

My Irrigation System is Plugged: What Do I Do Now?

It is almost inevitable for irrigation emitters to be plugged after a short period of time. Blockage of emitters is one of the most common problems when dealing with micro-irrigation systems. Properly designed and maintained filtration systems generally protect the system from most blockages. Blockages can cause irregular water distribution, which in turn can damage the crop. Our research shows that plugging is random, which means irregular patterns of plugging in emitters. When the plants show excessive stress, it is generally too late to correct the problem. The main causes of plugging include algae, bacterial slime, particles, construction debris, and sediment. With adequate filtration, line flushing, and chemical treatment most blockages can be prevented.

If the blockage is caused by mineral precipitates it is either from the well pumping sand or soil which can be caused by cracks in the piping or low water level. The minerals most likely to cause plugging is silt. Silt can be ultra fine sand, clays, and other insoluble soils. This is a filtration issue that can be solved by using an effective filter. Coarseness of filters, the costs, etc are all variables involved in choosing the right filter for your system. Generally, the best type of filter is a media filter. The sand can be supplemented with DE (diatomaceous earth) for very fine filtration if necessary.

Some growers have been convinced they have a calcium blockage in their system. In the company's 40 years of water treatment, calcium/scale has never been found to cause plugging in emitters. What happens is that the blockage in the emitters grows so thick that water puddles on top of the emitter and when the water evaporates, a small amount of calcium/scale is visible.

A mineral scale will generally not form without heat and pressure. You would find scale forming in cooling towers, cool cells, boilers or something we are more familiar with: a tea kettle. It takes heat, pressure, an imbalance of alkalinity vs. calcium, or a recirculating system with evaporation for scale to form.

How much calcium carbonate is in the water? To put the amount of calcium carbonate in perspective, consider how little is in the water and what it means. At 200 ppm of calcium carbonate (hardness), that translates to 200 pounds of calcium carbonate for every million pounds of water. That is 200 lbs. of calcium carbonate in every 120,000 gallons of water. On a percentage basis this is 0.02%. This is a very small amount and is being spread over a large area. If 200 lbs. of calcium carbonate is spread over 40 acres using drip tape, it would not form a mineral scale thicker than a very thin paper. Mineral scale usually forms on the bottom and sidewalls of tubing as the water generally flows out of a system when it is shut down. At this concentration, the calcium carbonate would not form a thick scale for many years. There is always the debate of which is better well water or surface water. Sometimes there isn't really a choice due to location and availability. We had one customer in Louisiana that was pumping out of a bayou and had problems with plugging. They spent over \$10,000.00 installing a DI (deionization) system that produced almost pure water. They still had terrible problems with plugging. The source of the water is not necessarily a factor in the formation of plugging.

Most blockages are caused by some form of microorganisms that are growing. All the factors are there for this to occur: water, warmth, food (fertilizer), and time. If you are using fertigation in your irrigation system, just as the fertilizer makes your plants grow, it

will also make algae and slimes grow. Flushing the irrigation system after fertigation would reduce the amount of fertilizer in the system.

In the most general sense, a plant is a member of the lower or vegetable order of living organized things. Thallophyta are the lowliest organized plants and include a great variety of forms, the vegetative portion of which consists of a single cell or a number of cells forming a more or less branched thallus. They are characterized by the absence of differentiation of the body into root, stem and leaf which is a common feature in higher plants. Both sexual and asexual reproduction occurs in these types of organisms. They can be unicellular or complex organisms, lack mobility, have simple processes for digestion and reproduction, have little defense mechanisms, tend to have thinner cells walls, and can either be aerobic or anaerobic. They can survive and thrive in sunlight, darkness, or a combination of the two. Even if they become substantially dehydrated, these organisms will revive when exposed to water again. Types of these include algae (including Seaweeds) which contain chlorophyll, the Fungi which have no chlorophyll and therefore lead a saprophytic or parasitic mode of life, and the Lichens which are composite organisms consisting of an alga and a fungus living together in a mutual parasitism (symbiosis). A study of phylogeny has suggested twelve classes arranged in the following sequence: (1) Bacteria; (2) Cyanophyceae (Blue-green algae); (3) Flagellatae; (4) Myxomycetes (Slime-fungi); (5) Penicillineae; (6) Conjugatae; (7) Diatomaceae (Diatoms); (8) Fletteroconteae; (9) Chlorophyceae (Green Algae); (10) Characeae (Stoneworts); (II) Rhodophyceae (Red Algae); (12) Eumycetes (Fungi);

What to Do to Restore the System

Frequently growers find their irrigation system is plugged and they are baffled as to what to do. Sometimes the only help available is the salesman of the irrigation system or a local extension agent. Most extension services have recommended chlorine at various dosages and applications. Chlorine at low dosages will kill most organisms, but not remove them. Many times, these dead cells become food for the next generation of growth. As these micro-organisms sense an attack, their only defense is to reproduce to survive. Many times, after a dose of chlorine is injected in irrigation systems, 7-10 days later the problem is much worse. Algae which is the most common organisms in water systems has a re-generation cycle of 7-10 days which is readily apparent in a swimming pool. If you go on vacation without having someone treat the pool, after a week at the beach the pool will turn green.

When you consider municipal water systems that are generally treated at 1-2 ppm of chlorine, inspection of most toilet tanks will show a slight film on the inside that is slimy to the touch. In some areas, the growth in the toilet tanks can be excessive and can cause odors and stains in the toilet. The neighbors also had the same problem and the city was baffled and never did find out what caused it to grow so profusely. Most likely, it was like many irrigation systems that have a bio-film growing on the walls of the piping that breaks off and causes the plugging in emitters. In this municipal water system (similar to irrigation systems), the entire system needs to be treated to have a clean water system.

If you consider chlorine, think about the affects with its use in laundry. At low doses, it will remove some organic stains (coffee, food, etc.), but it has no effect on mineral soils such as mud, clay, iron, etc. Mineral soils are generally removed from clothing with

water and the physical action of a washing machine. The mineral stains are not generally soluble so it's more of the physical action and dilution that removes dirt, soils, etc. When you use higher dosages of chlorine, the fabrics will have holes in them if they are made with natural fibers like blue jeans, kakis, etc. If the dosage is high enough to eat holes in cloth, it will also eat holes in plants.

For years growers have gotten advice from the fertilizer companies to try flushing the system with acid and/or chlorine. Both of these options usually have poor results.

Neither acid or chlorine are effective at removing blockages in emitters at low dosages and at higher dosages, they are harmful to plants as well as the damage they cause to metals in the irrigation system. The acid that is generally available is 54% phosphoric acid which is contaminated with impurities. This can make the plugging much worse.

Sulfuric acid is also a cheap acid which is generally used to reduce the alkalinity of water to lower the pH that certain plants thrive on like blueberries. Sulfuric acid will not dissolve calcium carbonate. One time the city water department came to our office to buy sulfuric acid drain cleaner. After several trips, an inquiry was made as to what they were trying to achieve. A critter had crawled into a drainage pipe and the bones were working to collect debris. They thought drain opener would be cheaper than digging up the pipe. After selling them a few gallons of muriatic acid, their problem was solved.

High levels of hydrochloric acid will dissolve calcium carbonate scale. The only effectiveness of low dosages of chlorine and acid treatments is for the companies to increase their sales.

An old well driller's trick is to dump chlorine tablets, powder, or liquid down the pipe and allow it to sit for a day or two. Without some agitation to move the chlorine over a

large area, the chlorine simply drops to the bottom of the well and much of the chlorine either doesn't dissolve or is ineffective. The water is pumped to waste until the chlorine levels drop. Not only does it corrode metal pipes, but it works only for a limited time.

REMOVING PLUGGING IN MICRO IRRIGATION SYSTEMS

With new technology and a few hours of work, the grower can restore the irrigation system to working order. The discovery of a new safer and more concentrated form of peracetic acid has proven effective at removing blockages in all types of irrigation systems from drip tape, hard pipe with emitters or spaghetti tubing, micro jets, spinners, spitters, overhead sprayers and other irrigation parts. Growers have many different irrigation schedules, water requirements, flow rates, length of irrigation times per zone, the inability to shut down the irrigation system and other factors can determine how the grower can use this new technology. This chemical can be used in several different ways. This compound can adapt to the grower's schedule without interrupting the irrigation regimen required.

This compound removes the deposits in emitters with a 2-4 shock treatments at a ratio of 1:6,000 (1 gallon of treatment for every 6,000 gallons of irrigation water). This is frequently used in Tree Farms, Orchards, Row Crops, and Areas with Large Zones that can be irrigated for longer times. Each zone needs to be treated and allow contact time of 4-8 hours (overnight is better). Depending on the amount of plugging, 2-4 shock treatments are required. The cost using this compound at a flow rate of 100 gpm (gallons per minute) is \$12.50 per zone.

It can also be used in a continuous treatment at 1:24,000 (1 gallon of treatment for every 24,000 gallons of irrigation water). The continuous injection is ideal for

liners/starters and plants that are irrigated for shorter periods of time which can even be for only a few seconds at a time. These irrigation systems usually include switching zones frequently, applying small amounts of water many times a day. Injection time usually is 8 -24 hours depending on the amount of deposits in the emitters. The cost at a flow rate of 100 gallons per minute is \$10.69 per hour.

At either of the above injection rates, peracetic acid does not affect the pH, will not affect plants, has no taste, leaves no residue, 100% organic, and is economical to use. Peracetic Acid can also be used in weekly dosages to prevent the blockage from ever occurring. It has been used in greenhouses and has been sprayed on orchids and other plants at a ratio of 1:1.000 with no resulting damage. The only effect during this experiment was the removal of lichen moss that was growing around or on the ground below the plants.

One of our customers had a malfunction with their injector and it pumped an entire 55 gallon drum of treatment over the weekend. The drum would normally last three months and it was an almost full drum. When they called on Monday, they reported there was no damage to the plants and to send another drum.

This new compound is non-specific in that it removes all deposits in all parts of the irrigation system. If possible, injection before the filter helps keep the filter and the system cleaner. This compound cleans every part of an irrigation system safely, without harming any plant or the irrigation system. An injector for precise control has yielded best results in unplugging emitters in drip tape, drip lines, micro jets, and other micro irrigation emitters.

Respectfully submitted,

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