Skin surface selection and management for infield

THIS ARTICLE provides information on infield mix (soil) selection for use as baseball and softball skin surfaces, as well as maintenance guidelines to provide uniform playing conditions.

Soil used to construct a skin surface is referred to as infield mix. Thus, soil selection and management of skin surfaces will affect playability. A high quality skin surface is smooth, uniform, and provides consistent footing and ball response; whereas a poor skin surface can result in errors by players fielding ground balls, player injury, and chronic puddling in rainy weather.

A high quality skin surface is often described as one that is moist and cork-like, as opposed to hard and dry; the surface should allow players' cleats to penetrate the surface and leave an imprint with very little soil disturbance or displacement. The skin surface should not give way (break loose) when players plant their feet to throw, field a ball, or run. These characteristics are strongly controlled by the physical properties of the infield mix and its maintenance.

Physical properties of an infield mix are strongly affected by its sand and fines (silt and clay) content. Maintenance of a skin surface involves managing water (irrigation and tarping), dragging and grooming, and the use of conditioners. Dragging and grooming loosens, levels and smoothes the skin surface to maintain safety and playability. Conditioners are typically granular, clay-based materials used to maintain playability over a range of weather (water) conditions.

SELECTING AN INFIELD MIX

ASTM (2007) suggests that infield mixes consist of 60 to 81% sand with the remainder being comprised of silt, clay, and gravel (preferably none) according to the particle size specifications. A 4- to 6-inch layer of mix is placed above the subsoil and finished to final grade. In cases where the infield mix contains greater than 85% sand and exhibits high internal permeability after heavy compaction, the mix should be placed above a gravel drainage blanket to improve water retention and stability of the skin surface.

Mixes with less than 19% silt and clay are better suited for rainy climates due to better internal drainage; however, these mixes will require more irrigation in dry periods to minimize dust and provide a firm stable playing surface. In contrast, mixes with greater than 19% silt and clay will drain more slowly and retain more water; hence, the need to irrigate (frequency) will be less. Mixes with > 19% silt and clay will also be more prone to compact and be difficult to loosen, especially when dry.

Some field managers prefer skin surfaces that contain a greater percentage of fines (silt and clay) compared to the ASTM recommendation for infield mixes. An infield mix should contain between 50 and 75% sand because mixes with > 75% sand can become too loose and are readily moved (displaced) during play or dragging leading to high and low spots, as well as the formation of lips at the skin-turf boundary. Infield mixes should not exceed 40 to 50% silt and clay because these materials can become compacted, reducing the ability of the surface to accept water, and thereby limiting the grounds manager's ability to "soften" a hard skin surface with irrigation. [We] recommend infield mixes be comprised of approximately 60% sand, 20% silt, and 20% clay.

Skin surfaces should be constructed with a finish grade that provides adequate surface drainage (water runoff) away from and off the skin due to the limited permeability of most infield mixes. Baseball and softball skin surfaces should be designed with a finish grade of 0.5 to 1.5% slope away from the center of the infield.

Baseball and softball fields designed into multi–sport fields should surface drain water away from the infield and skin surfaces. Field designs that position skin surfaces of infields at the lowest elevation can render the baseball/softball field unplayable for several days after rain.

The following design parameters will provide reasonable skin surfaces for the majority of municipal and board of education baseball and softball infields.

1) Excavate 4 to 6 inches of native soil from the site.

2) Match the subgrade to the finish grade contours (ideally 1.0% slope away from the middle of the infield) using laser-guided equipment.

3) Firm, if necessary, but do not overly compact the subgrade (i.e. roll with a small [< 1 ton] pavement roller disengaging any vibratory function); any internal drainage that can be achieved through the subgrade will be beneficial.

4) Replace the excavated layer with 4 to 6 inches of infield mix containing no more than 70 to 80% sand (remainder silt and clay). Ideally, there should not be any gravel in the mix.

5) Use laser-guided equipment to final grade the skin surface to mimic the contour of the subgrade. This will ensure the correct contouring required for proper surface drainage.

6) A calcined clay conditioner product can be applied as a topdressing (0.25-inch or less) to the surface to create more consistent ball bounce and desirable sliding conditions.

SKIN SURFACE MANAGEMENT

Skin surface management is typically as much art as science and practices have often been handed down from one field manager to the next. The skills of the grounds manager are often a greater contributing factor to the playing quality of skin surfaces than the infield mix itself.

Grounds managers must use practices that are appropriate for the specific field or modify the field conditions to match a

given maintenance program. While skin surface management techniques may differ from one grounds manager to the next, there are specific tasks that need to be performed to produce safe playing conditions on skin surfaces. These tasks include but are not limited to watering, scarifying and dragging, leveling, lip removal and conditioning.

The frequency and intensity of these tasks is strongly influenced by the particle size distribution (sand, silt and gravel content) of the infield mix.

WATER MANAGEMENT

Water availability is probably the most important factor affecting the overall performance of skin surfaces. The water content of a skin surface affects both ball and player reaction. Water is needed to soften fine-textured infield mixes (high silt and clay content) and firm coarse-textured mixes (high sand content).

Field design should include water supply to the skin surface.

A quick coupler (hose connection) should be located approximately 6 feet behind the mound on a baseball field; the safest and most logical place for the coupler. More involved irrigation designs include automatic pop-up irrigation sprinklers to lightly water (syringe) skin surfaces.

Differences in the approach to watering skin surfaces are attributable to water accessibility, budget, labor, climate, particle size distribution of the infield mix, and coach and player preferences. Irrigation water for skin surfaces and turfgrass is often unavailable in the case of municipal fields. Conversely, managers of professional fields often "flood" skin surfaces before a homestand, immediately after a game, before lunch on game day, and conclude with a final light watering in between batting practice and pre-game activities.

Water held within a skin surface produces the "corky" feel that players desire; water is often provided through irrigation after games in addition to supplemental game day irrigation dictated by weather. [We] recommend skin surfaces be deeply irrigated at a rate that allows water to infiltrate slowly into the surface and be retained for a considerable amount of time. Care must be taken to avoid overwatering areas surrounding skin surfaces.

INFIELD DRAGGING AND GROOMING

Periodic scarification, leveling, and smoothing of skin surfaces is required; this can be accomplished with commercially purchased grooming machines or constructed drags which can be hand-pulled or towed by a small tractor or utility vehicle. Scarification and leveling methods should produce a thin (0.25-inch) loose layer or "cap" on the skin surface. This cap provides more uniform ball bounce and roll and a good surface for sliding. Scarification of this layer should not exceed 0.5-inch (too deep) otherwise traction (footing) will decrease and ground balls can skid rather than bounce. Scarification often involves dragging the skin surface with a nail-drag (or similar) to loosen the surface 0.25- to 0.5-

inch. This loosened material is used to level-out high and fill low spots, which decreases the time to dry the surface after rain (puddles are reduced in size after leveling). After scarification and leveling, a steel drag or cocoa mat is often used to groom (smooth) the surface before play.

Proper infield dragging, leveling, and grooming techniques maintain/improve surface drainage, safety and playability of skin surfaces. Improper techniques that physically move infield mix into turf will encourage the development of a lip. A "lip" is a mound or ridge at the boundary between a skin surface and turf. Lips impede surface water drainage off the skin surface as well as present unsafe playing conditions. Therefore, it is imperative that infield dragging and leveling along the perimeter 12 inches or more of a skin surface be performed by hand in a direction that moves soil away from or along the skin-turf boundary, not toward the turf. Wind and water erosion can also move infield mix into border turf areas resulting in a lip.

Invariably, movement of infield mix into the bordering turf does occur and routine corrective practices should be used to reduce lip development. Stiff-bristled brooms are often used to brush 6 to 8 inches of the bordering turf towards the skin surface. Blowers, irrigation hose spray and power washers have also been used successfully.

If allowed to develop, large lips require costly and time consuming methods to correct. A sod cutter will be needed to remove the grass and buildup of infield mix from the lip along the skin surface-turfgrass border. Repair of large lips may also require substantial re-grading to re-establish an acceptable grade along the skin surface and turf boundary area. Typically, the turf-skin boundary is re-established with sod.

Adding infield mix to "eliminate" a lip is a common mistake because this action elevates the skin surface relative to surrounding turf, decreases playability and safety, and often stops surface drainage. Repeated addition of infield mix eventually results in major renovation work to fix these compounded infield problems. Renovation involves the "extra" infield mix being removed and re-grading to reset the proper infield contours. The turf-skin boundary can then be re-established with sod.

USE OF INFIELD CONDITIONERS

Conditioners are materials designed to be spread on top of skin surfaces to improve playability over a range of weather conditions. Calcined clay is one of the most commonly used conditioners. Typically montmorillonite clay is fired at approximately 1200F to form granules of calcined clay that remain hard even when wet.

Conditioners are often used to soak-up excess water after rain; finer-textured conditioners work best for this purpose. Conditioners used for this purpose should be swept-up (removed) from the skin surface after play, stored and allowed to dry for re-use.

A 0.25-inch layer of conditioner can be spread (topdressed) evenly across the skin surface to produce the loose cap described previously. Using a granular conditioner as the cap material rather than infield mix generally makes it easier to remove migrated material from the turf boundary back onto the skin surface and prevent the development of a lip.

Skin surface water retention is a function of the amount of silt and clay in the infield mix, not the amount of calcined clay on the surface. Calcined clay applied to the skin surface will often dry before the underlying infield mix resulting in some grounds managers applying unneeded irrigation water. Fine-textured infield mixes can be modified to react more like coarser-textured mixes by incorporating calcined clay. In contrast, coarser textured infield mixes would be less affected by adding calcined clay because of the similar particle sizes between the infield mix and the conditioner. Thus, a particle size analysis of the existing infield mix is necessary when deciding whether to incorporate a conditioner; the addition of calcined clay to a coarse-textured infield mix often will not improve playability.

MOUNDS AND BATTER'S BOXES

Clayey soil or "bricks" (clay >35%) are used to construct a stable, wear resistant surface for the "table" (the area behind and to the sides of the pitching rubber), landing area of the pitcher's mound, and the batter's and catcher's boxes around home plate. The installation of a clayey soil often minimizes the damage caused by a pitcher digging in front of the rubber. Clayey soil should be placed and compacted (hand tamper) about 0.5-inch below the surface of the mound; infield mix is used to bring the area to final grade.

Particle size guidelines for an infield mix to be used in the construction of a skin surface range from 50 to 81% sand and 20 to 50% silt and clay. Infield mixes that contain greater than 75% sand will require substantial irrigation to provide a firm and stable playing surface during dry weather. Conversely, infield mixes with less than 60% sand will be very firm when dry and irrigation will be needed to "soften" the skin surface for play.

Regardless of infield mix selection, skin surfaces must be graded to provide surface drainage away from the infield (0.5 to 1.5% slope). It is also important to provide a water source to irrigate the skin surface. If irrigation is not available, playability of a skin surface will be less than optimum during drought. Grooming methods are needed to produce a uniform 0.25- to 0.5-inch cap over the skin surface and preventative maintenance is necessary to minimize lip development. Lips along skin surface perimeters present a hazardous condition and require costly, time consuming renovation work.

Conditioners can be applied (topdressed) to skin surfaces to act as the cap; finer-textured conditioners can improve playability during rainy conditions. Additionally, conditioners can be incorporated into finer-textured infield mixes to improve surface hardness and increase permeability. A particle size analysis should be performed on the conditioner and infield mix to determine compatibility before incorporating conditioner into the infield mix.

Pitcher's mounds and the batter's and catcher's boxes should be constructed with clayey soil or "bricks" containing > 35% clay to provide the stability, traction and durability needed in these high traffic areas. ■

Bradley S. Park is sports turf research and education coordinator at Rutgers University; Dr. James A. Murphy is extension specialist in turfgrass management at Rutgers. This material is online at http://www.cpe.rutgers.edu/brochures/pdfs/Skin-Surface-Selection-and-Management-for-Baseball-and-Softball-Infields.pdf.

What's your infield mix?

Editor's note: *We asked some veteran infield skin managers about their infield mixes and why they chose that combination and/or products:*

ERIC BLANTON, Reno Aces

I have Gail Materials Collegiate blend infield mix. It consists of a 60% sand/20% clay/20% silt mixture. It was chosen due to its high clay and silt content and NO cinder content. It holds together very nicely with very little cleat marks after games. Gail Materials has continuously tried to make their products better no matter what outcomes they have. They are a company that strives to be the best and that also was another reason I chose their product.

GEORGE MARSHALL, Stetson University

Here at Stetson University in Florida we use a clay field approximately 6 to 8 inches deep on a sand base. We mix in with it Turface Pro League Red that serves as our playing surface. We laser grade the infield annually in the off season, and will do it twice if necessary depending on the rainy season. Usually after laser grading we will add around 1 to 1 1/2 tons of Turface and play with it after that to get it to our liking. We try and aerate with our Toro aerator a couple times a year to aide in drainage and fight compaction.

LARRY DIVITO, Minnesota Twins

Our infield mix is from Natural Sand in Slippery Rock, PA. Grant McKnight is the owner there and he is the one who engineered this infield mix. It is somewhat similar to what the Mets used for their installation at Citi Field. Bill Deacon gave me some great anecdotal evidence of its performance. As for the blend, I would leave it to Grant to discuss. (see p. 22)

DAN DOUGLAS, Reading Phillies

Infield mixes in general have improved dramatically in the past 25 years. Suppliers are now producing much cleaner products and are more conscientious of the makeup of their mixes. There are also a lot more choices of amendments. Whether a mix is loose, tight, dry, sticky or just an unappealing color, there is an amendment available to correct the problem. In most cases, I recommend finding a fairly local supplier of infield mix (to save on trucking costs) and changing any characteristics of the mix you don't like with amendments.

The infield mix at FirstEnergy Stadium in Reading is a combination of Professional Diamond-Tex (50% sand/32% silt/18% clay) and amendments. Professional Diamond-Tex is tan in color, dries out quickly, does not get sticky when wet and, notably, is produced only 30 miles away by Martin Limestone.

The infield skin is renovated in March when we: add new infield mix, if needed, to help meet grade; Stabilizer is applied; the top 2 inches are tilled and the infield skin is laser graded and rolled. A top-dressing combination of Turface Pro League and Diamond Pro Vitrified Infield Conditioner is maintained during the playing season. The amendments have aided in overall moisture management, footing, ball bounce and aesthetics of the infield at FirstEnergy Stadium.

JIM WIGGINS, Tomball (TX) ISD

We just recently rebuilt both our softball and baseball infields as both were in dire need of an overhaul from the bottom up. We ended up taking about 4 inches out of the baseball field and 2 inches out of softball. Starting with the new subgrade of 60/40 sand clay mixture we had blended, the contractor, 4E Turf Services, and then began the compacting and laser work on the subgrade. Both fields had Diamond Pro Vitrified Red added as the new topdressing and then rolled and nailed multiple times to achieve our finished product. After 10 years of amending and working on our fields we were able to finally redo both fields and are completely satisfied with our finished product.

In the past we have used Klacon and Turface as infield conditioners and have used and still use Klawog mound and home plate clay for those areas. Getting used to the new vitrified product compared to our calcined products will be a new learning tool for us. I was comfortable with my Klacon and Turface products, and still have them in our

infield mix ▷

If there are 1 or 2 crew members, working on four or more fields every day, the infield mix will need a larger sand content as watering and drying will not be able to be maintained by the grounds crew.

baselines, mound and home plate areas on the baseball field. I feel water management will become even more important now with this new conditioner, but look forward to the new challenges this may bring.

During the redo portions of both fields and with Rain Bird's help, we added new Falcon high speed rotors to both infields. These dirt zone sprinklers have been time savers for us over the years. We finished off the redo's by adding a quarter-inch of sand topdressing to both fields. Bring on the seasons which start in the middle of January here in Texas!

CRAIG SCHLENDER, Ball Diamond Fine Sports Turf

I would have to say my favorite infield mix would be a 60% sand/40% clay silt mix, 6 inches deep, incorporated with 6-8 tons of calcined clay, on a regulation baseball field, with 1 ½ to 2 tons of calcined clay topdressing. I prefer the calcined clay amendments for good moisture holding ability on hot, dry days and the wicking ability on rainy, wet days. The addition of calcined clay on very wet days, used as a drying agent, doesn't change the mix or color in the future. The silt and clay provide a high quality, solid base for spikes to get good traction.

As a field manager, I like a higher clay, silt content with the ability to keep a high moisture content in the mix so it has a very solid, firm base feel; 60% sand, 40% clay on days with rain approaching, backing off on water, so that it will wick more moisture when the rain falls.

As a consultant, I try to prescribe a mix suited to the manpower of the grounds crew staff. If there are 1 or 2 crew members, working on four or more fields every day, the infield mix will need a larger sand content as watering and drying will not be able to be maintained by the grounds crew. The mix will stay softer when dry and will be more playable when wet. I still like to see calcined clay amended to the mix. A 70% sand, 30% clay, silt mix works well for a recreational mix.

On all fields, surface drainage and available water is the most important part of a good infield. On high-use complexes where time is a factor of maintaining good moisture in the mix, I suggest the addition of high out-put irrigation heads, so water can be added at night or early morning. This should be set up with an automatic shut off should a rain storm show up.

Whatever the mix, if the moisture content is right, the mix will play pretty well. I prefer a darker mix to minimize the glare for players and fans. In Wisconsin, where I consult on many fields with low budgets, amending seems to be a considerable option due to trucking costs. Additional factors include true surface drainage, ability to water enough and normally the addition of calcined clay.

Some fields are more than 1% slope due to various reasons, and in these circumstances, I will use a higher clay content and vitrified clay as a topdress, as it will stay put better because it is denser but wicks less water. ■

Factors to consider when total infield renovation is *not an option*

Editor's note: *We asked some people who make infield skin products this question: What factors should a turf manager consider if they want to improve their infield mix and/or skinned areas for this season and total renovation is not an option?*

>> **LASER-GRADING** the infield at two-time STMA Softball Field of the Year at Stetson University, DeLand, FL.

TOM BURNS, TXI Diamond Pro

This is a very difficult question to answer because so many factors need to be considered. First, determine what you are trying to change. Is the field too hard or too loose? Then I would get my infield mix analyzed and use the results to determine if I want to renovate or replace it. Next, you have to ask yourself what you can afford to do. Often times we can make improvements by amending the mix with a different textured soil or a manufactured soil amendment. Soil testing can determine what to use and in what volumes.

Next I would look at the grade. Do I have the proper fall to allow the skin to drain? Do I need to add more infield mix? Are the lips properly maintained? Many times the skin looks to be low when in fact the grass edge is too high. A little bit of daily maintenance on the lip can be a mini-renovation in itself.

Be sure to do an assessment of your maintenance program and be honest with yourself. A less-than-ideal mix can still perform well with a good management program while a great mix will not perform as well if it is not managed properly. Be honest with your expectations and factor in your limitations (financial and logistical); only then will you be able to make the right choice.

CLAYTON HUBBS, Stabilizer Solutions

We receive infield samples from fields all over the country. The first question we ask is, "What is your biggest complaint?" Focusing on your biggest complaint usually alleviates smaller complaints. This may sound like an oversimplification, but most complaints fall into three categories: too hard, too loose/soft, or poor moisture management.

The next question to ask is: where is my infield mix right now? The answer to this question lies within a particle size analysis. Typical infield mixes should be composed of 70% sand and 30% split between silt and clay for amateur fields and closer to 60/40 for professional. Pay close attention to the coarseness of the sand. If the sand particles are very fine, then the mix may be unstable despite the proper proportions of silt and clay. While these percentages are a good rule of thumb, it will vary per region and parent material of your existing mix.

Understanding that parent material may provide insight into why the mix may not be performing, even with a satisfactory particle size distribution. If your mix is dug from near a river bed, it may have too high of a silt over clay content, and the sand particles may be more round than angular. Mixes that are derived

from crushed stone may have the angular sand particles needed, but the fines may not act like true silt and clay particles. Also, mixes with good clay content may contain highly expansive clay particles that can wreak havoc during fluctuations from wet to dry and vice versa.

Now that I know where my infield mix is, can I adjust my maintenance regimen to compensate? If your biggest complaint is a loose field, then most likely your particle size analysis shows that you are low on clay content. Instead of immediately adding clay content, you could first try increasing your watering and rolling regimen.

If your complaint is a field that is too hard, and the analysis shows high clay content, then you could increase watering and nail dragging. Depending on your region and your silt content, increased watering may work against you, so make sure you don't experiment during a critical time of year. If nail dragging does not help, then try a different type of nail with greater weight added on top of the drag.

If changing your maintenance regimen does not provide sustained results, try amending your infield with sand, clay, or an infield amendment. Take great caution when adding sand or clay content. As mentioned before, sand should have a variety of particle sizes from fine to coarse. Too fine of sand may not have the desired results. The same goes for too coarse of sand. When adding clay content, it is inevitable that you will add silt as well. Take care in not adding too much silt content as this will have the opposite effect. It is recommended that you try a small test area first before adding sand or clay content over the entire field. Also, some fields may have several different mixes added over the years. This may cause a layering effect or pockets with varying particle size distributions. It is a good idea to survey different areas of the field to find out if these pockets exist and make the proper adjustments.

Sometimes a safer route, adding infield amendments, can often make a bigger impact. For hard or low drainage fields, conditioners such as calcined clay can be added. For fields that are unstable or have poor moisture management, organic infield amendments can stabilize the infield. While manufacturers may recommend incorporating amendments by mechanical blending (as we do), many times they can be nail dragged into the top couple of inches to provide short term relief.

Another option to consider adding is a stabilized infield mix, which contains a stabilizing agent, most often organic infield amendments, already pre-blended to work in conjunction with the proper amounts of sand, silt and clay. This can be an affordable option to get you through the season by addressing just the surface. When considering this option, request more information from the manufacturer's rep, if done incorrectly or with an unsuitable mix, a layering effect may occur.

The final option to consider without completely renovating a field is if the infield can be improved mechanically. Usually mechanical blending is used in conjunction with infield amendments, but can be done without their use as well. Ripping and tilling is recommended once a year. Fines do sink to the bottom, your surface may

become too loose and drainage layers may form. The surface soil particles themselves can also become crushed from overuse, depending on the parent material of the infield mix. Also, soil particles weather and break down from exposure to rain, snow, and sun. Ripping and tilling once a year evenly blends soil particles, brings fresh soil particles to the surface, and provides a good opportunity to level the infield by adding additional infield mix. Take caution not to till into your base material.

Like most things in life, infield mixes change and evolve throughout the years. This could occur from soil particles weathering and sinking, or from the addition of different mixes and amendments. Regardless of how it occurs, your mix is unique to your field. If you don't have the option to replace the mix with something more predictable, then you must become the expert of your own mix. The best way to become the expert is to experiment and see how your mix reacts to different variables.

GRANT MCKNIGHT,
Natural Sand Company

In general, amendment projects tend to be about one-third the cost of renovation. The best way to predictably alter an infield skin without renovation is to follow the T.A.C.S. process: Test, Analyze, Compare and Solve.

Test. In order to improve existing material, it is important to "know what you have." A soil test report with a particle analysis and size distribution will reveal the cause of many poor-playing infields. For example, an infield with excessive silt content and low sand is often described as playing "soft" and blows away over the course of the season.

There are a number of soil testing facilities across the country, some better than others. A reliable lab will be A2LA accredited.

Analyze. Analyzing the soil test report requires an understanding of the values it renders. The values on the soil test report include: sand content (overall), silt content, clay content. The size distribution portion of the test shows the array and concentration of sand particle sizes within the overall sand content.

Here are some basic principles:

• Sand (overall). Provides structural stability for the infield mix (think sand castle v. mud pies).

• Silt and Clay. Clay provides moisture-retention for the infield mix. Silt binds sand to clay.

• Sand (size). The larger the sand, the better stability it will provide.

Compare. A lack of specifications for infield soils has plagued this industry. By studying our projects, we have found the following to be true:

• Sand (overall). Should make up about 58-75% of the soil profile. Facilities with high-level maintenance will require less sand than fields with volunteer maintenance.

• Silt and Clay. Combined, these values should not exceed 42% of the soil profile. The ideal ratio of silt to clay is 0.5 - 1.0 (silt to clay ratio = silt ÷ clay).

• Sand (size). The majority of the sand should fall between the very coarse, coarse and medium sand ranges. Large concentrations of fine and very fine sand indicate a lack of stability within the mix.

Solve. Determine what objectives need to be met (i.e., increasing sand content, decreasing silt to clay ratio, decreasing very fine sand content, etc.), then choose a material and a method for the amendment project.

It is very important to only use materials that identify their particle makeup as verified by an independent soil test report. Engineered soils can be made into specific amendments for your project. Here are some general guidelines:

To increase sand content: Use a soil with a sand content higher than your current levels. Be sure that the amending soil does not contain an abundance of fine and very fine sand, and that it has a silt to clay ratio of 0.5 - 1.0.

To decrease sand content: Use a soil with a sand content lower than your current levels. Be sure that the amending soil has a silt to clay ratio of 0.5 - 1.0.

To decrease silt to clay ratio: Using soil with more clay than silt will always decrease the silt to clay ratio.

To decrease very fine sand content: Use a soil with minimal amounts of fine and very fine sand content. Be sure that the amending soil has a silt to clay ratio of 0.5 - 1.0.

Amendments require incorporation into the existing soil profile. We recommend tilling to a depth of 2-3 inches for optimal blending.

It is best to obtain another soil test report a few weeks after your amendment. The test report will reveal the changes made to the infield skin profile. If further amendment is required, simply repeat the T.A.C.S. process until you are satisfied with the test results.

JEFF LANGNER,
Turface Athletics

The first step to improving an infield mix is to really understand the kind of field you are working with. Every infield mix a combination of sand, silt, and clay, plus any conditioners or additives incorporated previously.

A field that is made of 100% sand would be loose, free flowing, and would drain well. When dry, however, a sandy field would produce an unstable and unpredictable surface. With the right amount of water it will be firm and playable but forgiving, allowing for sliding and clean ball hops. Consider a beach where the water meets the shore. This area would make a very playable surface!

The other two components of soil, silt and clay, present contrasting characteristics to sand. Drainage is poor, creating puddles and slippery areas and causing rain-outs. When clay and silt get too dry they become rock hard, often cracking, creating dangerous hops and

possible injury. These issues can be greatly compounded when clay and silt get compacted due to heavy traffic. If kept at the right moisture level and properly maintained, however, clay and silt are very stable and wear resistant making them ideal for high impact areas.

A blend of the three components is necessary to attain a safe and playable field that is easier to maintain. Knowing the makeup or composition of your existing infield mix will help determine how you approach conditioning the field, and how you manage moisture on the field. Water management is critical to providing a safe and playable field, no matter what mix of soil components are at play.

Calcined clay field conditioners help improve fields of any soil composition, because of their ability to reduce compaction and hold moisture. For example, Turface has 74% internal pore space, meaning that there is significant space within the particles to hold air and water. This keeps the field from becoming compacted, and promotes drainage in times when the field endures heavy rains.

And calcined clays don't just moisture but, similar to the effect of a sponge, will release water back into the surface of the playing field over time as things dry out, preventing the hardened, cracked fields that become such a burden in the hot summer months.

The multiple benefits of these products make them an effective addition to any infield mix. The amount of product added to the field should take into account not just the existing infield mix, but other factors such as the amount of traffic the field endures, the availability of irrigation and the frequency of rainfall, the number of field managers able to maintain the field, along with the frequency of field maintenance that takes place.

A field that doesn't have the benefit of frequent watering, endures high traffic, or lacks routine maintenance will benefit from a slightly higher amount of calcined clay conditioner worked into the field.

For a full renovation on a 90-foot field (high school, college, or pro), for example, it is recommended that 8-10 tons of product be incorporated into a field at a 4-inch depth with a roto-till, resulting in about an 18% rate by volume. For fields with smaller budgets, 4 - 5 tons could be incorporated into the top 2 inches using a nail drag, or even a ½ ton of product could be applied as a topdressing to at least create a consistent playing surface.

There is a significant difference in the improvement one could expect to see from a field based on these varied methods of application, and amounts of product. Understanding your existing infield mix and evaluating the external factors surrounding your field will help you better get started on a long-term maintenance program for your field, so that even if immediate renovation isn't a possibility, you can at least get the "ball rolling" on a better, more playable field.

LARA WEINSTOCK,
Game Time Sports Systems

To improve an existing field you can add products to help improve infield surfaces at a nominal cost. Consider adding 4-8 tons depending on the size of the infield surface and the type of material the skinned surface is made of. The materials will need to be worked into the top two inches of the existing infield dirt. Before any amendments, consider edging the base paths and the arc, and reduce or eliminate lips if possible. Try to promote surface drainage by re-establishing the grade of the skinned surface so it slopes toward grass areas. Mechanical weed management and good routine grooming practices will promote a safe playing surface, and a good visual experience until funds and more time allow for a more extensive repair or upgrade.

DAVID A. CYGAN,
Pro's Choice

I always tell prospective customers they should think of soil conditioners as the icing on a cake. Some field managers think that you can dramatically change an infield with conditioners. While conditioners will improve any infield, the best results occur when conditioners are added to soils consisting of sand, silt, and clay.

The amount of conditioners will vary depending on what is wrong with the field. If drainage is an issue, more material would be needed. For example a high school or college field with 90-foot base paths and poor drainage might require 10-12 tons of conditioner. A field that is hard and compacted can usually be helped with 6-8 tons of conditioners.

Note, when I refer to conditioners I specifically mean "MONTMORRILLITE" clays. These have been the industry standard since 1941. These types of clay are heat treated and are actually turned into a ceramic sponge. They are the only mineral that can absorb excess water, hold it, and release it when conditions become dry. They do all this while maintaining their particle size, and they continue working year after year. ■

Recovering turf from severe weather

Editor's note: *This is a report from several regions around the country on how turf managers handle their turf in the wake of some severe weather in 2010.*

PENNSYLVANIA

SportsTurf: What is or was your worst problem this year due to the weather?

James F. Cornelius, CSFM, West Chester Area SD: Our worst problem was the extreme weather pattern; periods of either too much rain or lack of rain with hot dry weather played havoc on the athletic field turf. In the Northeast we dealt with high humidity and cool nights that provided the perfect environment for diseases.

ST: What did you do last fall (or are doing now) to solve the problem?

Cornelius: Knowing past history and making the correct or almost-correct guesses of future weather patterns was our biggest tool. In Fall 2009 we began our aeration program much earlier, we aerated more than usual, we fed our turf higher amount of slow release fertilizers and we over seeded all the fields heavier than ever, applying over 71,000 pounds of seed in order to thicken the turf and provide ample seed to reduce late season wear areas from the end users.

In the spring of 2010 we aggressively topdressed, applied more fertilizer and seed. Due to the users' schedules we were limited to irrigation until the middle of June when we were able to deep water the fields on a rotating basis in order to prevent an early dormancy.

Around the beginning of July we backed off the irrigation to allow the fields to go dormant during the high stress period and educated our users on protecting the turf from cleat injury, moving around the field areas to reduce wear areas and where possible we shut down fields and moved users to less significant fields at our elementary schools.

In the fall of 2010 we overseeded, applied fertilizers, and with the help of our users who consistently applied seed provided to goal mouth areas, filled divots, moved daily warm up routines around the field and more heavy aeration and deep slicing, we were able to recover the fields quickly. By the third week of the fall season the weather patterns became favorable and we took advantage of welcome rain storms.

ST: What do you plan on doing in the spring to continuing solving the problem?

Cornelius: From our experience we will attack the fields as early as possible. The cold weather has set in faster this year [Dec. 10] so the extra work that was done earlier in the fall will hopefully pay off. We have yet to make a decision on whether we will be using any grow tarps and with the early below freezing temperatures we may have missed that boat.

Our strength unlike most has proven to be in our educating the end users on field maintenance, field care and do's and don'ts. Once you educate and you communicate your plans and goals (providing they the end uses benefit as well) to them and you have a proven record it works it makes dealing with the extremes and the unknowns much easier.

IOWA

ST: What is or was your worst problem this year due to the weather?

Chris Schlosser, Iowa Cubs: I am not sure what our worst problem was—either the record snowfall and amount of time it covered the turf and a little snow mold problem in the spring, or one of the wettest years in history combined with heat, humidity and disease that occurred because of the constant rainfall and not being able to dry out completely.

These historic amounts of moisture led to a root problem of shallowing up and all our chemical applications never lasted for the proper intervals. The last

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Up here in the Pacific Northwest the 2010 summer was very uneventful, almost normal. We had cooler then average temps and average rainfall.

-Jason Moore, CSFM, Tualatin Hills Park & Rec, Beaverton, OR

problem was the amount of time the tarp was covering the field. The rain patterns were so incredible you had to start planning days in advance of an upcoming homestand to make sure you were covered because of rain and dry time leading up to and in games. We (the turf and grounds crew) just tried to survive and keep our sanity.

ST: What did you do last fall (or are doing now) to solve the problem?

Schlosser: After the tough year the rains shut off for pretty much all fall and we were able to stress the field and drive some roots down with normal practices. I did put one liquid snow mold application down and followed it up with a granular PCNB before we froze. Just trying to get a little more residual in the plant to last if we have another winter like last.

ST: What do you plan on doing in the spring to continuing solving the problem?

Schlosser: For 2011I am planning for the worst case scenario happening again. After the schedule was released we are trying to limit outside events and games so we have enough time to do our cultural practices, which were limited because of a high number of events last year. For chemical applications we are working them in more often and cutting down the interval cycle. We are usually on a 14-day preventive program and now I am looking at a 10-day because the breakthrough last occurred on that 9th or 10th day. Overall we didn't have any turf loss; what was damaged grew out of it and came back with normal practices.

OKLAHOMA

ST: What is or was your worst problem this year due to the weather?

Jeff Salmond, CSFM: The only problem was dealing with drought and not being able to water during the day. Any watering during the day, for example on a baseball infield, was done during lunch breaks, which is equivalent to a slight syringe. Throughout the whole summer, we had camps and clinics during the day and in the evenings because of the heat. The only time we were able to get sufficient water was at night. But we could not water too heavy as to make it wet for activities the next day. We also were not able to perform as many cultural practices, especially verticutting and aerification.

ST: What did you do last fall (or are doing right now) to solve the problem?

Salmond: We did more multiple needle-type aerifications, gypsum applications and a little heavier watering.

ST: What do you plan on doing in the spring to continuing solving the problem?

Salmond: We plan to use growth blankets to promote and initiate earlier turfgrass growth and build up moisture in our rootzones in anticipation of a warmer, drier spring and cooler, wetter summer. We also hope to change up any consistent wear patterns for turfgrass recovery. ■