socket.

Drilled LDPE pipe has a limited timespan for being coiled. In general, no more than two weeks is recommended for the pipe to be coiled up prior to use. In addition, the pipes must be stored out of direct sunlight at all times.

*Never* use detergents on LDPE pipes to ease the fitting of push fittings. These degrade the pipes more quickly and result in splits.

## 20. Pressure regulation

All systems must be designed and operated with the correct pressure regulation control and protection to ensure maximum system efficiency. Using manual valves *does not* constitute pressure regulation. The manufacturers' recommendations and the strict maximum ratio of 3:1 reduction must be adhered to. Any pressure bounce must be reported and corrected caused by regulators reacting against each other. At all times the pressure must not exceed the maximum manufacturers' recommendations on any part of the system.

## 21. Air valves

The correct type of air and vacuum valves should be installed in the appropriate place on the system. This will reduce any potential water hammer and pressure surge, whilst avoiding 'suck back' in a vacuum situation.

## 22. Pressure gauges

It is essential to have all areas of the system covered with either permanent fixed gauges or portable gauge points so regular pressure checking can be taken. All irrigation systems –

even pressure regulated and CNL systems – can be effected by pressure in some way so it is vital that regular measurements are logged and referred to during the life of the system.

### MAINTENANCE FOR DRIP IRRIGATION

#### a. Acid treatment

Application of acid is recommended as part of a routine maintenance procedure. Acid injection reduces clogging caused by low solubility salts, such as calcium carbonate. Please consult the manufacturer's instructions

#### b. Chlorination

Chlorine injection reduces clogging caused by organic materials. It is recommended as an intermittent treatment or as an on-going preventive treatment in systems that use water that contains a high concentration of organic materials. Please consult the manufacturer's instructions

#### c. Lateral flushing

Lateral flushing is the most important maintenance practice. Flush the laterals before and after each irrigation season. It is recommended to flush laterals periodically throughout the season depending on water quality. Lateral flushing flushes out debris that accumulates in the drip line, which can eventually clog the dripper's water inlet. Flushing is done by opening the lateral end for 1-2 minutes until the water that comes out of the lateral is clear.

Installing a lateral flush valve will reduce costs of manual labour and guarantees frequent flushing. High-pressure head and flow velocity of flushing are important factors in removing sediments. For best results, use the highest operating pressure allowed.

Recommended minimum flushing velocities:

Mainline: 1 m/s Sub-main: 1m/s

Laterals: 0.6 m/s or 16mm - 400l/hr, 20mm - 700l/hr at 1.0 bar at edge of drip line

#### **Table 1: Chemicals that CAN be injected into drip irrigation systems and will not affect the future performance of the dripper. (Check up to date laws regarding use and handling).**

Nitrogen Urea, Ammonium Nitrate, Nitrate acid

Phosphorus

Phosphorus acid, Monoammonium

Phosphate, Ammonium Phosphate

Potassium Potassium Nitrate, Potassium Chloride

Micro-elements Chelates and Boric acid

Polyphosphate

Red Potassium Chloride

**d. Safety measures**

Only use acid-resistant containers for the cleaning process. Use adequate body protection in order to prevent any direct contact with the acid solution. Purchase the acid only from official suppliers. Use the acid according to their official MSDS (material safety data sheet). Tapered connection must be unassembled before the acid cleaning treatment. The cleaning solution is Hydrochloric acid (HCl), diluted with water. Note that the acid should be poured into the water.

**e. Plugs**

When using plugs for drip irrigation, installation must be done under water pressure when the drip lines are full. It is highly recommended to first check the plugs on a few drippers to make sure that the plugs fit the dripper and that there are no leaks.

**f. Other measures**

- Regularly check the performance of your whole system using the spreadsheets and test procedures from NDJ. This will give a performance chart over time which will allow blocking to be noticed sooner and thus may allow for remedial actions to be taken.
- Any blocked drippers should be kept. Cut open and inspect what is causing the blockage. Discuss with your supplier the correct actions as necessary regarding filtration or maintenance procedures.
- Drain down the system thoroughly in winter time. Whilst NDJ drippers are highly resistant to any frost damage, any plastics can suffer if subjected to the closed force of ice build-up. Remember that water is at its most expansive at just below freezing.
- Check the slopes on the system of laterals and ensure that the slope is less than the closing pressure of the dripper being used. The use of lateral LPDs allows greater slopes to be managed.

**MAINTENANCE FOR SPRINKLER IRRIGATION SYSTEMS**

NaanDanJain micro-sprinklers should be installed and operated according to the recommendations in the relevant catalogues. Find the filtration requirements for your specific product in the NDJ catalogue or NDJ web catalogue (NaanDanJain.com > web catalogue). However, with time, lime deposits might occur. This document will guide you on how to remove it.

**a. Flow Rate Check**

Once a year, perform a random check of a few micro-sprinklers at the recommended working pressures, and compare the actual flow rate in the field to the values that appear in the catalogue including the permitted tolerance.

Non-regulated micro sprinklers:



1. Low flow rates – may indicate possible clogging in the nozzle, at the entrance to the micro-sprinkler and in the filters, so these should be checked.
2. High flow rates – may indicate wear and tear in the nozzle, which should then be replaced.

Regulated micro-sprinklers:

1. Low flow rates – may indicate possible clogging in the nozzle, at the entrance to the micro-sprinkler and in the filters. These should be checked.
2. High flow rates
  - 2.1 Open the micro-sprinkler to verify that the disc is in place and positioned freely. Clean the disc and wash the area, and then perform another flow rate check.
  - 2.2 If the flow rate remains higher than the permitted maximum rate it may indicate a decrease in the quality of the disc which must then be replaced.

#### **b. Cleaning instructions for removing lime deposits**

##### **Safety measures:**

Only use acid-resistant containers for the cleaning process. Use adequate body protection in order to prevent any direct contact with the acid solution.

Purchase the acid only from official suppliers. Use the acid according to their official MSDS (material safety data sheet). Tapered connection must be unassembled before the acid cleaning treatment. The cleaning solution is water, diluted with hydrochloric acid (HCl). Note that the acid should be poured into the water. Please consult the manufacturer's instructions

##### **c. Cleaning process**

The micro-sprinklers/foggers should be immersed for 3 hours and then properly washed with water. The process can be repeated up to 4 times (a maximum of 12 hours) if the first cleaning cycle did not clean the sprinklers perfectly.

**Warning:** You can damage the micro-sprinklers with too high a concentration of acid. Make sure to follow the instructions exactly, or first try on small number of micro-sprinklers.

##### **d. Basic operation guidelines**

Avoid irrigation in windy conditions and do not irrigate when wind speed is higher than 2 m/s. Check that you are working at the recommended pressures. Verify that you are using the appropriate sprinkler and stand. Make sure the sprinkler is installed about 60 cm above the crop. Make sure that all stands/risers are vertical. To prevent water run-off, match the duration of irrigation and the precipitation rate to your soil. Make sure all nozzles are clean and free of dirt or any other particles that may affect performance.

##### **e. Preventing wear and tear**

Check and tear seals and gaskets, and replace if necessary. Check and tear nozzles, and replace if necessary. Every 0.2 mm increase in the diameter of the nozzle orifice (due to wear and tear) contributes to a 10% increase in flow rate. This fact may reduce distribution uniformity and have a negative effect on pump operation.

**f. Filtration:**

Read the filtration requirements written in the NDJ catalogue or NDJ web catalogue ([NaanDanJain.com](http://NaanDanJain.com) > web catalogue) for your specific product.

The recommendation filtration level refers to the nozzle size. The ratio between the nozzle diameter and the filtration degree is 1:5. For example, if the nozzle size is 5 mm, the filter

holes should be maximum 1 mm. In wells or sources of water that are high in sand content it is highly recommended to install a sand separator— hydro-cyclone or automatic filter. Sand will cause faster wear and tear of the nozzles and may cause the sprinkler to leak. Never use oil or grease to lubricate sprinklers.

**g. Lifespan**

Remember that neither sprinklers nor drippers last forever. Their life span depends so much on the maintenance programme, the filtration system and overall system design and the amount and type of use plus the quality of water. In general, an average can be assumed of 5 years operational life. After this time, even well maintained systems *can* start to show a fall-off in performance. This can only be gauged with regular output and uniformity testing.