Surfactants:

Practical Tool For Turf Uniformity

Race track grounds crew applies a surfactant to infield to eliminate dry spots and to obtain uniform turf appearance.

Managing large turf areas characteristic in sports is considerably different than managing other types of turf The primary goal is to establish and maintain a dense, uniform stand of turfgrass to provide optimum footing, reliable bounce and cushion for falling athletes. Any gap in the uniformity of the surface not only reduces the competitiveness of the sport but can result in serious injuries to players.

One of the biggest obstacles to achieving uniformity of turf is a lack of uniformity in soil conditions across an entire field or playing surface. Sports turf managers employ a variety of methods to eliminate inconsistencies in soil conditions on playing fields. One particular method being utilized more today than in the past is the periodic application of chemicals called surfactants. These chemicals, when used in conjunction with other methods of soil maintenance, can improve drainage, reduce compaction and increase irrigation efficiency.

The most reliable method of assuring consistent soil conditions across an entire playing area is to construct a field to precise specifications. Such specifications are designed to provide uniform drainage, soil texture and irrigation. Qualified athletic field contractors go to great lengths to test and mix soil components before they are spread and graded on the field. Sands must be of a certain particle size and soils must contain the right fractions of sand, silt and clay. Any unreasonable departures from specifications are cause for rejection.

Since reconstruction is an expensive proposition, a number of methods to improve soil conditions without disrupting existing turf have been developed. One of the most practical and effective of these is aerifying or coring. In this process hollow tines or solid tines are driven into the soil to open up channels for air, water and chemicals such as fertilizers and insecticides to enter.

Topdressing with sand or organic matter is sometimes combined with aerification to help level out areas, cushion soil from the weight of foot traffic and to provide a uniform growing medium on the surface. Topdressings will fill in holes left by aerifiers to provide a very limited form of soil modification.

Vertical mowers and thatch rakes are other devices used to make sports turf surfaces more uniform. They remove excessive thatch which may be impeding water and chemicals from entering the soil. Vertical mowers can also open up the surface soil for overseeding or break down bumps to make the surface smoother.

Despite efforts to make all soil equal, irregularities in turf density and health still develop. One of the most obvious is localized dry spots. Water is simply not absorbed as rapidly in these areas as in surrounding turf areas. Surfactants are gaining popularity today as a solution to localized dry spots.

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Dr. Martin Petrovic of Cornell University has studied the effects of surfactants on turf for more than ten years. He says localized dry spots that were once considered a problem just on golf courses, are now a growing concern on other turf areas.

Petrovic points out that localized dry spots are caused by a fungus. This fungus produces a wax-like material which coats thatch and soil particles. The wax seals the soil surface in the area preventing moisture from entering the soil. In a short time, the turf goes into water stress. Tests have shown surfactants can get the water through these areas and help the turf recover.

The way to distinguish localized dry spots from chemical burn or buried debris under the surface is to take a soil sample in the affected area. Petrovic says if the soil is considerably drier than a sample taken from a nearby healthy area, the problem is localized dry spot.

Surfactants are not soil conditioners, they are water conditioners. The word surfactant is derived from the words "surface active." They effectively reduce the force that holds water droplets together so droplets become smaller. Smaller droplets can then fit between a wider range of soil particles. Once water is more "surface active," it will penetrate soils and soil layers that previously would not accept it.

Surfactants have many practical benefits for the sports turf manager. They help reduce soil compaction, one of the biggest enemies in sports turf, by preventing water-soaked surface soil. Wet soil packs down more easily under the weight of a player or piece of maintenance equipment. For this reason, some sports turf managers apply surfactants to compaction-prone areas, such as bench areas on football fields, turf adjacent to golf cart paths, and goal boxes on soccer fields. If water drains quickly in these areas and the soil does not stay wet, compaction can be greatly reduced.

Compacted soils lack sufficient pore space between soil particles for the air and water turf requires. Dr. William Daniel, professor emeritus of Purdue University, says an ideal, well-textured clay/loam soil should contain by volume 25 percent air and 25 percent water. The remaining half is soil solids and organic matter.

Daniel, who invented and is continuously adapting the Prescription Athletic Turf (PAT) system, is a proponent of sand for athletic field and golf green rootzones. Since sand of the size range suggested by Daniel drains rapidly and does not store as much water in its pore spaces as clay or loam, closer attention must be paid to fields constructed with sand. Sand resists compaction and contains a great deal of air.

But the vast majority of fields today were built with local topsoils. When these soils become compacted, it becomes harder for water to infiltrate the surface and drain through.

Daniel's research has shown that compaction reduces the amount of water draining into a clay/loam soil from 1.5 inches per hour to less than half an inch per hour. As the infiltration rate drops, the percentage of runoff increases to more than 75 percent of water applied to the surface. In other words, compacted athletic fields reject three fourths of the irrigation water and rainfall applied to them.

Although compacted soils reduce infiltration, they also hold water more tightly says Dr. Herbert Dostal, vice president of research for Four Star Agricultural Services. Compacted soils do not drain as well and stay wet longer than well-textured soils. Dostal also points out that well-drained and aerated soil serves as a more favorable environment for beneficial soil flora and fauna and reduces the potential of severe soil-borne diseases.

Robert Moore, president of Aquatrols Corporation of America, says tests have shown untreated soils take six times longer to drain than soils treated with surfactants. To avoid compacting wet soils, Moore says traffic from mowing or play should be avoided on untreated fields for six hours or longer after a heavy rain or irrigation. This is the time it takes for the soil to drain off excess water. Traffic could be resumed on the same field treated with surfactant in about an hour, according to Moore.

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Healthy turfgrass is often the result of deep roots. Surfactants enable water and water soluble nutrients and chemicals to leach deeper into the rootzone. Often distinctly different layers of soil below the surface prevent deeper penetration of water and nutrients. Water reaches these layers and stops. Surfactants allow the water to pass through these layers. Roots will then grow deeper to reach and utilize this moisture. Roots that were once merely two or three inches long can extend more than 18 inches into the soil to reach water and nutrients.

As the importance of irrigation is realized by a rapidly growing number of athletic field managers, so is the importance of surfactants. They have discovered, like golf course superintendents, that natural rainfall is too unpredictable to maintain acres of important turf to the standards required by most sports.

Managers of all sports facilities share a concern for using water efficiently. Irrigation systems, intended to place water only where it is needed, have often been misused to waste water. Excessive irrigation not only wastes water, but contributes to compaction problems. Surfactants help cut water waste by getting applied water into the soil.

Turf managers who gauge how much water to apply to a large area by the appearance of localized dry spots will waste thousands of gallons of water and cause damp conditions favorable to turf diseases. By treating the dry spots separately or by injecting surfactants into the irrigation system, vast amounts of water can be saved.

Of course, surfactants won't help if the irrigation system is poorly designed and maintained. Poor irrigation patterns must be corrected first. Once an irrigation system is performing well, surfactants injected into the system can cut water usage by a third, says Moore. He attributes the savings to rapid infiltration, less runoff and less chance of loss to evaporation.

Surfactants can also be applied in granular form to the surface. These materials must be watered in to become effective. Both injected and granular materials improve water flow in the soil for up to 30 days. It's important to reapply the materials according to a schedule to maintain the benefits. Since surfactants change the water, not the soil, once they are depleted the soil is as flawed as it was when you started.

Both compaction and excessive irrigation are primary factors in the invasion of *Poa annua* on fairways and athletic fields. These conditions favor annual bluegrass over bentgrass or Kentucky bluegrass. Surfactants can be used to improve drainage in these areas and discourage *Poa annua* from invading.

When used in combination with other practices, such as lightweight mowing, clipping removal, aerification and reduced irrigation, surfactants can play an important role in stopping the spread of *Poa annua*.

One surfactant, AquaGrow, has been shown to reduce the number of seedheads on stands of annual bluegrass. The weed's short, white seedheads spoil the appearance and uniformity of desired turf in the summer. They are also the primary method the weed uses to spread. By greatly reducing the seeds produced by *Poa annua* and correcting soil moisture conditions, the desired turfgrass will overtake the invader in two or three seasons.

Another contributing role played by surfactants is helping insecticides and preemergence herbicides get into soils where they must be to work. Some insecticides have a difficult time getting through heavy thatch layers. If they become bound to the thatch, when they are needed for insects feeding below the surface, they are wasted.

Thorough distribution of preemergence herbicides in the rootzone is very important for their effectiveness. These products prevent weed seeds in the soil from germinating. If dry spots reject the herbicide solution, control will not be provided.

Some formulations of herbicides and insecticides may already contain surfactants. Read the labels on your particular pesticides and check with your chemical suppliers before mixing them with surfactants. Furthermore, surfactants do differ. Use those marketed specifically for turf.