

# **ACID INJECTION SYSTEMS REAL RELIEF OR LONG TERM DISASTER**

SOIL DIMENSIONS  
SOIL BASES  
pH MISCONCEPTIONS  
SULFUR DILEMMA  
NITROGEN CONSIDERATIONS  
POTENTIAL FOR SOIL COLLAPSE

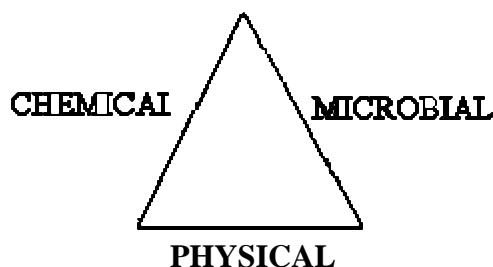
ALSO SEE: Technical Bulletin  
Acid Injection Systems for Correcting Soil Problems

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## THE INJECTION OF ACID INTO IRRIGATION WATER & THE POTENTIAL FOR SOIL COLLAPSE.

### THE SOIL

There are three dimensions to soil, PHYSICAL, CHEMICAL, MICROBIAL.



It is only when these three dimensions are in proper balance or are able to function properly that we can realize the production potential of the soil.

- PHYSICAL DIMENSION: When we talk about a functioning physical dimension it simply means that the soil physically allows for the linear movement of Nutrients, Oxygen (& CO<sub>2</sub>), & Water throughout the soil profile. By extension, this means a non-compacted (non-sealed) soil.
- MICROBIAL DIMENSION: A functional microbial dimension is possible when the physical dimension of the soil has a desirable physical configuration. When the proper physical dimension is realized, the essential microbes can function & reproduce because food, water & oxygen are available to them. Without proper microbial function in the soil, we cannot hope to achieve nutrient availability to our plants.
  - A) Nitrogen Conversion
  - B) Micronutrient / Mineral Conversion
  - C) Many other functions
- CHEMICAL DIMENSION: For proper function, the chemical dimension must be fairly well balanced from the standpoint of the nutritional constituents contained within the soil. The basis for determining what constituents should be in a certain soil is the PERCENT BASE SATURATION OF THESE BASIC CATIONS.

The basic soil cations are:

- 1) Magnesium
- 2) Calcium
- 3) Potassium
- 4) Sodium
- 5) Hydrogen

From these PPM numbers, the functioning Cationic Exchange Capacity (CEC) can be readily calculated and it is this resultant number which will lead us to the correct content of all nutritional inputs in the soil with the exception of Nitrogen.

NOTE: Only when the PERCENT BASE SATURATION of the basic cations is within the proper range can the soil function properly from the standpoint of total nutritional availability from the soil.

The correct ranges of saturation for the basic cations are:

|           |        |
|-----------|--------|
| Calcium   | 65-75% |
| Magnesium | 12-15% |
| Potassium | 2-5%   |
| Sodium    | < 2%   |
| Hydrogen  | < 6%   |

NOTE: When you reach these ranges simultaneously other important factors such as (pH) will fall into line. There can be momentary and temporary changes in pH (for example, by injecting acids into the irrigation water) but **UNLESS THE PERCENT BASE SATURATION OF THE BASIC CATIONS ARE BROUGHT INTO ACCEPTABLE RANGES, ANY ADJUSTMENT IS GOING TO BE SHORT LIVED AND EACH SUBSEQUENT APPLICATION OF AN ACID MAY PUSH YOUR SOILS CLOSER AND CLOSER TO COLLAPSE.**

#### ACID INJECTION, SEEMS LIKE A GOOD IDEA AT FIRST

Right or wrong, many turf managers look at soil pH before they look at anything - else. It has come to be the accepted line of thought that if I can get the pH in the 6.5 - 7.0 range all my problems will go away and in fact, many problems will go away when you achieve pH ranges like this & are able to maintain them through natural and desirable ranges.

**THE MAJOR PROBLEM IS THE LACK OF A COMPLETE UNDERSTANDING OF THE TOTAL MECHANICS OF pH.**

The basic misconceptions begin with the fact that there is generally a problem of achieving good nutrient availability when the soil pH is above 7.0. By extension, it is often reasoned that a drop of the pH will solve the problem and because a new soil pH lower than 7.0 (neutral) is on the acid side of the scale, the reasoning is that if I add acid to the soil I will correct the pH downward and the problem is solved. Further, we encounter many instances of high pH water on the golf course & the reasoning is that if we adjust the pH of the irrigation water through injection of acid (which is relatively easy to do), that the pH of the soil will go down as well. **THE TRUTH IS THAT ANY SOIL CHANGE IS GOING TO BE VERY TEMPORARY AND VERY FLEETING.**

## TWO MAJOR PROBLEMS WITH THE ACID:

- 1) Because the effect of the acid is totally on free acidity (i.e., the hydrogen in solution) it is going to be moving downward and out of the soil solution with each additional irrigation. **THE BOTTOM LINE IS THAT YOU ARE FORCED TO CONTINUALLY ADD ACID WITH NO HOPE OF LONG TERM pH ADJUSTING EFFECTS.**
- 2) While there are some temporary beneficial results and slightly improved visual performance with the infusion of the acid, there are other compounds building up in the soil that can be detrimental to the functioning ability of the soil and to the turf itself. **SULFUR, WHICH IS BEING ADDED WITH THE INJECTION OF ACID, WILL BUILD AT AN ALARMING RATE AND WILL EVENTUALLY SHUT DOWN THE SOIL FUNCTION.**

The way soil function will be most affected is that the microbes that are absolutely essential for plant life are very adversely affected by the accumulating sulfur. The more sulfur that is added, the more severe the impact.

NOTE: As you continue with the acid injection system, more and more will be required just to get half the results you previously experienced until you get no results at all. **YOU HAVE COLLAPSED THE SOIL FROM THE STANDPOINT OF SOIL FUNCTION.**

The chain of events started with the chemical dimension:

- A) The chemical dimension was out of balance and possibly even the physical dimension was being reduced from a functional standpoint.
- B) You inject the acid which alleviates symptoms temporarily pH but at the same time another part of the chemical dimension is being pushed further & further out of balance with the sulfur accumulation.
- C) As the sulfur accumulates, there is a corresponding adverse impact on the microbial dimension.
- D) As the microbial function is adversely impacted, there is more and more impact on both the physical and chemical dimension.

**AS ACIDS EXPENDED IN THE SOIL SOLUTION INCREASE, THERE IS A CORRESPONDING DECREASE IN FUNCTION OF ALL THREE DIMENSIONS OF THE SOIL.**

**CHEMICAL DIMENSION FUNCTIONALLY IMPAIRED  
MICROBIAL DIMENSION FUNCTIONALLY IMPAIRED  
PHYSICAL ASPECTS OF THE SOILS ARE FUNCTIONALLY IMPAIRED**

The more acid applied, the more required to achieve any kind of temporary results. The more acid used, the more all three soil dimensions are impacted until eventually nothing works. The soil is collapsed.

REFERENCE: Please refer to FPG, Inc. Technical Bulletin "ACID SYSTEMS FOR CORRECTING SOIL PROBLEMS". This bulletin details the exact chemical exchanges that take place in the soil when acid is added.

SUMMARY:

"OUR GRASS HAS REALLY LOOKED GOOD FOR THE FEW WEEKS WE'VE BEEN USING THE SYSTEM"

Well, it should have looked good with all the nitrogen you were applying.

YES - NITROGEN

The acid being used is sulphuric acid. Raw sulphuric acid is as "rank" as a rodeo bull.

- ~ Raw sulphuric acid would explode at induction site on mixing with water.
- ~ Raw sulphuric acid could not be handled by the golf course without great hazard.
- ~ Raw sulphuric acid could not legally be stored on most golf courses. Raw sulphuric acid poses many problems with D.O.T. regulations.

One could mix enough water with sulphuric acid at the plant and react it to the point it was less dangerous, but this would require that massive quantities of water be mixed with it. This would make shipping impractical and very cost prohibitive per pound of acid.

To make the solution practical, the formulator blends 50% raw sulphuric acid with 50% urea. This reaction makes a product that can be handled, but it also means that for every pound of material put through the injection system, you will apply approximately 0.25 lb. of Nitrogen. Although it is not stated as such on most of the product labels, these acid mixtures for turf are very high in Nitrogen.