CAPTURING The Good Points Of Clay

During the second half of the 20th Century, sports turf managers of all types have been waging a battle against unsafe and poor playing conditions on large recreational turf areas.

By identifying the key flaws in soils, turfgrass selection, and maintenance, they have impressed both athletes and fans with their skill. Injuries have been reduced, playing conditions have improved drastically, and the quality and appearance of golf courses and athletic fields has never been better.

In the heat of battle, turf managers have focused on certain enemies of quality sports turf. One of these has been clay. This natural component of soils throughout the country has been linked to compaction, poor drainage, shallow rootzones, surface hardness, and poor footing. When sports facilities have the budget and ability to remove or amend clay in their soils, they will go to great lengths to eliminate the headaches it causes. However, in doing so, they also give up some of the beneficial characteristics of clay.

Clay acts like a sponge for water and chemicals. It can absorb and store significant amounts of moisture and nutrients and release them to plant roots gradually over a period of time. This gradual-release characteristic can protect plants from high concentrations of chemicals. The chemical term for it is buffering. Clays, due to their large surface area, also provide a vast number of sites for chemical reactions to take place. This reactivity is important in converting nutrients from their applied form to a form that plant roots can absorb. Cation exchange capacity is the measure of this reactivity.

Organic matter also buffers chemical reactions in the soil and provides important cation exchange capacity. Sand, on the other hand, offers very little in the way of buffering or exchange capacity.

Clay, like sand, is inert. It does not change or rapidly break into different components in the soil over time. Its properties remain consistent and predictable. Compare this to organic matter in the soil which does change as it decomposes. Decomposition of organic matter can supply nutrients for turf, but it also requires oxygen and nitrogen from the soil to occur.

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The bad reputation of clay is based upon its size and tendency to plug pore spaces in the soil. As the smallest of soil particles, clay settles between larger particles. It will form tight layers within the soil profile which disrupt drainage and aeration, processes necessary for healthy turf growth. Clay layers can restrict root growth and deprive plants of soil moisture and nutrients deeper in the rootzone. Clay also compacts easily when wet.

For more than 40 years, scientists have known that certain types of clay can be processed into crystalline aggregates hundreds of times larger than clay particles. By solving problems associated with the size of unprocessed clay, manufacturers were able to offer soil drainage and aeration similar to sand, in addition to moisture and nutrient retention, buffering, and exchange capacity.

The process, called calcining, heats clay to remove moisture and strengthen the bonds between particles. The resulting crystals retain their integrity in the soil, resist compaction, do not become slippery when wet, and provide a more controlled absorption and release of water and nutrients. They can be sized and screened to match the size of medium to coarse sand.

"Calcined clays rescued a huge number of greens in the late '50s and early '60s," points out Dr. William Daniel, retired Purdue University professor. This was before sand became popular in golf green construction. The clay improved the drainage and texture of compacted soil greens. "If you had a wet spot on a green, you topdressed it just like we do today with baseball infields."

When the USGA Green Section released its perched, sand-based rootzone in 1960, superintendents found that sand was easier to obtain than calcined clay. Because sand was available from a number of sources, it could be shipped more cheaply. "It became a question of the cost, not a failure of calcined clay," recalls Daniel. "At the time, the manufacturers also lacked a fine size of calcined clay which would have been more appropriate for incorporation in sand greens."

There are two reasons why calcined clay costs more than sand: It requires specific types of clay, mined only in certain locations, and the energy to process it. The two most popular calcined clays, Turface from Aimcor and Terra-Green from Oil-Dri, come from separate mines in Mississippi. They

are processed in the state and shipped to users from there.

Aimcor's mine is in Blue Mountain, MS. The unique deposit of montmorillonite and illite clays is removed and carefully heated to extract moisture without destroying the structure of the aggregates.

"To understand how Turface works, you really need to know the structure of the clay," explains Dr. Louis Ferrara. "There are six different types of clay. Montmorillonite clay is like a sandwich: Two layers of silica surround a layer of mineral, such as aluminum. Water is held both on the surface and within the layers. The surface can be relatively dry, even though moisture is stored inside the sandwich. Nutrients such as nitrogen, iron, potassium, or phosphorus can be stored in the clay by exchanging with the aluminum in the center."

The illite clay consists of two layers. It absorbs and releases water more slowly than montmorillonite. The combination of the two allows the product to absorb moisture at a rate and duration that fit the needs of sports turf managers, says Ferrara.

Terra-Green is montmorillonite clay from a mine in northeastern Mississippi. The raw clay is crushed, dried, screened, and then baked at temperatures up to 1500 degrees F. The finished product consists of red and grey granules ranging in diameter from .25 mm to 4 mm, depending upon the intended use.

"Clays have unique properties and definable structures," says Terry Kippley, Terra-Green product manager. "Superheating strengthens the structure and lowers the solubility of the granules. It creates and reinforces a network of pore spaces for air, water, and nutrients."

When asked about the durability of calcined clays, Kippley referred to a Purdue study conducted in 1962. Robert Montgomery, a graduate student, showed that several calcined clays had 94-percent stability or better when exposed to moisture, freezing, and thawing over a two-year period. Daniel, who was Montgomery's professor, reveals that calcined clay remained stable in a sand mix green at Purdue for more than 25 years.

Montgomery also reported that calcined clay improved the infiltration of fine-textured soils, allowed more intensive root growth, and increased the cation exchange capacity. In unirrigated plots, Montgomery found that rootzone mixes containing calcined clay and peat decreased the tendency of turf to wilt during droughts.

The primary uses of calcined clay today are for topdressing and soil incorporation on athletic fields for moisture control. The standard rate for topdressing turf after aerification is 50 pounds per 200 square feet. "This rate can vary depending upon the size of the core holes, the number of cores per square foot, and the height of the grass being aerified," explains Charles Selvik, Aimcor's director of marketing communications.

Topdressing provides backfill for the core holes and a layer of material on the surface. Any standing water will be absorbed rapidly to dry the surface to a playable level. The other potential benefits of topdressing are improved infiltration and compaction resistance.

Perhaps the biggest use for calcined clay has been incorporation into skinned baseball infields. By amending clay infield mixes with coarse fractions of calcined clay, infiltration and drainage improve.

The water storage capacity of calcined clay also controls the moisture level and texture of dirt infields and basepaths. Recommended rates of calcined clay for skinned infields depend upon the depth of

continued on page 28

DON PARKER

Don Parker, a golf product application engineer for Rain Bird Sprinkler Mfg. Corp. who worked with the company for 25 years, passed away recently. He was 54.

"Don epitomized service within our industry," said Peter Johnson, marketing manager of Rain Bird's golf division. "As our first golf product application engineer, he was renowned for his caring 'bedside manner' and was blessed with the ability to convert even our most difficult customers into ardent supporters of Rain Bird. We will miss Don Parker, a true friend and a most respected colleague."

The Don Parker Service Award has been established in his memory. It will be presented annually to a person in the golf industry who continues Parker's standard of service excellence.

BOSCH APPOINTED TURF SPECIALIST

Northrup King has appointed Fred Bosch to the position of turf specialist, Medalist Turf Division. He will be responsible for sales of Medalist Professional Turf Products in the Michigan, Ohio, western New York, and western Pennsylvania areas.

Bosch holds a bachelor's degree in agriculture from Ohio State University, where he majored in agronomy and specialized in turf management. Most recently, he was a technical sales representative for W.A. Cleary Chemical Corporation. Before that, he was golf course superintendent at TRW Golf Club in Chesterland, OH.

SOD COMPANY FORMED

John Foster, former president of Foster Turf, recently announced the formation of West Coast Turf, a commercial sod producer in California's Coachella Valley.

Joe Foster and Jim Cole, also former Foster Turf employees, have also joined West Coast Turf. The office manager is Jennifer Clark.

The company will market bentgrass, hybrid bermuda sod, and stolons.

The Good Points of Clay

continued from page 27

incorporation and the percentage of calcined clay desired in the dirt. Percentages range from ten to 35 percent.

A more recent use for calcined clay is for soil incorporation prior to sodding. Dr. Hank Wilkinson at the University of Illinois in Champaign/Urbana has been testing different rates of Turface in a poor clay soil for the past year. "We found that ten percent [mass/mass at three inches] was effective in improving a low-maintenance soil medium for the rooting of sod" he reports. "More than ten percent did not appear to provide additional benefit. We are now exploring lower rates. We also need to evaluate rates for incorporation into sand."

Calcined clay was used in the past three years in the sand rootzones at Joe Robbie Stadium in Miami, FL, and Soldier Field in Chicago, IL. Roger Bossard, groundskeeper with the Chicago White Sox, is mixing Turface and peat in the sand-based field at the new Comiskey Park. The clay improves the moisture and nutrient retention of the sand until the turf contributes its own organic matter. Finer grades of calcined clay are closest to the size of sands in sand-based rootzones.

The question becomes, if calcined clay is effective in the sand-based rootzones of these stadiums, why can't it make a similar contribution to sand-based greens and tees? If it can, then what amount or percentage of calcined clay in sand is appropriate?

"Calcined clay was not fractionated for greens construction until recently," Wilkinson states. "The particles were too large. Now these products are available in sizes below 1 mm. The fine-sized versions may expand the usefulness of calcined clay in golf."

One recommendation for construction of greens and tees with regular Turface was for about 20 percent of calcined clay in the top six inches of soil mix. The suggested rate for Terra-Green is about five to ten tons per average-sized green. Both manufacturers advise superintendents to discuss rates with their local supplier.

No manufacturer has been able to get the USGA to include calcined clay in its specifications for greens construction. Perhaps the introduction of smaller-sized particles may warrant consideration by golf organizations.

There is little argument that raw, unprocessed clay has many negative characteristics for turf managers. Calcined clays, however, offer important useful features that should not be ignored.

