

Compliance Through Stability

The Art of Avoiding Plant Crises



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TOTAL SYSTEM COMPLIANCE

Feed Forward Control: The Good, The Bad, The Ugly

- ◆ Overall Systems Stability
- ◆ Effluent Clarity
- ◆ Nutrient Removal (Ammonia, PKN's)
- ◆ Alkalinity Stability
- ◆ pH Stability
- ◆ FOG Control
- ◆ Odor Control



MAGNESIUM HYDROXIDE – TECHNICAL GRADE



KEEPING CONTROL, WHERE OTHERWISE CONTROL IS LOST!



MILK OF MAGNESIA—MAGNESIUM HYDROXIDE

Magnesium Hydroxide can provide alkalinity as a slurried hydroxide ranging 58-59% by dry solids weight or as a Magnesium Oxide powder. The slurry has a freezing point at or just below that of water. Overdosing of the slurry will have little impact on the biology or effluent discharge limits.

- Magnesium is a big part of the **energy production in biology**.
- For batch systems visited once or twice a week, a couple days worth of chemical can be added **all at once**.
- **No reportable** spill quantities or fish kills.



GREATEST ADVANTAGE/CAUTION

⬇ Caution

- Caustic – chemical burn risk
- Lime – softening/scaling/sludge costs
- Milk of Magnesia – Brucite (Mag Hydroxide Marble)

⬇ Advantage

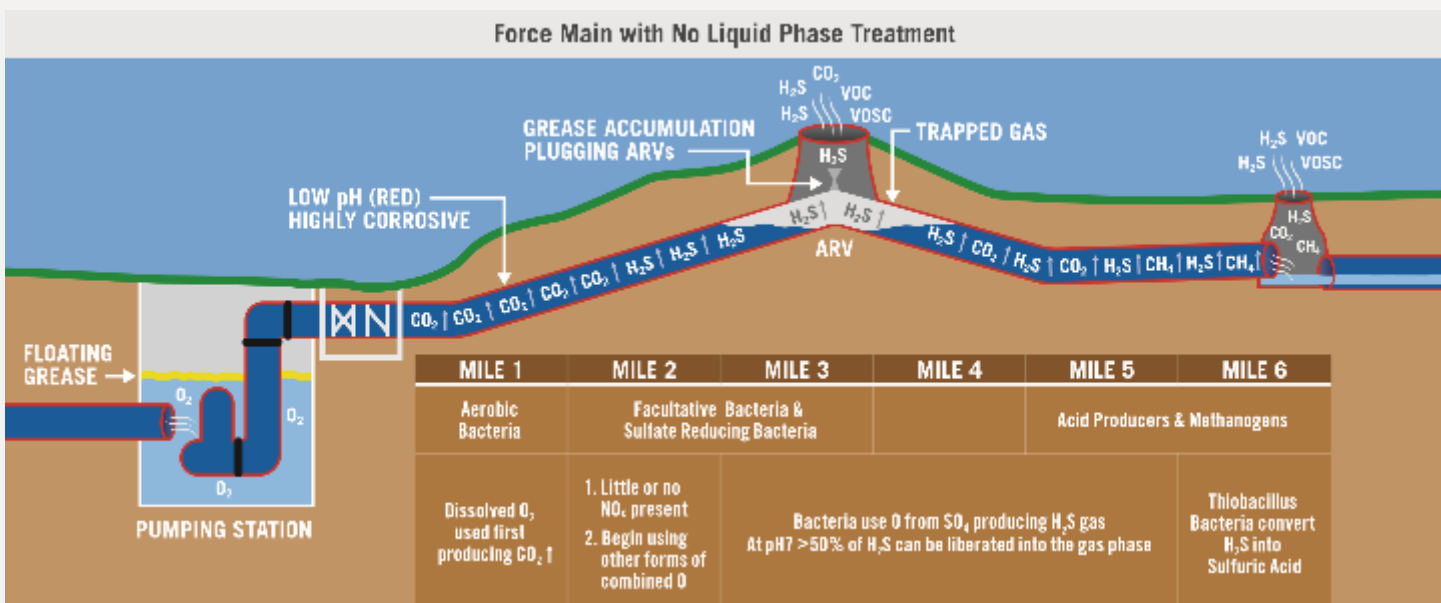
- Caustic - completely soluble
- Lime - get it anywhere
- Milk of Magnesia - doesn't drive pH above 9 S.U.



ODOR CONTROL COMPLIANCE

This section will discuss why there is a need for odor and corrosion control, what is causing the issue, and how to not miss hot spots .

- ◆ **Odor** – Bacteria and chemicals, detection technology
- ◆ **Corrosion**– Acid attack and life of concrete; surface pH
- ◆ **Common Chemistries**– Hypochlorite, magnesium hydroxide, nitrates
- ◆ **Magnesium hydroxide dosage** - equipment and calculations



HYDROGEN SULFIDE (H₂S)

In water at pH 7, about 50% of the dissolved sulfide
Hydrogen sulfide (H₂S) is
converts to H₂S gas. Raising the pH by just one standard
a colorless, poisonous,
unit reduces that percent 5X.
flammable gas that

produces foul odors like

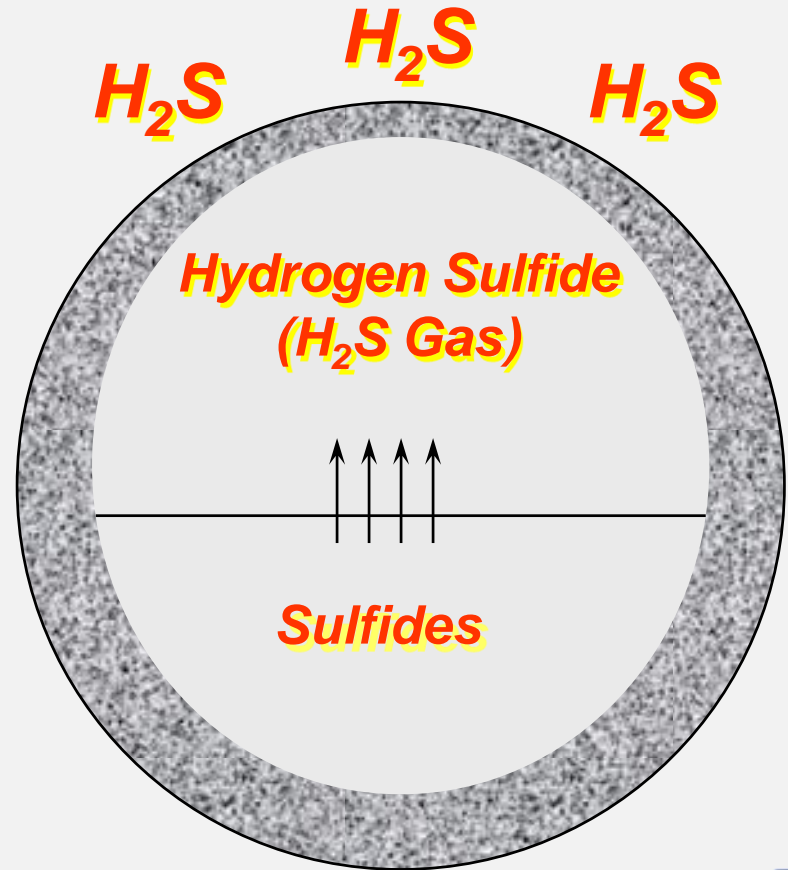
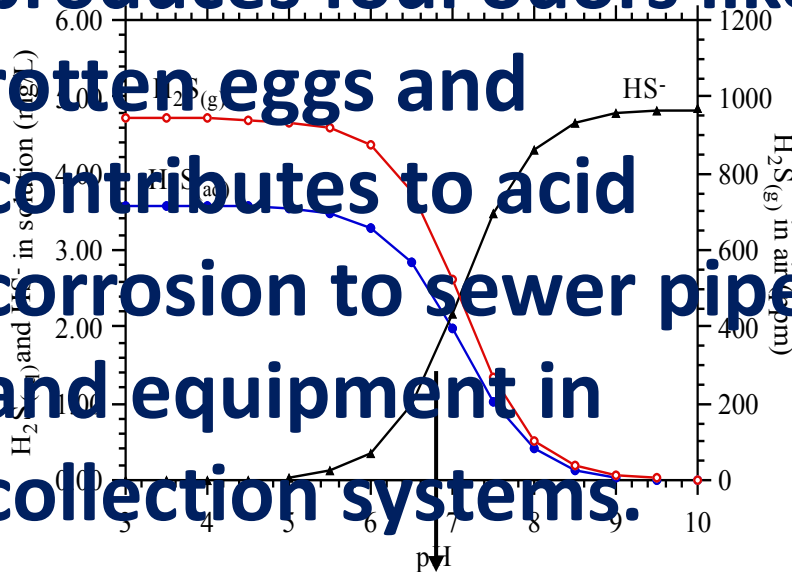
rotten eggs and

contributes to acid

corrosion to sewer pipes

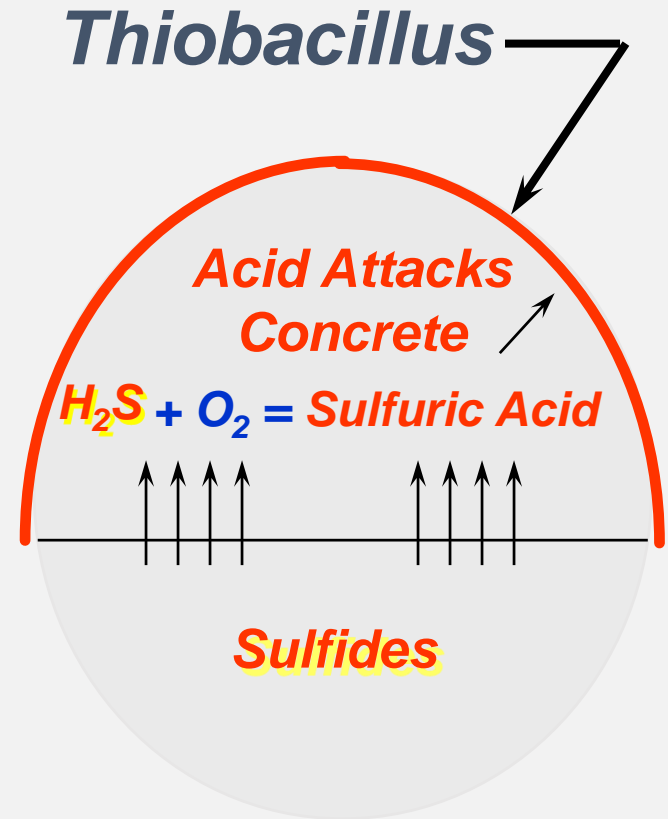
and equipment in

collection systems.



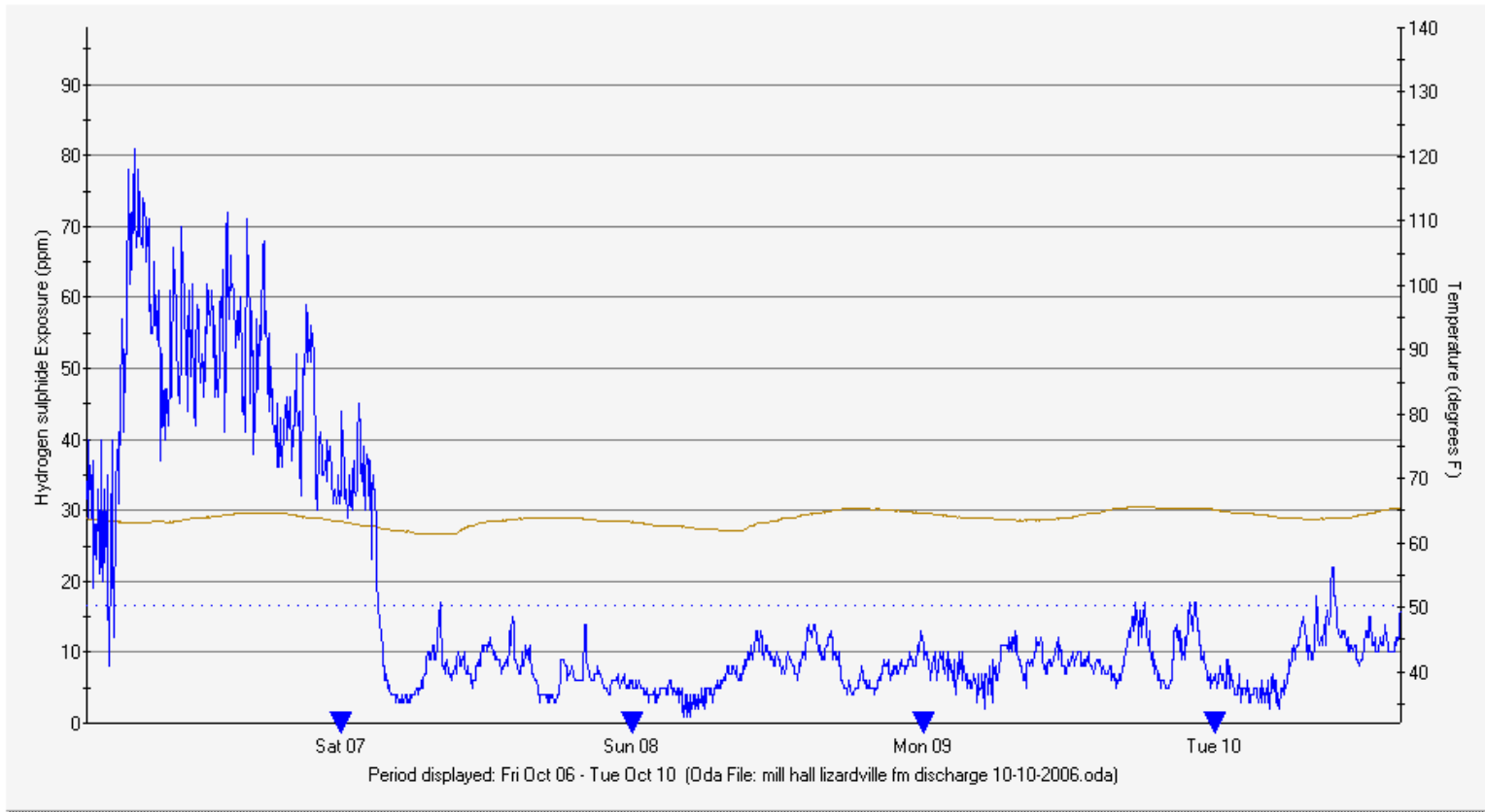
HYDROGEN SULFIDE (H₂S)

Hydrogen sulfide gas conditions, such as in swamps and sewers (anaerobic digestion), consuming bacteria (Thiobacillus) excrete sulfate-reducing bacterial this sulfuric acid onto the breakdown of organic matter the collection system for fuel, producing hydrogen pipes and equipment. sulfide as a waste in the wastewater stream.



TYPICAL GRAPH OF GAS LEVELS

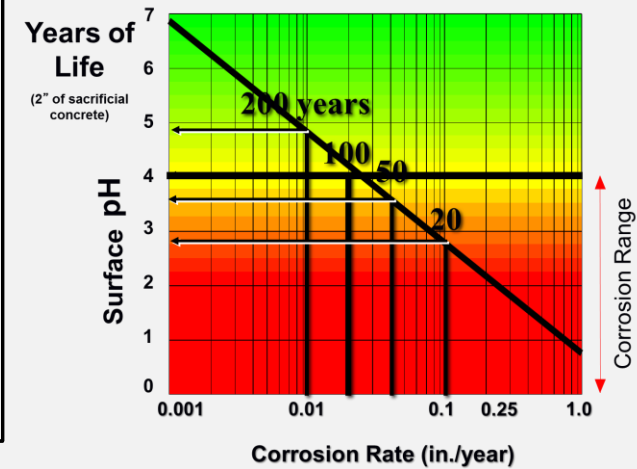
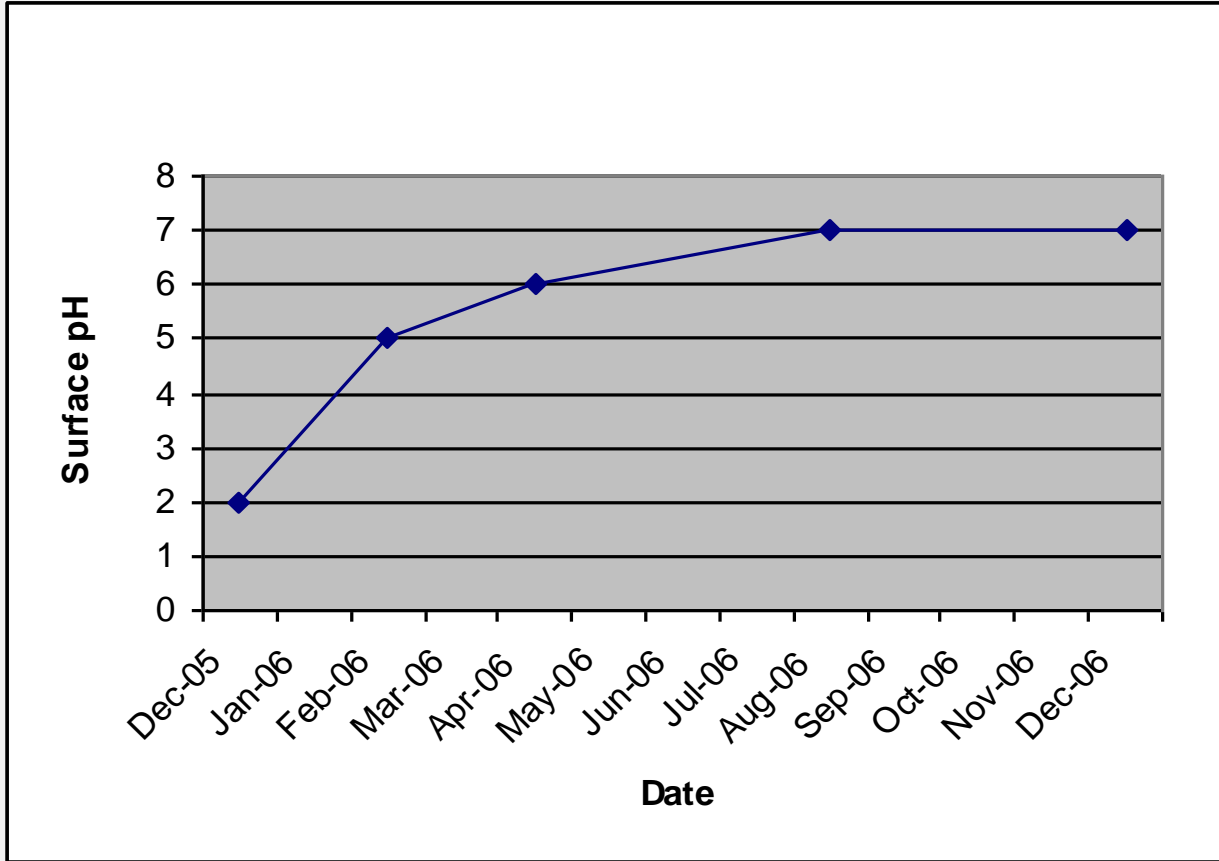
- Session: 1 (OdaLog: OL45036022)



— INST : Min (1 ppm) Max (81 ppm) ▼ Day Transition Average (16.6 ppm) — Temperature



NO OTHER TREATMENT TECHNOLOGIES HAS BEEN SEEN YET TO IMPROVE SURFACE PH



Source Data L.A. County San District



KEEPING ODOR UNDER CONTROL

- **Sodium Hypochlorite, Hydrogen Peroxide** – attacks all biology indiscriminately and chlorine gas corrodes
- **Nitrates** – can cause a biological “grease” mat and longer pump run times due to nitrous oxide gas
- **Magnesium Hydroxide** – poor startup planning and shortcuts can consume man-hours initially



THE ADDED BENEFIT OF ODOR CONTROL

Saponification – Break Down, Decompose **FOG!!!**

- ◆ By raising the pH of the wastewater to 8 or higher, Magnesium Hydroxide breaks fats (FOG) down into a mild soap and glycerol. Glycerol is then consumed at the plant or in the collection system by the biology. 👍

FATTY ACID

GLYCEROL

CARBOXYLATE SALTS - SOAP



THE ADDED BENEFIT OF ODOR CONTROL

Saponification – Break Down, Decompose **FOG!!!**



Better for the system **Downstream at the Treatment Plant!**



COLLECTION SYSTEM BENEFITS

- ◆ Non-Hazardous/G.R.A.S.
- ◆ One dosing point gives pH and Odor control for miles
- ◆ Provides corrosion protect when doing odor control.
- ◆ Reduces FOG
- ◆ Least Expensive to the Total WW Treatment System



Waste Water Treatment Plant Effects



Maintaining Control and Achieving Compliance

Biological treatment plants and collection systems operate better with wastewater that has proper, stable pH, lower acidity and higher available alkalinity.

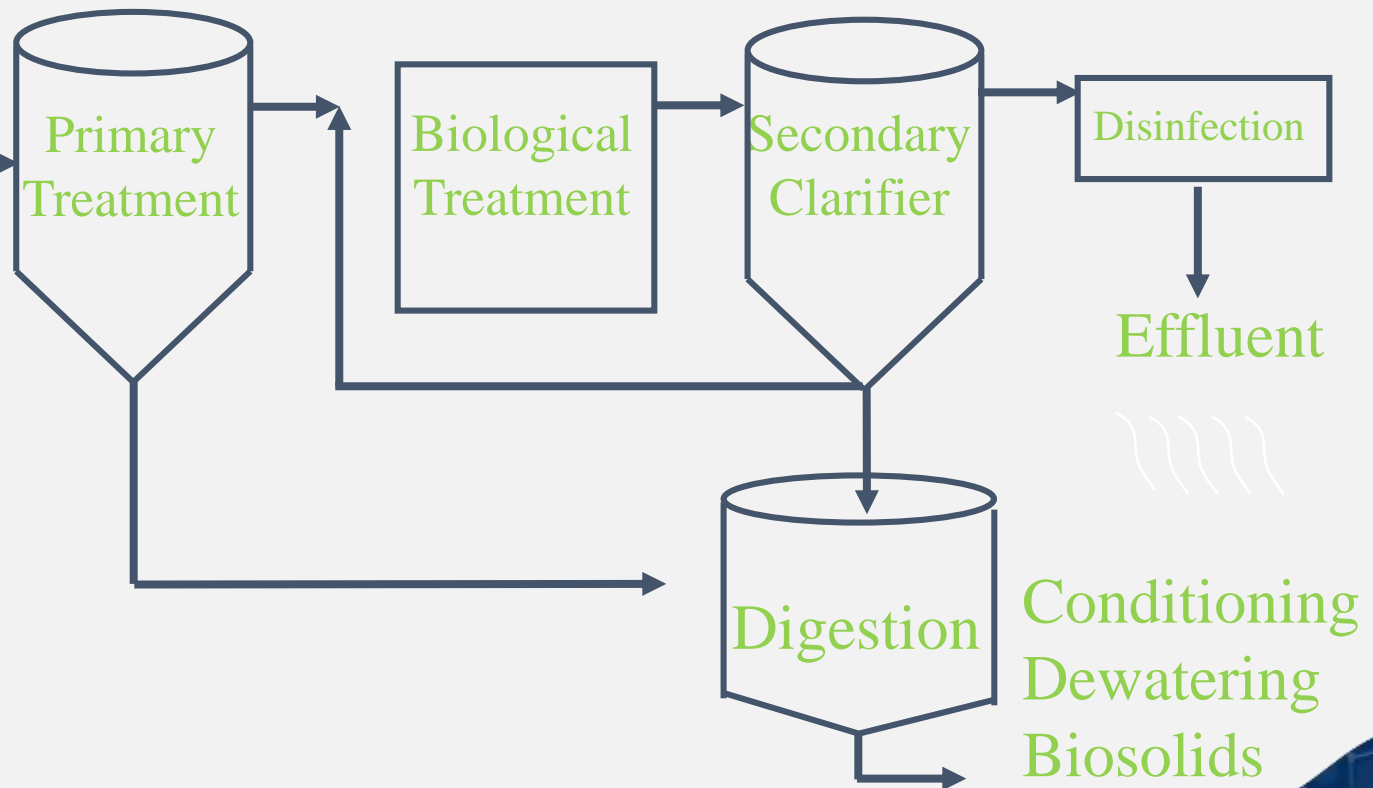


MAGNESIUM HYDROXIDE

- ◆ A More Natural Approach to Wastewater
- ◆ Total System Treatment.



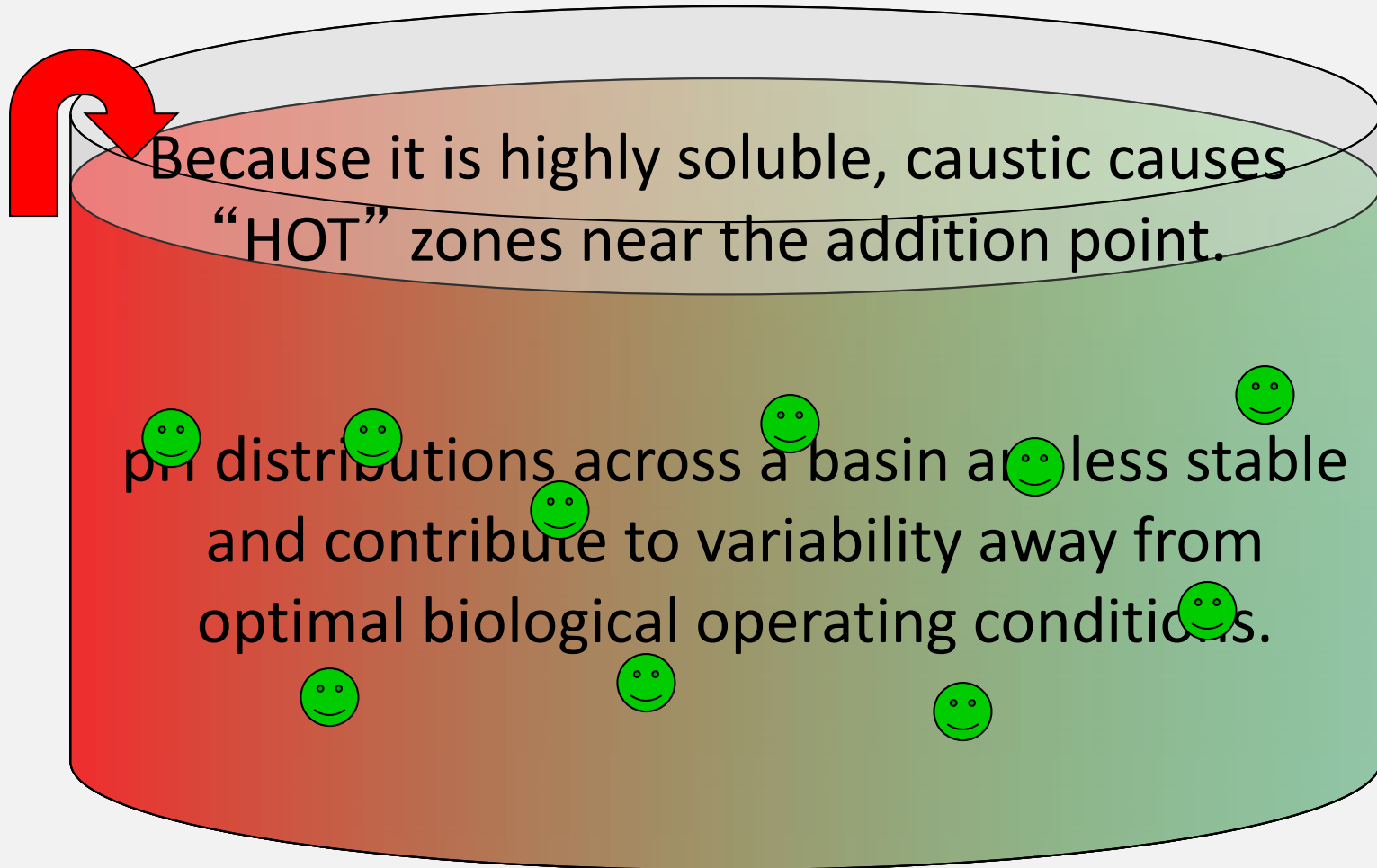
Collection
System



TAKE FULL ADVANTAGE OF YOUR PLANT DESIGN CAPACITY

- 
- ◆ Utilize the entire tank volume to improve contact time.
 - ◆ Deliver **Magnesium** nutrition to biology for improved respiration.
 - ◆ Decrease settling volume to improve **dewatering and effluent TSS**.
 - ◆ Improve efficiency and **alkalinity and pH control sources**.

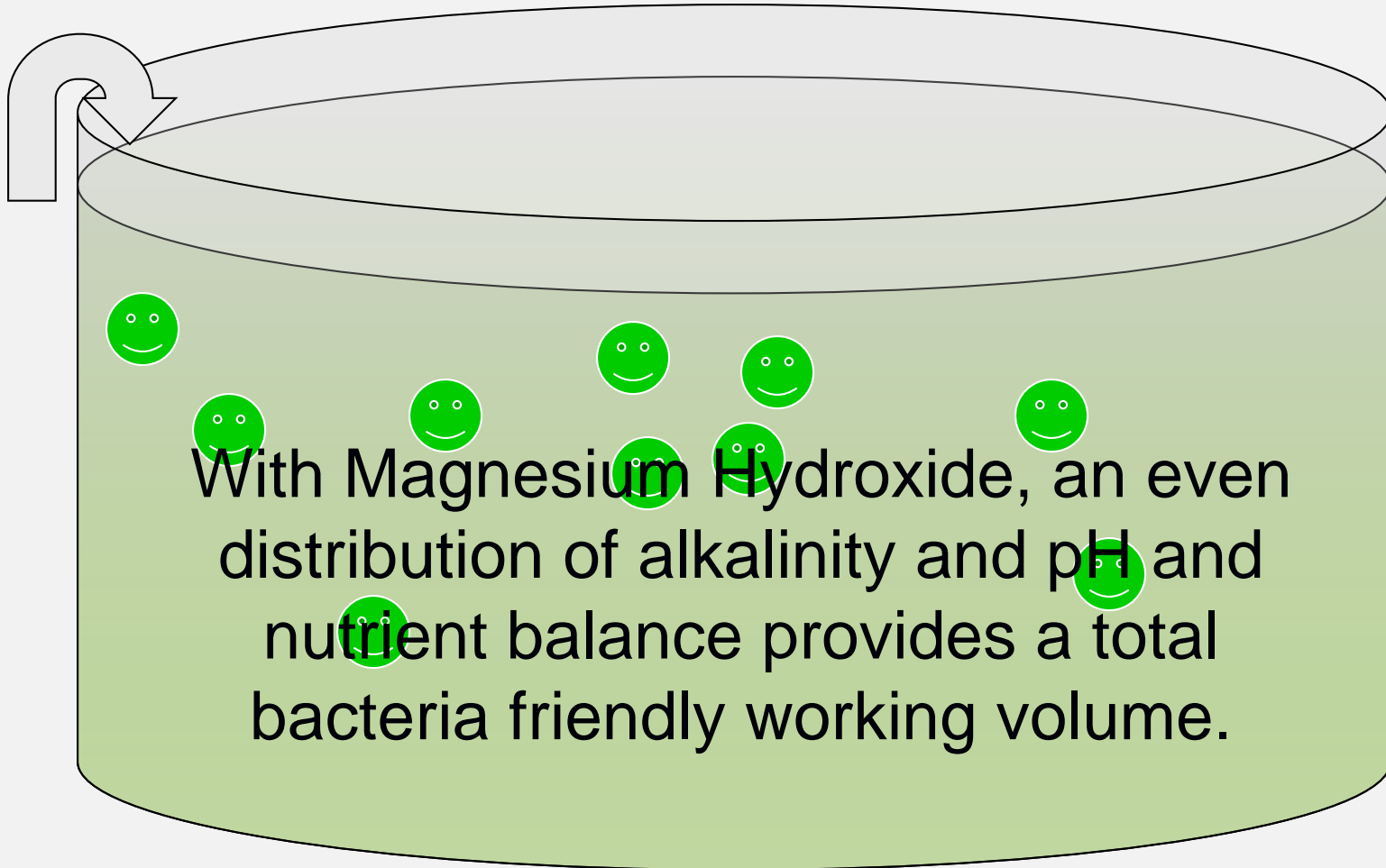
CAUSTIC SODA ADDITION



IF IT BURNS YOU, IT HURTS THEM

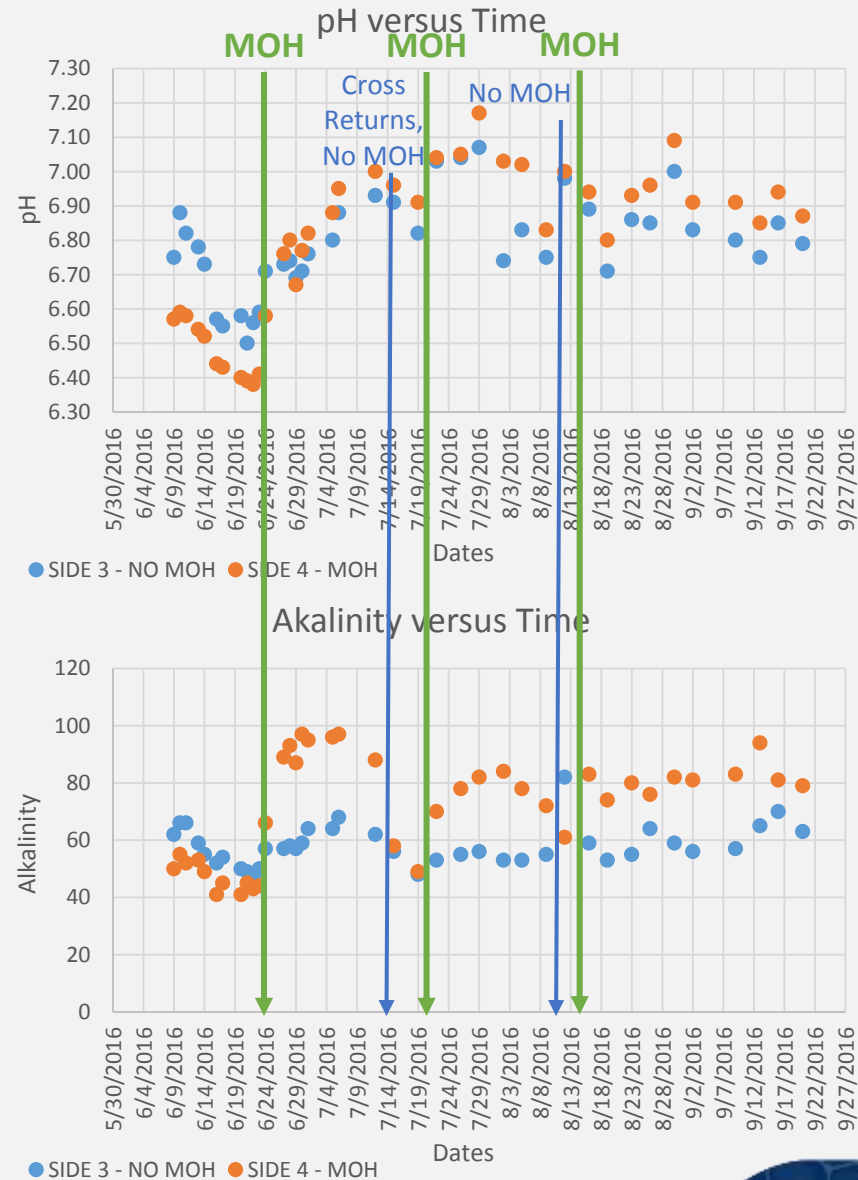


WITH MAGNESIUM HYDROXIDE



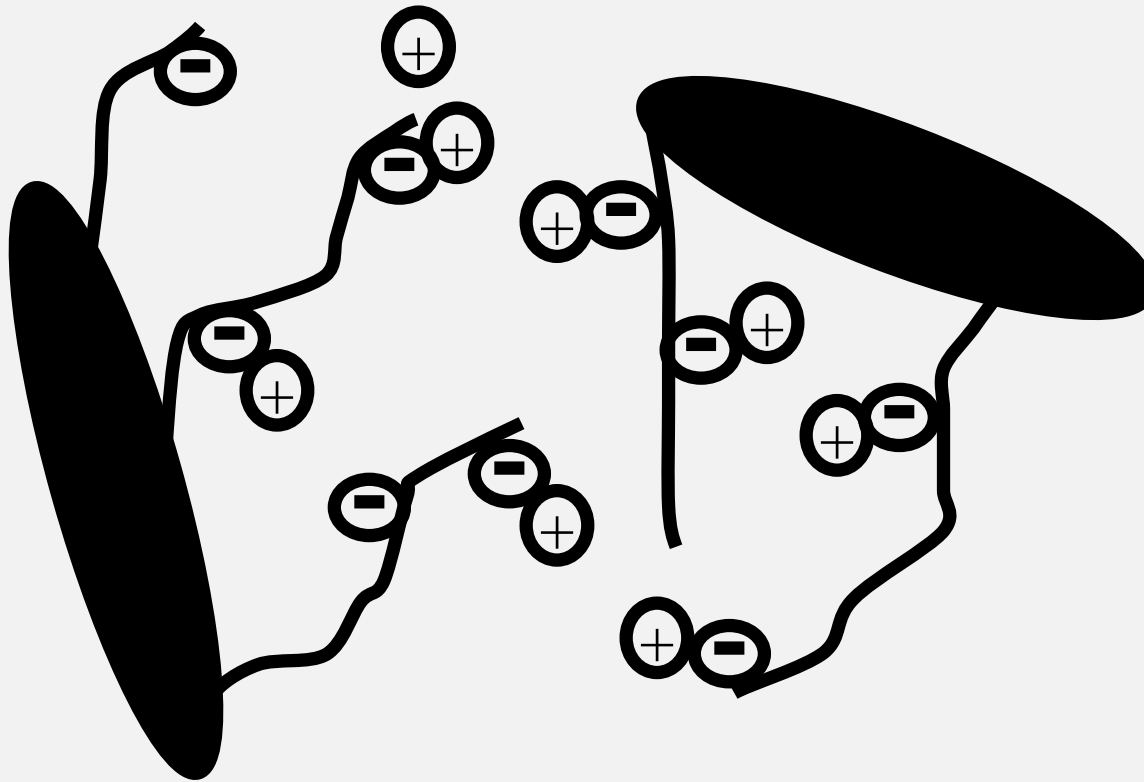
PLANT STABILITY AND ELIMINATING UPSETS

- ◆ Watch BOTH pH and Alkalinity, they may not track the same!!
- ◆ Good pH may not equal sufficient Alkalinity



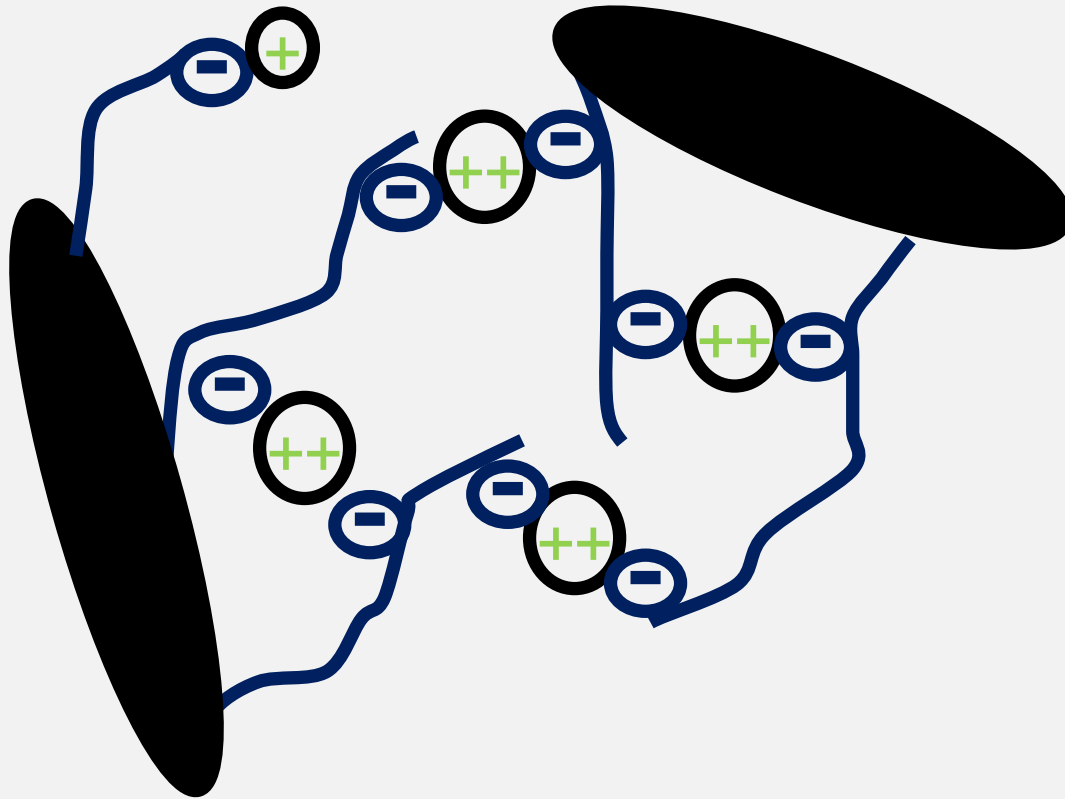
EFFLUENT DEWATERING CLARITY & EFFICIENCY OF PRESS

- ◆ Monovalent Cations (Na^+) Bond to Negative Anion Sites on Exocellular Biopolymers



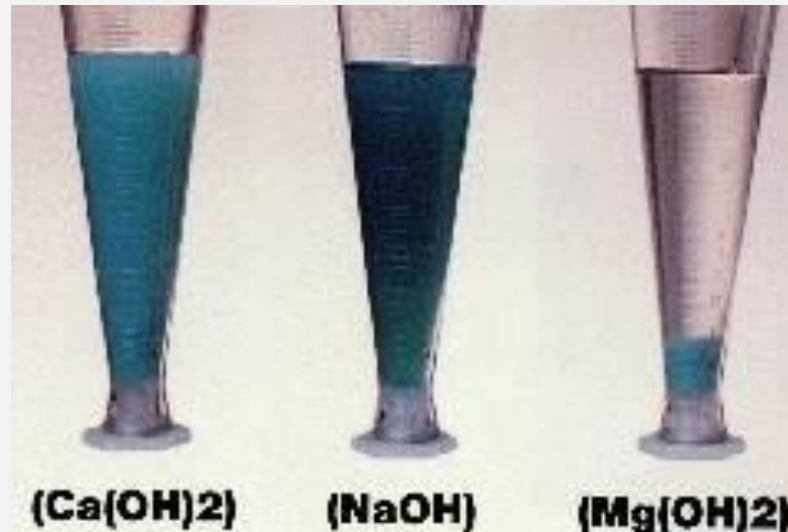
EFFLUENT DEWATERING CLARITY & EFFICIENCY OF PRESS

Divalent Bridging Improves Floc Matrix



EFFLUENT DEWATERING CLARITY & EFFICIENCY OF PRESS

MAGNESIUM HYDROXIDE CAN IMPROVE SLUDGE DEWATERING



When compared to calcium hydroxide (far left) and sodium hydroxide, magnesium hydroxide (far right) substantially reduces sludge volume as shown in this laboratory acid neutralization test.



IMPACT OF MAGNESIUM HYDROXIDE

CHEMICAL	% REDUCTION	ANNUAL SAVINGS / MGD
Ferric Chloride FeCl ₃	75-100%	\$1,553 – 1,100
Polymer	75-100%	\$533 - 400
Chlorine Cl ₂	20-30%	\$496 - 330
Sulfur Dioxide SO ₂	20-30%	\$377 - 250
TOTAL ANNUAL CHEMICAL SAVINGS		\$2,960 – 2,147
5-YEAR SAVINGS		\$14,804 - 10,739



MAGNESIUM DEFICIENCY IN OUR DIET



- ◆ Modern agricultural practices have depleted the nutrient content of our foods, creating common health issues due to mineral deficiencies in our diet.



CALCIUM MAGNESIUM BALANCE



- ◆ Approx. 43% of the US Population use supplements containing calcium.
- ◆ Without balancing their calcium with magnesium they may be at risk.



LOW MAGNESIUM LINKED TO HEART DISEASE



- ◆ Research reveals that low Mg levels – not cholesterol or saturated fat intake – are the greatest indicator of heart disease.



MOH FOR THE COMMUNITY

UTILIZATION IN YOUR COMMUNITY'S WATER TREATMENT PROCESSES-BETTER WATER

- ◆ The MOH Nutri-Mg⁺⁺® Process
 - a proprietary strategy
 - enables municipalities to enhance their treatment of potable water
 - Including protecting their water distribution assets
 - Subtly fortifying their water supply with an essential mineral supplement.
- ◆ Positive consequences
 - Can reduce the need for corrosive, acid-rich flocculating and settling chemistries
 - Eliminates the need for common pH enhancement modifiers
 - Likely reduces the need for corrosion and scale inhibitors throughout the distribution system



MOH FOR THE COMMUNITY

UTILIZATION IN YOUR COMMUNITY'S WATER TREATMENT PROCESSES-BETTER WATER

- ◆ **Nutri-Mg⁺⁺**[®] has been proven to have tremendous potential as a flocculation aid in drinking water treatment, offering multiple and varied benefits, including:
 - ◆ **HEALTH BENEFITS:**
 - Drinking water fortified with magnesium, as Mg⁺², is proven to be beneficial to human health, according to the World Health Organization (WHO)
 - Reduction in sodium, sodium hydroxide/caustic soda, NaOH related to an increase in hypertension
 - Reduction in alum/aluminum
 - Visit **www.nutritionalmagnesium.org** to learn more about magnesium as an essential nutrient that is indispensable to life



AVOIDING THE CRISIS OF BIOLOGICAL UPSETS

The difference between a Good Day and Bad Day

- ◆ **Odor Control**
Headworks, RBCs, Digesters, Sludge Holding, and Dewatering
- ◆ **Treatment Enhancement**
Effluent Quality and Plant Capacity - BOD, COD, SVI, TSS, MLSS, MLVSS, RAS, DOC
- ◆ **Better Bio-solids** Volume and Disposal
- ◆ Improved Safety and **Environmental Compliance**

