

Though long considered by many superintendents as one of the best soil amendments to mix with sand when building or rebuilding greens, peat may be wearing out its welcome.

For 40 years, the industry has been using peat and other organics blended with sand for root zone mixes. Peat has been the amendment of choice with architects, builders and superintendents to blend with sand to add nutrient and moisture retention of the greens mix. However, peat and other organic amendments are being challenged in light of the emergence, popularity and success of today's inorganic soil amendments.

A continually growing body of evidence, including research, tests and experiences on golf courses, shows that Profile Products' Porous Ceramic (PPC), an inorganic amendment, performs better over time than does peat as an ingredient in the root zone mix. With that body of evidence has come acceptance and endorsement by leading architects, builders and superintendents.

Arnold Palmer Design Company, prompted by positive results and feedback from clients, specifies Profile™ Porous Ceramic in its designs and renovations. With more than 250 ongoing and

completed golf course projects, the architecture firm is a leader in the industry.

"Profile's inorganic soil amendment improves the health of your turf and increases the longevity of your greens," said Erik Larson, executive vice president of Arnold Palmer Design Company. "It is an amendment we have confidence in."

Many other architects and consultants believe in Profile Porous Ceramic because the amendment has proven that it withstands the test of time and increases the longevity of your greens, partially because of the low 3% degradation of the particle over 20 years.

Research Favors Profile

Peat, an organic material, helps to improve water and nutrient holding in the greens' root zone. But, as tests and real life experiences have shown, peat fills air pore space and reduces drainage. Peat also changes with time which may contribute to large pore space being lost, possibly resulting in low oxygen levels, black layering and poor drainage. The consequences can be poor playability and reconstruction of the greens.

Research shows that when peat moss such as sphagnum or reed-sedge peat is used as an amendment in the root zone mix, fine particles can hinder air and water circulation. Poor aeration, high moisture content and low temperature and pH,

Root Zone Amendments: Profile vs. Peat



Profile™ vs. Peat

Comparison of 8-year-old Profile-amended greens vs. 6-year-old greens amended with organic material

A comparison of soil analyses between 8-year-old Profile-amended greens at Bay Hill's Charger Course³ and 6-year-old peat-amended greens at the Cordillera Mountain Course near Vail, Colorado,⁴ illustrates that even after eight years Profile outperforms peat in drainage and air pore space.

Root Zone Mix	Drainage (in/hr)		Porosity (%)			
			Non-capillary (Air-holding/drainage)		Capillary (Water-holding)	
Sand/Profile after 8 years (Bay Hill's Charger Course)	Original 28.1	8 years 9.1	Original 25.5	8 years 24.8	Original 12.3	8 years 20.8
Sand/Peat after 6 years (Cordillera Mountain Course)	Original 23.8	6 years 3.1	Original 22.1	6 years 13.9	Original 20.7	6 years 32.7
USGA® Recommendations						
Normal range	6-12		15-30		15-25	
Accelerated range	12-24					

combined with the application of iron chelate, create optimal conditions for black layer in putting greens.¹

In a separate study, researchers came to the following conclusion after analyzing four tests of organic matter as a soil amendment:

“From the time grass is established, the soil physical characteristics of the root zone begin to change. Increased organic matter is predictable, considering the continuous growth and death of grass shoots and roots that occur on greens. This process fills aeration pores (macropores) of the sand and increases the amount of capillary pore space (micropores). As a gel-like mass of dead root material fills macropores, aeration porosity is reduced, saturated hydraulic conductivity (drainage) declines and soil oxygen diminishes.”²

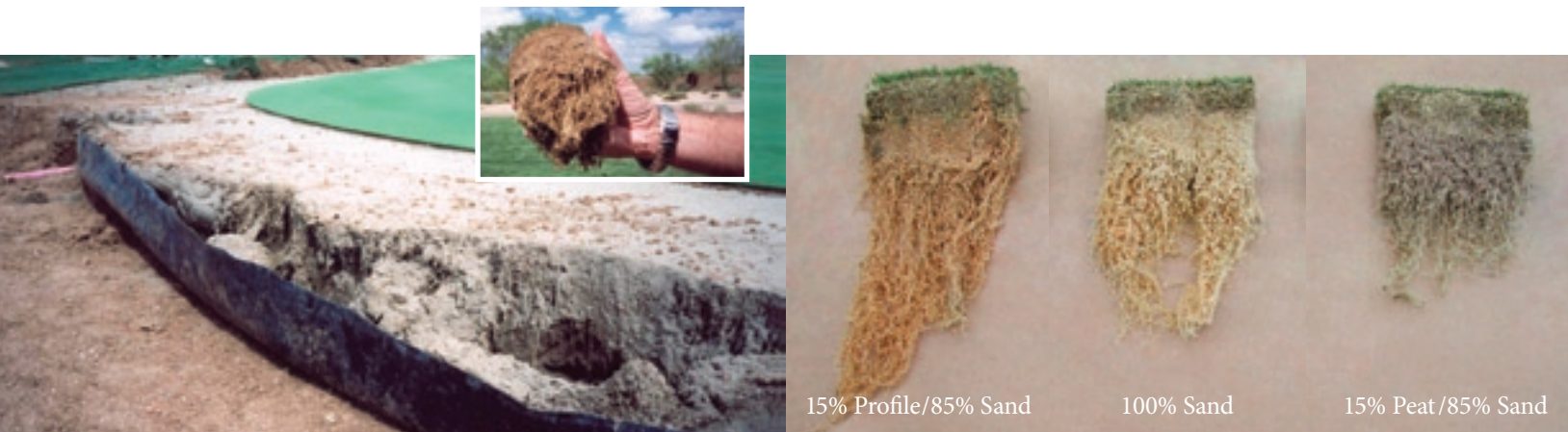
Research points out clearly that percolation rates on sand/peat-amended greens drastically reduces

over time. Good drainage, of course, is vital to the health of a green.

Unlike peat, Profile™ Porous Ceramic is an inorganic amendment that changes little over time. A sand/Profile mix will remain more consistent for the life of the green. Mixed with sand, Profile helps bring about ideal soil conditions: 50 percent solid matter, 25 percent water-holding pore space and 25 percent air-holding and drainage pore space.

Therefore, sand/Profile root zone mix has the ability to better maintain optimal water and nutrients without reducing large pore space and slowing down drainage. That combination keeps plenty of oxygen in the soil, which is the key to a strong root system and healthy, stable greens.

So what does this mean to superintendents? It means they can have confidence knowing their greens will withstand the test of time. And it means



At 118° F in August 2002, the expansion of the 2-year-old Whisper Rock Green revealed 8- to 10-inch bentgrass roots. “Profile is keeping the drainage up and providing the air to keep these roots deep.”
Mike Pock, Superintendent, Whisper Rock Golf Club

1 Year, 11 Months Old A1& A4 Bentgrass Seeded Greens –
FarmLinks Golf Club; Sylacauga, AL

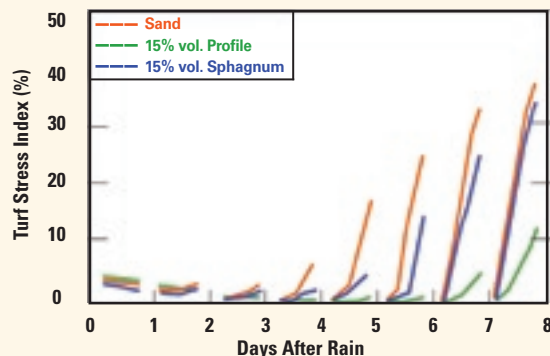
Comparison of Profile vs. Peat

Test results like these, conducted for The Ginn Company on its new Tesoro Course, Stuart, Florida, consistently illustrate how Profile outperforms peat in drainage rates, total porosity and pH balance.⁵

Root Zone Mix			Drainage (in/hr)	Porosity (%)
Profile (%)	Sand (%)	Peat (%)		Non-capillary (Air-holding/drainage)
0	100	0	23.3	22.2
15	85	0	28.3	24.7
0	85	15	12.2	20.5
USGA® Recommendations				
Normal range			6-12	15-30
Accelerated range			12-24	

Delayed Onset of Drought Stress with PPC-Amended Root Zone

Profile delays the need for irrigation by 2-3 days when compared to sand and peat mixes.



superintendents can look forward to spending less in maintenance costs for irrigation, fertility, aerification and labor during the life of the green.

Growing great greens is never easy, especially in the hot climate of the Arizona desert. Shawn Emerson, director of agronomy for Desert Mountain courses, faces this challenge everyday. After 20 years of play, Poa annua and Bermuda grass began to encroach on the course. While dealing with the encroachment, Emerson determined it was the ideal time to re-grass the 20-year-old greens and modify the root zone to achieve the best physical properties.

“Removing the organic buildup in the top few inches and replacing the mix with Profile Porous Ceramic (PPC) Greens Grade increased the percolation rate as well as the CEC would help the greens,” said Emerson.

“As soon as we completed the greens, we experienced extreme weather conditions,” Emerson said. “The

greens are holding up well in the high heat and heavy traffic and we have not had any issues.” By reconstructing the greens and adding PPC, Emerson ensures the Cochise Course continues to live up to championship standards.

Results Speak for Themselves

Today, the owners and representatives of more than 100 golf courses have constructed sand/Profile greens. Courses from the Northeast like Willowbend Country Club and Black Rock Country Club in Massachusetts, to repeat customers like the Robert Trent Jones Golf Trail in Alabama, have had great success with sand/Profile greens. The Trail placed a 1,200 ton Profile order for construction of three new courses and soon after, renovated these older sand/peat courses with an 85/15 sand/Profile blend. The Cliffs Communities have constructed their last three courses with Profile and the Ginn Resorts have included Profile in construction on their last five courses.



Director of Agronomy, Shawn Emerson, utilized Profile Products to reconstruct 19 greens at top-ranking Jack Nicklaus Cochise Course.



The greens at the Oasis Golf Course in Mesquite, Nevada, constructed with a sand/Profile mix in 1992, continue to thrive.

Profile™ vs. Peat

Profile Porous Ceramic was first used as a soil amendment in 1992 at the Oasis Golf Club in Mesquite, Nevada. Kelby Hughes, then superintendent at the Arnold Palmer-designed course, said the greens continue to thrive today at the Oasis. When it came time for Hughes to select an amendment in 2001 for his new course, Wolf Creek at Paradise Canyon, in Mesquite, Nevada, the choice was easy. Seventeen years later, the Oasis Golf Club continues to perform.

"I didn't hesitate," Hughes said. "I've seen proof that Profile provides better, healthier greens." In 2001, *Golf Digest* tabbed Wolf Creek at Paradise Canyon as the third best new golf course in the nation.

Mark Langner, director of golf and grounds maintenance at FarmLinks Golf Club in Alabama, is impressed each summer with how the Profile™-amended bentgrass greens grow without a hitch in the hot climate of the Deep South. Several samples taken during the grow-in stage showed that percolation rates were ideal, and that the root zone mix remained as consistent and uniform as the day it was added to the greens during construction.

"No matter what the weather does, the root system on our Profile mix always has a much better root zone. We also find it very easy to mix our own blend right here on site."

At Whisper Rock Golf Club in Scottsdale, Arizona, builders installed a root zone mix of 13 percent Profile and 87 percent sand during construction in September 2000. Over the next two years, Superintendent Mike Pock said his greens thrived throughout the summer and easily outperformed sand/peat-based greens that he previously maintained.

Pock said Profile promotes deep rooting, healthy, firm greens that don't give way easily to ball and spike marks.

"All of our members are very pleased with the greens, and I am as well," he said.

The importance of putting time, energy and money into the construction of greens should not be overlooked.

Cost is often cited as the reason Profile is not included in specifications for greens. Cost should be a big concern for owners, but greens are the most

important part of the golf course and quality greens bring golfers back. The investment to build greens with the best methods and components not only provide superior greens for golfers, but also require less money to maintain and last many years longer than poorly constructed greens.

An industry expert has stated, "Like the irrigation system and drainage, the construction of greens is not an area in which corners should be cut in an effort to save money. Well-built greens are much less expensive to maintain throughout the remainder of their lives."

Profile vs. Rest of the Field

In addition to peat, Profile has the upper hand over other inorganic soil amendments. A Profile particle has 74 percent water and air pore space, which allows it to hold water and oxygen in a nearly perfect balance. Profile increases drainage and water-holding capacity at the same time. It also meets USGA® particle size distribution recommendations and stability requirements, and provides a high CEC.

Profile has also proven to have more consistent quality and to be a more consistent performer. Profile Products LLC owns, operates and controls all aspects of mining and manufacturing of its product. Profile is engineered from a proprietary blend of amorphous silica, illite and montmorillonite clays. The mineral is screened, sized and kiln fired, changing it into a porous ceramic. The final product is a superior inorganic soil amendment that is less dusty, less brittle and more stable than other amendments.

For copies of all the research and names of superintendents in your area who use Profile, call us at (800) 207-6457.

Literature cited

1. She-Kong Chong, Ph.D.; Richard Boniak; Chang-Ho Ok; Sam Indorante, Ph.D.; and Dan Dinelli, CGCS; "How Do Soils Breathe?," Research section, *Golf Course Management*; January 2003, pg. 181-183.
2. Jason Habeck and Nick Christians, Ph.D.: "Time alters greens key characteristics," Research section, *Golf Course Management*; May 2000.
3. Tifton Physical Soil Testing Laboratory, Inc., March 7, 2002.
4. Jason Habeck and Nick Christians, Ph.D.: "Time alters greens key characteristics," Research section, *Golf Course Management*; May 2000.
5. Tifton Physical Soil Testing Laboratory, Inc., January 8, 2003.



Hong Kong | Singapore | Malaysia | Australia

Email: info@centaur-asiapacific.com

Website: www.centaur-asiapacific.com