WELCOME

PRESENTATION

ON

FERTIGATION EQUIPMENT

By

Jain Irrigation Systems Ltd.
Philosophy

Mission
Leave this world better than you found it.

Vision
Establish leadership in whatever we do at home & abroad.

Credo
Serve & strive through strain & stress; do your noblest, that’s success.

Goal
Achieve continued growth through sustained innovation for total customer satisfaction and fair return to all other stakeholders. Meet this objective by producing quality products at optimum cost and marketing them at reasonable prices.

Guiding Principle
Toil and sweat to manage our resources of men, material and money in an integrated, efficient and economic manner. Earn profit, keeping in view of commitment to social responsibility and environmental concerns.

Quality Perspective
Make quality a way of life

Work Culture
Experience: ‘Work is life, Life is Work’
Born in a farmer’s family in the tiny village, Vakod, Dist. Jalgaon.

Began in 1963 with Rs. 7,000, a saving of 3 generations.

Traded in agricultural inputs and equipments till 1978.

Acquired a sick unit for Rs. 30 lacs (3 millions) in 1978.

Utilized the unit to make exportable Papain in 1978.

Started PVC Pipe plant in 1980.

Pioneered Micro Irrigation in 1987-88.


Ventured into large scale Agro-Food Processing in 1994.

Toiled to create a world class enterprise with a distinct work culture.
## Product Divisions

<table>
<thead>
<tr>
<th>Division</th>
<th>Applications</th>
</tr>
</thead>
</table>
| Agriculture Division | - Agricultural R&D  
                      - Farming  
                      - Tissue Culture  
                      - Vermi-compost  
                      - Organic Manure  
                      - Bio Gas |
| MIS Division   | - Drip Irrigation  
                     - Sub soil Irrigation  
                     - Sprinkler Irrigation |
| Pipe Division   | - PVC Pipes & Fittings  
                      - PE Pipes & Fittings  
                      - Well Casing & Screen Pipes |
| Sheet Division  | - PVC Free Foam  
                      - PVC Celuka  
                      - PVC Rigid  
                      - PC Compact  
                      - PC Corrugated |
| Food Division   | - Onion & Vegetables Dehydration  
                      - Fruit Puree, Pulp and Concentrate.  
                      - IQF |
| Solar Division  | - Solar Water Heating  
                      - Solar Air Dryer  
                      - Solar Lighting  
                      - Solar Inverter |

**Applications:**
- **Agriculture**
  - Open Field Irrigation  
  - Control Irrigation  
  - Landscape
- **Horticulture**
- **Nursery**
- **Domestic Gas**
- **Control Irrigation**
- **Landscape**
- **Drinking Water**
  - Farm Irrigation  
  - Plumbing  
  - Sewerage  
  - Effluents  
  - Cable Ducting  
  - Gas  
  - Dust suppression
- **Advertising**
  - Interior Designs  
  - Industrial  
  - Building & Construction  
  - Marine Industry  
  - Transport  
  - Greenhouse  
  - Stadium Roofing
- **Processed Food**
  - Soups  
  - Salad Dressing  
  - Juice  
  - Baby food  
  - Ice cream  
  - Confectionary
- **Domestic**
- **Industrial**
Production Facilities

Jain Plastic Park
Micro Irrigation, Plastic Piping & Sheet

Jain Agri Park
Agri R&D cum Demo Farm & Tissue Culture Lab

Jain Food Park
Fruit Processing Plant

Jain Food Park
Onion and Vegetable Dehydration Plant
Production Facilities

Kondamadugu, Andhra Pradesh
Fruit Processing Plant

Baroda, Gujarat
Onion & Vegetable Processing Plant

Coimbatore, Tamilnadu
Onion & Vegetable Processing Plant

Chittor, Andhra Pradesh
Fruit Processing Plant
Production Facilities, USA

Chapin Watermatics Inc., Watertown, NY 13601 USA

NuCedar Mills, Inc., Chicopee MA 01022 USA

Cascade Specialities Inc., Boardman, OR 97818 USA

Aquarius Inc., USA

Drip Irrigation Company

Building Product Company

Dehydration Company

Drip Irrigation Company
Production Facilities, Israel

Naan Dan Jain Irrigation Systems,
<table>
<thead>
<tr>
<th>A] Pre-sale counseling</th>
<th>B] Survey and Sampling</th>
<th>C] Designing the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Understanding the farmer’s need</td>
<td>• Detail engineering survey.</td>
<td>• Interpretations of soil water and agro-climatic data.</td>
</tr>
<tr>
<td>and preferences.</td>
<td>• Soil &amp; water analysis.</td>
<td>• Choice of right component and designing the system factoring in the crop, soil, water, and climatic data.</td>
</tr>
<tr>
<td>• Providing broad advices to the</td>
<td>• Agro-climatic data collection.</td>
<td></td>
</tr>
<tr>
<td>customer on cultivation choices.</td>
<td>• Water source assessment.</td>
<td></td>
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<tr>
<td></td>
<td>• Collection of crop data.</td>
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<td></td>
<td></td>
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<tr>
<td>D] Installation of the system and</td>
<td>E] Agronomical advisory and extension service</td>
<td>F] R&amp;D Services</td>
</tr>
<tr>
<td>support to the farmer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Installation of the system in the</td>
<td>• Providing complete irrigation &amp; fertigation schedule.</td>
<td>• Farm R&amp;D</td>
</tr>
<tr>
<td>farmer’s field.</td>
<td>• Providing complete package of practice for cultivation.</td>
<td>• Lab R&amp;D</td>
</tr>
<tr>
<td>• Training of the farmer to use the</td>
<td>• Repeat visits by the company’s agronomists for advising the farmer from time to time.</td>
<td>• On-field trials</td>
</tr>
<tr>
<td>system properly.</td>
<td>• Seminars on productivity increase for specific crops by experts from JISL.</td>
<td>• Publication of literatures, leaflets and catalogues.</td>
</tr>
<tr>
<td>• After sales service.</td>
<td></td>
<td>• Publication of Manuals containing good agricultural practices.</td>
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</tbody>
</table>
Applications: • Agriculture, • Horticulture, • Nursery, • Domestic Gas
Strong Brand Equity

- Jain® Drip
- Jain® Sprinklers
- Jain™ Tissue-Culture
- Jain Pipes
- Jain PE Pipes
- Jain Solar
- Jain Jyot
- FarmFresh®
- Cascade Specialties™
- EX-CEL™
- NuCedar Mills
- NAAN DAN JAIN IRRIGATION
- Chapin WATERMATIC INC.
- Aquarius Brands Incorporated™
- API
- PEPCO

More Crop Per Drop®
Indian Network:

Worldwide Network:

<table>
<thead>
<tr>
<th></th>
<th>Global</th>
<th>India</th>
<th>Rest of World</th>
<th>Total</th>
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<tbody>
<tr>
<td>Plants</td>
<td>8</td>
<td>14</td>
<td></td>
<td>22</td>
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<tr>
<td>Offices</td>
<td>58</td>
<td></td>
<td>6</td>
<td>64</td>
</tr>
<tr>
<td>Depots</td>
<td>25</td>
<td></td>
<td>3</td>
<td>28</td>
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<tr>
<td>Agronomist</td>
<td>455</td>
<td></td>
<td>30</td>
<td>485</td>
</tr>
<tr>
<td>Dealers and Distributors</td>
<td>3,748</td>
<td></td>
<td>2,952</td>
<td>6700</td>
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</tbody>
</table>

The above figures are for all company products
Awards & Accolades

Till date we have received 36 State, 126 National and 4 International Awards for, R&D, Quality, Innovative Product development, Fair Business Practices and outstanding Exports.

The Nation honoured our Founder Chairman, Shri B.H. Jain with 'Padma Shri' for services in the Science & Technology sector — (Agriculture Science and Water Technology).

The internationally prestigious “Crawford Reid Memorial” Award instituted by Irrigation Association, USA was also bestowed on our Chairman for “Significant Contribution to the Irrigation Industry outside the United States”. He has been conferred by “Doctor of Letters” by NMU, Jalgaon and “Doctor of Science” by KKV Dapoli, MPUAT Udaipur & TNAU Coimbatore. Recently he received Yeshwantrao Chavan Foundation Award for noticeable contribution in the field of Agriculture-Industry.
Awards we give

- Jain – INCID Micro Irrigation Award – Micro Irrigation
- Padmashree Late Dr. Appasaheb Pawar Modern Agri Hi-Tech Award – Hi Tech Agri.
- Best Banana Producer Award – Banana Yield
- Jain Nedungadu Agri Engg. Award – Soil Conservation
- Godavari Drawing and Sculpture Award – Fine Arts
- Jamnaben Social Work Award – Gandhian Philosophy
- Rural Poetess Bahinabai Award – Rural Poetry
- Nature Poet Balkavi Thombre Award – New Generation Poet
- Rural Poet Mahanor Award – Rural Literature
- Hiralalji Jain Talent Award – Educational
- Gaurabai Hi-Tech Banana Award – Hi-Tech Banana
- Hira Gold Medal – Educational
- Gauri Gold Medal - Educational
Jain Integrated Model

The Jain Self Sustaining Agri Cycle

- **Sustainable Environment**
  - Renewable Energy
  - Bio Energy
  - Solar Energy
  - Watershed Planning
  - Water harvesting
  - Soil/ Water Conservation
  - Water Source Development
  - Waste Land Development

- **Hi-tech Agri Inputs**
  - Increased Productivity
  - Product Development

- **Better Productivity**
  - Cost Savings
  - Drip & Sprinkler Irrigation
  - Tissue Culture Plants
  - Bio Fertilisers
  - Green houses
  - PVC Piping Systems
  - HDPE Piping Systems

- **Soil**
  - Adequate & Timely
  - Repayment & Security

- **Water**
  - Knowledge
  - Feedback

- **Manpower**
  - R&D Agronomic Support

- **Markets**
  - Assured Price
  - Quality Goods

- **Assured Price**
  - More Investments
  - More Profits
  - Contract Farming
  - Dehydrated Onion & Vegetable Processed Fruit

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- **More Investments**
- More Profits
- Contract Farming
- Dehydrated Onion & Vegetable Processed Fruit

- **Adequate & Timely**
- Repayment & Security

- **Credit**
- Adequate & Timely
- Repayment & Security

- **Assured Price**
- More Investments
- More Profits
- Contract Farming
- Dehydrated Onion & Vegetable Processed Fruit

- **Quality Goods**
- More Investments
- More Profits
- Contract Farming
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- **Markets**
- Assured Price
- Quality Goods

- **Turnkey Projects**
- Agri Consulting
- Training
- Agronomy Advise
- Market Information
- Irrigation Scheduling
- Fertigation Scheduling

- **Improved Quality**
- Higher Value
- Turnkey Projects
- Agri Consulting
- Training
- Agronomy Advise
- Market Information
- Irrigation Scheduling
- Fertigation Scheduling
WHAT IS FERTIGATION?

Fertigation is the application of fertilizers, soil amendments, or other water-soluble products through an irrigation system.

WHY USE FERTIGATION?

1. **Higher yields and better quality crops:** The supply of nutrients to the crops according to the physiological stage, considering the climate and soil characteristics, resulting in high yields and high quality crops.

2. **Increased efficiency of nutrients:** Nutrients are applied to the root zone and uniformly, where the active roots are concentrated. Less fertilizer applied resulting on decrease of production costs.

3. **Reduction of groundwater pollution:** The exact dosage optimizes fertilization, reducing the potential for groundwater contamination caused by the leaching of fertilizers.

4. **Greater convenience and economy:** Allows use of fertilizer solutions, which is more practical than the solid or granular type fertilizers.

5. **Efficient application of microelements:** which are expensive and are required in small quantities.
EQUIPMENT FOR FERTIGATION

Fertilizer tank

- Pressure differential is created by decreasing the water flow in the main pipe at head control and diverting a fraction of the water through the tank containing the fertilizer solution.

- In the above photo by adjusting the Choke valve (Throttle valve) a gradient of 0.2 to 0.3 kg pressure will be created between the inlet (entry of system flow into the FT) and outlet (exit of fertilizer carrying water out of the FT) to allow suction of fertilizer solution from the tank. Fertilizer tanks are made of corrosion resistant, epoxy coated galvanised cast iron, stainless steel or fibre glass with a capacity to withstand the working pressure of the irrigation system.
Fertilizer tank-Metal

- **Standard Pure Polyester / Epoxy coating for Protecting from Corrosion** Coated with more than 70 micron thick deep blue colored pure Polyester powder on outer surface & Epoxy coating from inner side for protection against corrosion and weather effects
- **Innovative Turbulent Inlet** Turbulent inlet ensures thorough mixing of chemicals and / or fertilizers
- **Additional fine filter** To avoid entry of solid particles in system, Special provision of strainer on the outlet side
- **Separate Draining facility available** Special Drain port given to flush the tank
- Mild steel construction.
- Separate valves are provided on the inlet & outlet to control the injection rate.
- High pressure hose assembly inlet / outlet connection.
- Wide 8" opening for easy pouring of stock solution.
- Maximum working pressure 10 kg/cm² (142 psi).
- Available in 30, 60, 90, 120 & 160 liter (8, 16, 24, 32 & 42 US gallon) capacity.
- Can also be supplied in stainless steel material
Fertilizer tank-Plastic

- **Heavy Duty, High Quality, Light Weight Tank** Manufactured from Heavy Duty, High Quality Plastic Fertilizer Tank with optimum weight
- **Innovative Turbulent Inlet** Turbulent inlet ensures thorough mixing of chemicals and / or fertilizers.
- **Additional Fine Filter** To avoid entry of solid particles in system, Special provision of strainer on the outlet
- **Separate Draining Facility Available** Special Drain port given to flush the tank
- Separate valves are provided on the inlet & outlet to control the injection rate.
- High pressure hose assembly inlet / outlet connection.
- Maximum working pressure 6 kg/cm².
- Available in 30, 60 & 90 liter (8, 16 & 24 gallon) capacity.
Advantages
1. Very simple to operate, the stock solution does not have to be pre-mixed
2. Easy to install and requires very little maintenance
3. Easy to change fertilizers
4. Ideal for dry formulations
5. No electricity or fuel is needed

Disadvantages
1. Concentration of solution decreases as fertilizer dissolves
2. Accuracy of application is limited
3. Requires pressure loss in main irrigation line or a booster pump
4. Proportional fertigation is not possible
5. Limited capacity
6. Not adapted for automation
Suction through a Venturi is achieved by water passing through a constricted section - the venturi tube, resulting in an increase of flow velocity and generation of negative pressure (suction) which sucks the fertilizer solution from a fertilizer solution via suction tube mounted in the constricted section of the venturi tube (see the Schematic diagram).

Venturi devices are made of corrosion resistant materials like plastic. The injection rate of the venturi device depends on the pressure loss which ranges from 10-75% of the initial pressure, depending on the injector type and operating conditions.

Constant pressure in the inlet of the injector results in uniform nutrient concentration over time.
• **Innovative Venturi design** Innovative design of convergent, throat and divergent sections of Venturi for more injection rate

• **Additional Valve Provided** Additional Valve provided for suction side to prevent reverse flow of water

• **Additional Fine Suction Filter** To avoid entry of solid particles in system, additional suction filter is provided

• Made of engineering plastic.

• Excellent chemical resistance to most of the chemicals.

• Highly efficient and compact differential pressure injection device.

• Economical and low cost option

• Available in ¾", 1", 1¼", 1½" and 2" BSP inlet / outlet connection. Any other size can be supplied on demand.

• Based on inlet size and pressure difference and mainline flow, injection rate ranging from 70 LPH to 1900LPH
**Injector Pump**

Fertilizer pumps are used to drive fertilizer solution from a supply tank to the system. They can be driven hydraulically by the water pressure of the irrigation system. Hydraulic pumps are versatile, reliable and have low operation and maintenance costs. Centrifugal pumps are used when high capacity is required. The most prevalent pump types are the water driven diaphragm and piston pumps that combine precision, reliability and low cost maintenance costs.

**Advantages**
1. Very accurate, for proportional fertigation
2. No pressure loss in the line
3. Easily adapted for automation

**Disadvantages**
1. Little expensive
2. Complicated design, including a number of moving parts, so wear and breakdown are more likely.
Injector Pump conti..

- **Innovative Compact design** Innovative compact design which operated without electricity
- **Accurate and Proportional Injection Rate** For accurate injection, special adjusting lock arrangement provided
- **Additional Fine Suction Filter** To avoid entry of solid particles in system, additional suction filter is provided
- **Different options available** ON/OFF Knob OR Air Release option available
- Made of strong plastic material with high chemical resistance.
- Available in two models to provide operational flexibility,
  - With on/off system.
  - With Air Release Valve.
- Maximum operating pressure 5 kg/cm² (70 psi). High pressure model (6 kg/cm²) available on demand.
- Simple to install, operate and maintain.
- Low pressure loss.
- ¾" BSP inlet / outlet connection.
- Dosing flow range,
  - 0.6 to 50 lph for 0.3% to 2% adjustable.
  - 0.12 to 100 lph for 0.4% to 4% adjustable.
  - 150 lph for 6% fixed dosage.
Automatic fertigation equipment

FertiMix System

General Description
Accurate EC and pH control has become a major factor of modern nutrition systems. Though it is Soil-less cultures or even open field farming; nowadays require a good control of the electric conductivity and the acidity of the irrigated water, that's what the FERTIMIX designed for.
System Components and Features

• A strong, modular, non-corrosive frame out of Aluminum
• PVC non-corrosive piping and fittings
• A set of 3 Venturi type fertilizer injectors expanded upto 8 with a flow rate of 400LPH to 1200LPH each. Each injector contains and electric fertilizer control valve, an adjustable flow regulator, and flexible suction pipe.
• A polyethylene mixing tank with high and low level sensors.
• A triple purpose water pump for supplying pressure for irrigation, fertilizer suction and mixing process.
• An EC and pH monitor unit, consisting of transmitter with 4-20mA output with galvanic isolation, a large LCD display and a four button keyboard for soft calibration.
• A pair of EC and pH electrodes installed in a sampling cell.
• A by-pass valve for manual operation.
• A water meter which emits pulses for precise proportional fertigation.
• Hydraulic inlet and outlet valves.
• An electric control panel with manual switch, a protection unit for the pump and mixing tank level transmitter.
Chemigation

Chlorination
Addition of chlorine in to the drip irrigation system. Chlorine when dissolved in water acts as a powerful oxidising agent and vigorously attack microorganisms such as algae, fungi and bacteria.

Common chlorine sources
* Calcium Hypochlorite (Bleaching Powder) - contains 65 % freely available chlorine (HOCL & OCL\(^-\))
* Sodium Hypochlorite - Liquid form with 15% Freely available chlorine.
* Chlorine gas

Calculation of Injection Rate:

**Sodium Hypochlorite**

\[
IR = \frac{(0.36 \times Q \times C)}{S}
\]

Where, IR - Inj. Rate lph,
- Q - System Flow lps,
- C - Desired Concentration ppm,
- S - Percentage of free available chlorine,
Chemigation Contd...

**Calcium Hypochlorite** -

\[
IR = \frac{(360 \times Q \times C)}{W \times S}
\]

Where,

- IR - Inj. Rate lph
- Q - System Flow lps,
- C - Desired Conc. ppm.
- S - % of free available chlorine,
- W - Concentration of solution gms of Ca(OCL)²/ltr.

**Gaseous Chlorine**:

Chlorinator can be used to inject gaseous chlorine in to the system.

Injection Rate = 3.6 \times Q \times C

Where,

- IR - Injection Rate in gms/hr
- Q - System Flow in lps.
- C - Desired concentration in ppm.
Chemigation Contd...

**Acid Treatment: Injection Rate Calculation**

\[
Q_a = \frac{3.6 \times Q_s \times A}{V}
\]

Where,

- \(Q_a\) - Inj. Rate of acid lph,
- \(Q_s\) - System Flow Rate lps,
- \(A\) - Acid quantity in ml to achieve the required pH in a water test sample of volume ‘V’ litres,
- \(V\) - Volume of test sample litres.

The commercial Grade of Acid recommended for Acid Treatment are:

<table>
<thead>
<tr>
<th>Acid Type</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrochloric Acid</td>
<td>HCl - 35%</td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>HNO₃ - 33%</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>H₂SO₄ - 65%</td>
</tr>
<tr>
<td>Ortho Phosphoric Acid</td>
<td>H₃PO₄ - 85%</td>
</tr>
</tbody>
</table>

- Most of the cases HCl can be used which is highly effective & the cheapest of all, except the crops which cannot tolerate Chloride.
- H₂SO₄ is not recommended where calcium, magnesium salts are above 500ppm.
- Acid treatment is always done before chlorination.
- If iron is present, do not use ortho phosphoric acid (H₃PO₄) as iron would precipitate with phosphoric acid.
Chemigation Contd...

Procedure for Acid Treatment:

One time setting for acid/chlorine treatment:

1. Measure the pressure and discharges at various points in the system and mark them.

2. If the acid is to be injected through venturi or fertilizer tank. Set the venturi for a particular suction rate with plain water.

3. Take colour die or potassium permanganate set the stop watch and start injecting. Go to the last emitter of the section and measure the time required for colour die to come out. This time is a time of acid/chlorine treatment.

4. Reapeat the same for remaining sections, prepare a chart mentioning time required, amount of acid and differential pressure for the venturi/FT.
Procedure for Acid Treatment:

Calculating quantity of acid:

- Take measured quantity of source water (about 10 lt.)
- Take acid to be injected in a can. Using a droplet or an injection marked with scale. Start adding acid drop by drop in to the source water stir it well and measure the pH.
- Once the necessary pH is arrived (usually 4). Note quantity of acid required to change the pH of source water to required pH (4).
- Calculate the acid quantity with proportions to designed flow for the given time and acid required in step 3.

E.g. Designed flow 25 m3/hr – Time 30 min. – Acid needed to bring 4 pH for 10 l. of source water = 10 ml.

In 30 min. 12.5 m3 of water will flow i.e. 12,500 lt.

For 10 lt. : 10 ml
For 12,500 lt. : x ml

\[ X = 12,500 \text{ ml i.e. 12.5 lt.} \]
Chemigation Contd...

**Procedure for Acid Treatment**

**Injecting Acid:**

- Take required quantity of acid.
- Set the venturi / FT for the required differential pressure.
- Start injecting acid.
- Check at the nearest faucet (e.g. drain valve) the pH.
- Adjust the pH by throttling the valve.
- Go to the last dripper of the section and check pH.
- As soon as pH is 4. Shut down the section. Keep it for minimum 6 hours and maximum 24 hours.
- Open the ends of the lateral and submain flush the section thoroughly.

**Note:** If treatment is for inline, take a small wooden stick and gently hammer the drippers during the reaction period.
Procedure for Chlorine Treatment using bleaching powder:

Calculating Quantity of Bleaching Powder:

1. Follow the one time setting for acid treatment.
2. Calculate the volume of water required to be treated.
3. With the proportion of required chlorine level calculate quantity of bleaching powder required.

E.g. for 25 m3/hr flow – time of treatment is 30 min.

Volume of water to be treated is 12.5 m3 i.e. 12,500 lt.

Chlorine concentration required – 20 ppm – 20 mg/lt.

For 1 lt.: 20 mg
For 12,500 lt. : x

X = 2,50,000 mg – 250 gram

Bleaching powder has 50% available chlorine then double the quantity to get required ppm.

Hence, 250x2= 500 gram of bleaching powder required.
Chemigation Contd...

Procedure for Chlorine Treatment using bleaching powder:

1. Appropriate time for chlorination is afternoon when source water temperature is slightly increased.
2. Take the required quantity of bleaching powder in a bucket. Take only fresh bleaching powder.
3. Add proportionate quantity of water which can pass through within treatment time.
4. Stir the solution and allow it to remain stagnant for atleast 30 min.
5. Filter the solution using filter cloth. Take only the chlorinated water.
6. Set the required injection rate and inject the chlorine water in to the system.
7. Check ppm at last dripper.
8. Shut down the system for 24 hours.
9. Open all the ends of the laterals and submain. Flush the section thoroughly.
Precautions:

1. Do not go for acid and chlorine treatment together.
2. Use hand gloves and goggles while doing acid treatment.
3. Do not inhale the chlorine fumes.
4. If acid spilled on the body wash that portion with plenty of cold water and take medical treatment.
5. Backflush the filter thoroughly before acid/chlorine treatment.
6. After acid/chlorine treatment remove the screen of screen filter and wash it.
7. Do not spill acid/chlorine on the filter/fertilizer tank.
Thank You