



***CISTERN is a novel soil amendment containing multi-functional soil surfactants and humectants that have been carefully “tuned” so their components work together to enhance plant tolerance to water deficit and heat stress by correcting hydrophobic conditions in the subsurface layers of the soil profile as well as by improving moisture retention and reducing the loss of water due to evaporation and drainage.***

## **We’ve Reset the Standard for Surfactant Performance**

CISTERN takes advantage of break-thru surfactant technologies and humate chemistries to provide the golf course superintendent and turfgrass manager with a unique broad spectrum solution to address water repellency problems and strengthen the soil profile’s ability to acquire and retain water needed for plants and turfgrass to stand up to heat and water deficit stress.

### ***“Tuned Surfactant Technologies”***

“Tuned” surfactant formulations don’t involve just changing the rate or putting a different use label together for the same product. CISTERN offers the golf course superintendent a whole new set of *optimized surfactant hydration and water movement* performance characteristics that are needed to address highly problematic soil water repellency conditions.

### ***Extended Performance Profile***

The CISTERN formulation also contains a mixture of hydrophilic humectants and hygroscopic compounds that in combination with CISTERN’s blend of surfactants, will extend and enhance rootzone hydration characteristics and plant tolerance to water deficit stress and drought conditions. These humectants molecules attract water molecules from air spaces within the soil profile and when required by the plant, make these water molecules “available” for uptake by the plant root system.

Because plants are able to obtain water that was previously unavailable, golf course superintendents and production managers should experience improved rootzone moisture conditions and improved water conservation.

## **Significant Advancements in How To Deal with Water Repellency**

The CISTERN blend of chemistries results in a multi-functional soil amendment with a range of chemical and physical properties that addresses the demand by turfgrass and production managers for a water management product that will:

- Overcome problems with water repellency on soil particles
- Increase infiltration rates and reduce runoff
- Improve wetting and promote uniform water movement into and throughout the soil profile
- Increase irrigation effectiveness and efficiency
- Reduce stress conditions and improve recovery from stress
- Will not burn target plants
- Reduce watering requirements
- Improve seed germination and minimize transplant loss

### **APPLICATION RATES:**

#### **Greens & Tees, Fairways, Bunker Faces, Collars, Sports Turf, Parks/ Recreations Areas, Commercial Property, Residential Lawns, and Landscapers**

General Application: Apply CISTERN at 6–8 oz. (180–235 ml.) per 1000 sq. ft. (100 sq. meters) in 2 gallons (8 liters) of water. For best results, apply every 2-4 weeks as required. A light watering-in after application is recommended to ensure movement into soil profile.

Sodding, Overseeding and Sprigging: Apply CISTERN at 6–8 oz. (180–235 ml.) per 1000 sq. ft. (100 sq. meters) in 2 gallons (8 liters) of water. For best results, apply every 2-4 weeks as required. A light watering-in after application is recommended.

General Turf Granular: Apply Cistern G uniformly at the rate of 1 to 2 pounds per 1000 sq. ft. Apply every 2 to 4 weeks as required. A light watering-in is recommended after application to ensure Cistern G is moved into the soil profile. Cistern G is safe – NO BURN.

Sodding, Overseeding and Sprigging Granular: Apply Cistern G at the rate of 1 to 2 pounds per 1000 sq. ft... A light watering-in after application is recommended. To ensure Cistern G is moved into the soil profile. Do not apply to wet turf conditions.



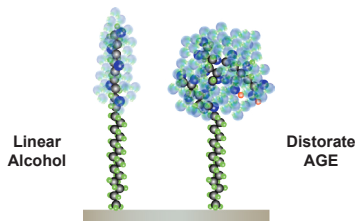
**CISTERN**  
SOIL SURFACTANT AND HUMECTANT COMPLEX

## “Tuned” Surfactants and Humate Chemistries

*CISTERN utilizes advances in surfactant humate and formulation technologies to offer golf course superintendents and turf managers a more comprehensive set of performance characteristics than found in other “wetting agents.” CISTERN contains a blend of new, highly effective chemistries that can be “tuned” to take advantage of their unique patterns of self-assembly and compatibility with other formulation components.*

### Disorrate AGE

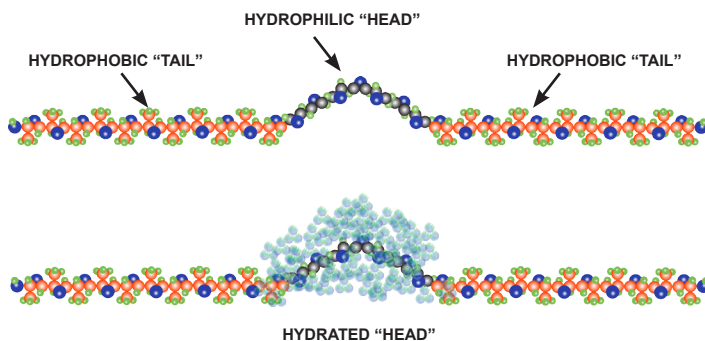
The first constituent of CISTERN is **Disorrate AGE**, a new class of alkylpolyglucoside ester surfactants derived from natural, renewable raw materials. Golf course superintendents will find that the Disorrate AGE surfactant chemistry will make a significant contribution to the infiltration performance and sub-surface hydration of the soil profile because of the large size and repulsion to water by its non-polar “tail” and the large size and attraction to water by its polar “head.”



Graphic depiction of hydrated linear alcohol surfactant and the new generation Disorrate AGE alkylpolyglucoside ester surfactant. Note the larger, Improved hydration profile of the Disorrate AGE surfactant.

### Tri-block Copolymer

The second constituent in the CISTERN surfactant blend is a tri-block copolymer. It was chosen for its exceptional ability to establish or restore adhesion sites (water attracting negative sites) on water repellent surfaces. In addition, this tri-block copolymer is proven to promote uniform vertical and lateral movement of water and solutes into and through the soil profile.



Graphic of tri-block surfactant used in CISTERN formulation.

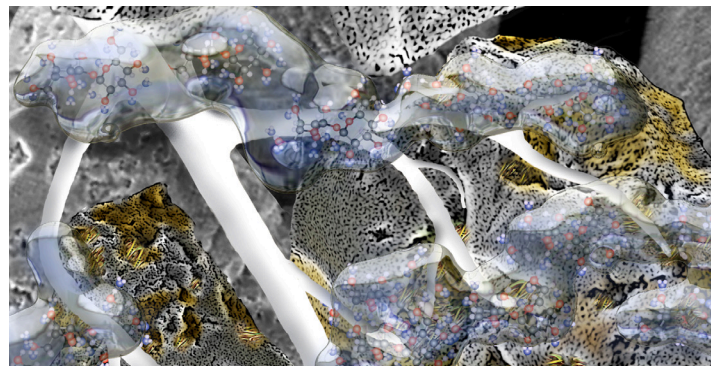
Disorrate AGE and its tri-block co-surfactant both contribute to preventing disruption of the wetting front by creating sites for water attachment (reducing surface tension). The larger, more complex tri-block surfactant also promotes downward and lateral movement of water (matrix flow).

### Humectant Complex

A humectant complex has been added to the CISTERN formulation primarily to harvest and retain ambient water in the soil profile. These humectants are a mixture of several short-chained sugar alcohols (polyols) and longer chained polysaccharides that both contain several hydrophilic (water loving hydroxyl groups) sites.

The polar nature of most sugar alcohols and polysaccharides allow them to absorb microscopic amounts of free water found in the pores of soil rootzones. Since the water molecules are not held “tightly” to the humectant compounds, roots can take up this new source of available water through osmosis.

This is a net gain for the plant since without the humectant “bridge,” this microscopic water would be unavailable and eventually lost through evaporation.



Graphic depiction of hydrated humate molecules providing a unique source of water to fine roots.

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