



Fluid Dynamics

Hard water solutions since 1973

Nozzles: Irrigation and Plant Growth



Maintaining efficient water delivery and enhancing plant growth in water based irrigation systems





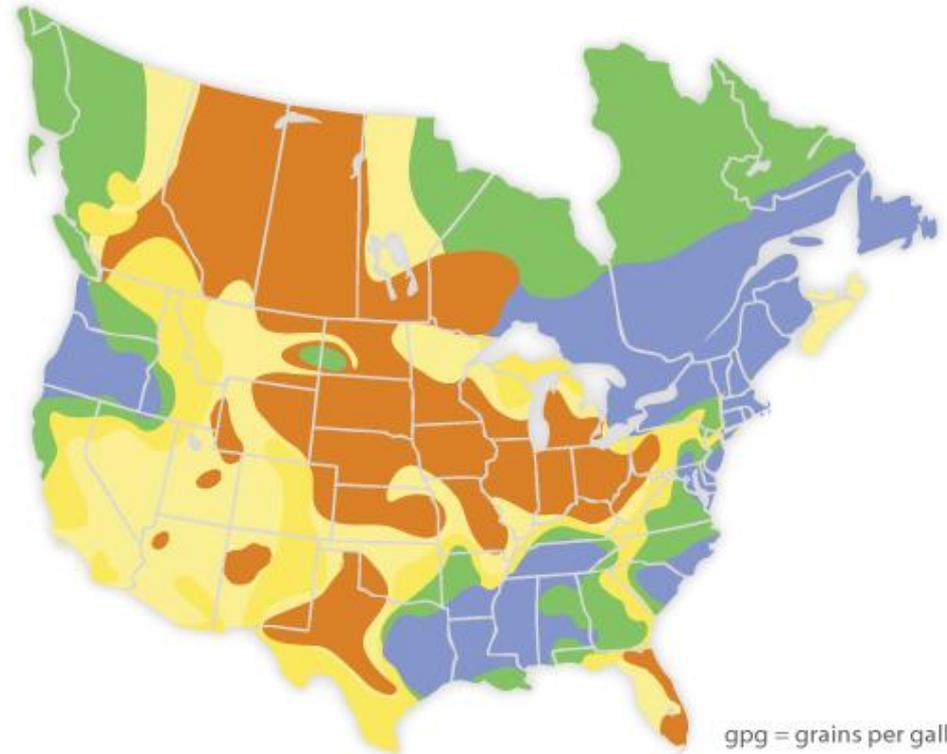
About Lime Scale

As shown in the map on the right, over 85% of the United States has hard water. Canada is affected by lime scale to a similar degree.

If water is not treated this can create a significant problem with scale build-up in pipes and equipment in homes and industry.

Lime scale is an unwanted insulator in heating and cooling systems having a negative impact on efficiency.

America spends billions of dollars each year addressing this problem wasting time, energy and resources.



gpg = grains per gallon

According to the United States Geological Survey, 89.3% of US homes have hard water.

Over 85% of Canada has a hard water problem.

- less than 3 gpg  Slightly Hard
- 3 to 7 gpg  Moderately Hard
- 7 to 10 gpg  Hard
- 10 to 14 gpg  Very Hard
- over 14 gpg  Extremely Hard





Problems Facing Irrigation Systems

Large scale irrigation systems rely on borehole or well water for its rich mineral content and stable pH range. This water contains a high level of calcium and magnesium salts which are essential for successful plant growth. Water with high mineral content otherwise known as hard water will pose a number of problems to the cost and efficiency of the irrigation system if left untreated in the form of scale.



One area where scale will cause a problem is deposition inside the main feed pipes. Particularly hard water will see a steady build up of scale inside the pipe. This causes a reduction in water delivery, increasing the workload on the pumps. Furthermore scale can also contribute to corrosion of the pipe itself.



Problems Facing Irrigation Systems

Scale build up will also affect the nozzles themselves. Water delivery is slowly reduced until the nozzle becomes completely blocked and requires cleaning.

Each nozzle has to be manually dismantled and cleaned using sharp implements and chemicals which damage the nozzles. After several cleans the nozzles require replacing. Altogether this adds a significant cost to the operational cost of the irrigation system.



[Clogged Nozzle](#)



[Clear Nozzle](#)



A recent installation on a center pivot irrigation system in Texas



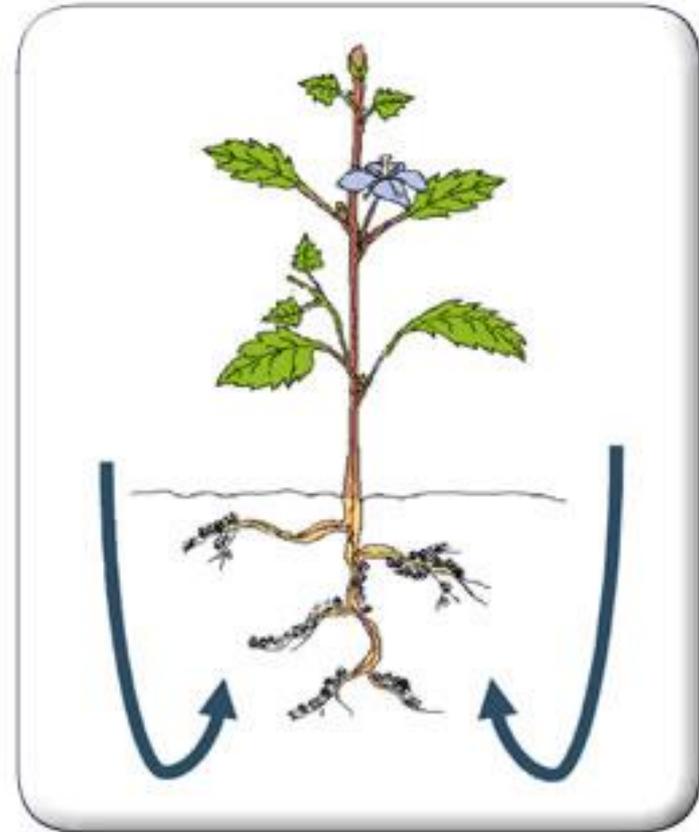


Problems Facing Irrigation Systems

Vital nutrients for plant growth include calcium and magnesium carbonate. However, in its calcite form these salts, rather than being ingested by the plants, tend to stick to the roots in the form of scum. Over time this will prevent effective ingestion of water carrying these minerals to feed the plants.

When irrigation is used intensively due to a lack of rainwater growers will notice the plants change color due to under nourishment.

When the rain returns the rainwater is under saturated with mineral salts. Rainwater does not carry these mineral salts and as a consequence washes the roots clean of this scum allowing them to re-ingest mineral salts at a more effective rate.





Problems Facing Irrigation Systems

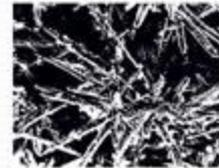
How does Fluid Dynamics treatment improve plant growth?

It's simple, once water is treated calcium takes on a colloidal crystal form which is easier for the plant to ingest and scum does not build up on the roots.

This has been proved in a preliminary university study carried out by the Middle Tennessee University using two species and four treatments (overhead watering or watering at the base of the plants, with or without the Fluid Dynamics catalytic unit installed).

The plants being watered with the Fluid Dynamics catalytic unit were noticeably larger after several weeks.

Following this study research has been commissioned to determine the extent of the benefits Fluid Dynamics treated water can offer growers.



Untreated calcium carbonate shown here in its calcite state



Treated calcium carbonate shown here in its colloidal crystal state



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Communications from Middle Tennessee State University

We ran a preliminary study with the Fluid Dynamics unit that you left with us. We used two species (Basil and Fescue) and four treatments (overhead watering or watering at the base of the plants, with or without the Fluid Dynamics unit installed). The plants being watered with the Fluid Dynamics unit were noticeably larger after several weeks. My student worker destroyed the plant materials while cleaning, so I didn't get any dry weight measurements or any other data. However, I do believe that I have photos showing the size differences.

In any case, these preliminary trials provide me with some rationale to investigate this further. I'm leaning towards doing a larger study in conjunction with my floriculture class this fall semester.

Following that, I will be able to provide you with some actual results.

I will keep you updated as we proceed.

Nate Phillips, PhD
School of Agribusiness and Agriscience
Middle Tennessee State University
Campus box 5
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Simple Installation

All Fluid Dynamics water treatment equipment is simple to install. Ranging in sizes of up to 3.5 feet in length the selected unit will replace a section of the existing main line pipe work and is connected using flanges or simple fittings.

Equipment can be installed in remote locations as there are no power requirements and no maintenance is required.

Equipment must be sized according to flow rate. Typical return on investment is within 5 months.

NOM BORE	INCH	2.5"	3"	4"	5"	6"	8"	10"	12"
	MM	65	80	100	125	150	200	250	300
LENGTH	INCH	36	36	36	36	36	36	36	36
	MM	913	913	913	913	913	913	913	913
	m3 p/hr	18 - 29	25 - 54	45 - 80	75 - 145	120 - 270	225 - 440	360 - 650	550 - 750
	ltr/sec	5 - 8	7 - 15	12.5 - 22	21 - 40	33 - 75	62.5 - 122	100 - 180	155 - 210
	usgal/min	80 - 127	111 - 238	200 - 350	330 - 635	530 - 1190	990 - 1930	1585 - 2850	2450 - 3300





Irrigation: Required Information

Matching the appropriate Fluid Dynamics solution to the application is a simple process requiring information about the system and water tests.

Water Analysis Requirements:

System Make Up (Prior to filtration or nutrient dosing)

M-Alkalinity	
Chlorides	
Sulphates	
Total Hardness	
Calcium Hardness	
Ph	
Total Dissolved Solids	
Water Temperature	





Other Nozzle Applications

In addition to irrigation, Fluid Dynamics products are used to protect nozzles in a variety of other applications.

Shown here are drippers that are used to supply drinking water to chickens. As scale builds they become inoperable. The dripper on the left was used in untreated water. The dripper on the right was switched to treated water. The existing scale has been eliminated and remains scale free after 90 days of operation.





Other Nozzle Applications

A car wash is a harsh environment with multiple nozzles in use.

The Fluid Dynamics installation shown on the right is successfully preventing scale build up without the use of chemicals.

The owner has been able to remove their water softener unit freeing up space and eliminating salt use. They have also reduced their detergent consumption.



Car Wash System Installation





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Technology Summary

The catalytic process offers a viable cost effective solution to the nations hard water problems.

By reducing scale you reduce energy waste. This no longer has to be done using treatment methods which substitute one burden on the environment for another.

The catalytic process is wholly green with no running costs and no wasted water while providing continuous flow.

If you would like to have a more in depth understanding of our catalytic process we encourage you to read the scientific research confirming the validity of our technology:

The research was carried out by:

Dr D.M.Dawson, Ph.D,
Harwell Laboratories' Materials Development Division





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ROI (Return on Investment):

Once installed our maintenance and chemical free units typically pay for themselves in a matter of months.

Reductions in maintenance, energy and chemical use result in savings that can amount to many thousands of dollars annually.

Corporations and companies around the world are reducing costs, adding to their bottom line while improving their environmental footprint in a sustainable way.



Technology Backed by Science
Endorsed by Industry™





Fluid Dynamics

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Summary

Fluid Dynamics offers sustainable inexpensive environmentally friendly green solutions to eliminate hard water problems.

With over 40 years in the business and over 400,000 units installed we've assisted businesses large and small to reduce their costs associated with energy, water and chemical use while improving their environmental footprint.

