A RANDOMLY ORIENTED, INTERLOCKING MESH - HIGH-SAND ROOT ZONE SYSTEM FOR GOLF COURSE APPLICATIONS

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The ever increasing intensity of traffic on golf courses has necessitated the construction of high sand root zones in order to avoid serious soil compaction, divoting, and turfgrass wear stress problems. Investigations have been underway at Texas A&M University since 1985 concerning the feasibility of using a randomly oriented interlocking mesh element system for stabilization of high-sand root zones in order to further increase the traffic tolerance characteristics.

The mesh inclusions consisted of discreet 50 by 100 mm (2 x 4 inch) rectangular elements each having open ribs extending from the full perimeter.[1] The latter design results in a unique interlocking, three dimensional random orientation. The square aperture between individual ribs of the extruded mesh was 10 mm (0.4 inch). The mesh elements were mixed in the upper 15 cm (6 inches) of a high-sand root zone at a rate of 5.0 kg m^{-3} (14.6 lb/cu. yd.), with 25 mm (1 inch) of root zone topdressed over the mesh matrices. Both the rate and depth were based on initial studies involving three rates and three depths of mesh inclusions, compared to the same high-sand root zone mix and cultural system without mesh element inclusion. Divoting, lateral tear, compression displacement, and traction simulation apparatus were designed, constructed, and successfully tested on Tifway bermudagrass turfs (*Cynodon dactylon* x *C. transvaalensis*). Other physical assessments included the FIFA ball bounce test and a surface hardness test involving a decelerometer, the Clegg impact hammer. The above replicated assessments were conducted four times during each growing season starting in 1985.

Based on five major field plot investigations conducted since 1985 and three additional ongoing studies, we found that mesh element inclusion in high-sand root zones substantially reduced divot width and length, plus lateral tear. Recovery of the divot openings was more than twice as rapid. Results from the traction and compression displacement assessments were variable. Under intense traffic conditions, the inclusion of mesh elements was also found to enhance ball bounce resiliency and, even more significantly, resulted in a three to four fold improvement in ball bounce uniformity. Surface hardness, as assessed by a Clegg impact hammer, was also significantly reduced on trafficked turfs with mesh element inclusion when compared to nonmesh turf root zones.

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[1]The mesh elements were manufactured by the Netlon© process from polypropylene.

When the turfs in the long term field experiments were four years old it became apparent that additional unanticipated benefits had resulted from the mesh inclusion. When replicated turfs with and without mesh elements were grown on a comparable root zone and under a similar cultural system, a black layer problem appeared during the fourth year on the nonmesh + high-sand root zone, while the adjacent turf on a mesh + high-sand root zone had no black layer. These findings showed that mesh element inclusion was also providing an enhanced soil environment for turfgrass growth, especially for the roots.

Subsequent studies revealed enhanced infiltration and aeration from mesh inclusion, while at the same time providing slightly improved soil moisture retention. The evidence suggests that mesh elements have an interlocking, three dimensional aspect that imparts a flexing action. The result is what could be described as a "self cultivation" effect.

This unique three dimensional, interlocking mesh concept is providing a wide array of benefits to high-sand turfed root zones. Thus, numerous field tests of mesh element inclusion have been underway around the United States and world to confirm these findings under actual "real world" use conditions. There are four applications that should be considered for golf course turfs.

1. One of the more obvious applications is for golf course tees where substantially improved recovery of divot openings has been repeatedly observed in England, Germany, and the United States. Further evidence of the reduced divoting response comes from a mesh + high-sand installation at the 4 hectare (10 acre) Santa Anita Park turf track in California where an eight to ten fold reduction in divoting from intense horse racing has been observed. The breaking of several world records in the past two years show that the mesh + high-sand system consistently provides the desired surface resiliency with speed, but without the hardness associated with speed on soil based tracks.

2. The unique capability of mesh elements to provide a stabilized root zone along with a more favorable environment for turfgrass growth offers potential applications for golf cart paths. It is an interesting "green" alternative to the widely used artificial surfaces. In addition, mesh stabilized turf root zones have proven successful in supporting very heavy load pressures from emergency vehicles, fire trucks, and similar heavy vehicles.

3. The soil stabilization capability derived from mesh also offers good potential for use in the construction of unique golf course architectural features such as steep sloped banks around putting greens, bunkers and grassy mounds.

4. Finally, the more recently discovered benefits of an enhanced root zone environment for turfgrass growth, plus the more uniform ball bounce, opens interesting potential applications for high-sand modified putting greens. Studies regarding this application are ongoing and will be reported as results evolve.

REFERENCES

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