Natural, reinforced or artificial?

Football pitch qualities

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Photographs/Fotos
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This page
Fibres reinforced PowerGrass® by Eurogreen

Page right
Emirates Stadium London (Desso fibres reinforced turf)

Page 46
Fibresand pitch at Rotherham United Stadium

During the late 1970's and early 1980's, more and more stadia were used for concerts and other non-sportive events. This led to intensive research (especially in the USA) in order to reinforce the soil for such stadia. Also in the early hours of the 80's, some sand-filled artificial turf appeared in the UK, but this trial period didn't last long. At the end of the century, artificial turf with rubber infill made its appearance. UEFA was immediately interested in this new development and around 2002/03 both UEFA and FIFA defined precise test criteria for such surfaces in order to allow championship matches to be played on approved turf products.

About the same time, other types of reinforced soil appeared and became more and more popular. The reason for this development was mainly stimulated by its acceptance by the professional players and coaches, as most of them do not like to play on artificial turf (named by FIFA = Football Turf).

At the moment natural, reinforced and artificial pitches compete.

An interview with Rolf Hediger.

sb: What are some of the main footballistic characteristics of a football pitch?

Rolf Hediger: Very important for preventing injuries are:

- Shock absorption (cushioning properties), defining the capacity of a surface to reduce an impact;
- Energy restitution (energy loss; speed before and after an impact), defining the resilience of the impacted material.
- Ball rebound, ball roll, stability; (deformation) and torque (rotation).

Which type of pitch is best suited for the players?

Football players prefer a soft, not too deep surface and a full / dense, humid grass cover and most important, a 100% even surface where all spots have identical footballistic / technical qualities. If all pitches had the technical and footballistic qualities of Camp Nou pitch in Barcelona, there would be no discussion. However, by far not all clubs have this ideal geographical situation and the economic power to maintain such an excellent pitch.

What is a natural grass pitch?

Natural grass is something so common in our lives that we take its very existence for granted. It is an ecosystem of its own in which the grass plants known as the graminae grow and need to be fed with water and fertilisers. One can mow a lawn and as long as the crown level isn't affected, the grass grows back. As long as the crown remains intact, the roots underneath can be sliced through below their tips. Grass reproduces by the seeding process, but also by stems that emanate from the crown.

How many hours of play a natural grass pitch can be used?

In Central Europe, a natural grass pitch can, under normal circumstances, be used only a few hours per week, calculated over a full year between 400 to max. 700 hours in order to keep a pitch in perfect condition. These playing hours depend of course on the geographical situation in Europe (cool, hot, dry, wet, length of the summer and the winter).

What do the football associations require concerning the different types and qualities of grass used in their competitions?

There are no regulations and recommendations concerning the qualities of natural grass and the type of graminae to be used. Up to today no specific footballistic tests, studies and requirements have ever been published by any football federation.

What exactly is a reinforced natural grass (sometimes also called hybrid) pitch?

With the use of stadia for concerts and other non-sportive events, the pitches sometimes have to support heavy weights. This resulted in the introduction of sand-dominant root zones. However as an infrastructure with 100% sand is unstable, various fibre reinforcement techniques in sand-dominant root zones

tackled the basic lack of stability inherent in such root zones. Two such techniques are, first the Fibresoil system (and other similar systems) of random fibre orientation developed in the USA and secondly the DESSO GrassMaster system of 'stitched fibre' into a sand base. Today many football pitches in major stadia are reinforced with all types of artificial fibre systems or grow natural grass within artificial turfs and in the daily use, sometimes neither the players nor the coaches are aware of this. The advantage of this type of pitches: their evenness is generally perfect and they can support heavy weights. The disadvantage is that they are generally much harder for the players.

Why are reinforced turfs getting more and more popular?

The football season is getting longer and longer and at the end of the season the pitches are mostly in a very bad shape. Such uneven / unstable pitches can be very dangerous for such highly paid players. This is the reason why the clubs are searching for alternatives to a standard organic natural turf. Moreover, until today, most professional players still do not want to play on artificial turf, except in the Nordic countries where they have a long tradition of playing on artificial surfaces.

What are the main requirements for such reinforced turf?

There are two main groups of reinforced turfs.

Sand-base systems

The maintenance techniques, particularly vertidraining and other forms of solid aeration, are very important in enabling the grounds staff to exercise control over the somewhat conflicting requirements in order to achieve a surface which is not too hard but gives a good stability. Players like this type of pitch construction for championship matches even though the evenness is perfect and the footballistic qualities are on all spots identical, and in most cases they prefer to train on training pitches which are softer (higher shock absorption and lower energy restitution).

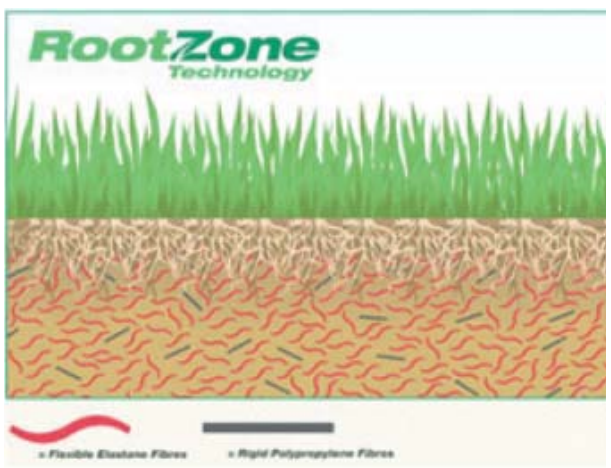
Artificial turf systems filled with organic material

These systems do not allow vertidraining however, the daily maintenance/supervision of the turf is important as scarification and irrigation have to be adapted daily to the meteorological conditions. Due to the feeble thickness of the organic infill material, fertilisation has to be done in small quantities but very often. That means that these systems need more daily observation/maintenance. The players like this type of pitch because the evenness is perfect and the footballistic qualities are on all spots identical, very similar to good natural grass (similar shock absorption and energy restitution values).

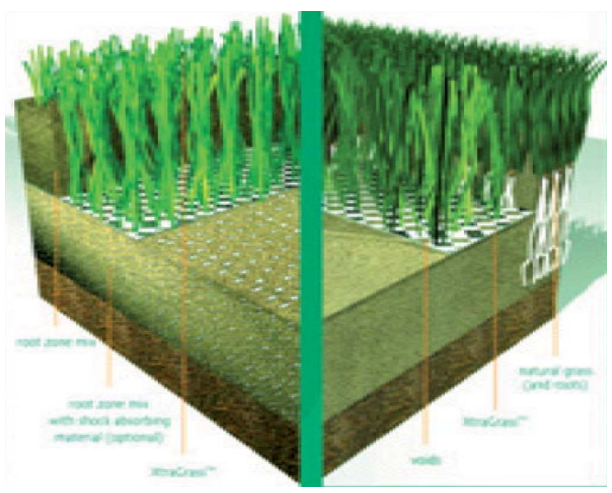
If a club intends to install a reinforced pitch, what is a general observation about these turf systems?

Compared to natural or synthetic grass, they all require a more intensive and specific care by the ground staff! The major problems are felt and thatch and a very good knowledge is necessary in order to locally fine-tune the fertilising and watering schedule.

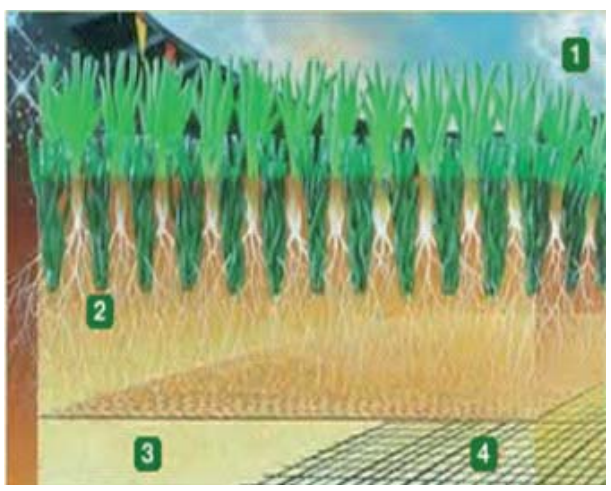
A comparison of the principal reinforced turf systems



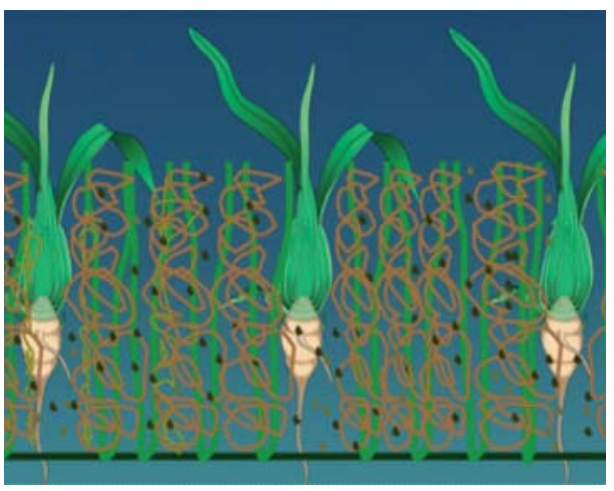
Natural grass reinforced with artificial fibres within the grass roots
Fibrelastic, Fibresoil or similar systems



Natural grass reinforced with artificial fibres on a turf carpet
Greenfields, Xtra Grass



Natural grass reinforced with implanted artificial fibres
Desso, GrassMaster



Natural grass reinforced with artificial fibres on a turf carpet
Limonta, Green-Live s

Are these reinforced systems accepted by the football associations? At what moment is a football pitch no longer considered as natural?

At the moment (2012), FIFA and UEFA do not take this evolution into account. They consider that a pitch which has any kind and amount of natural grass within the playing surface is to be considered as natural grass. Therefore no test and approvals are required as it is the case with artificial turf pitches.

Are the footballistic qualities of natural grass the best for the game, are the reinforced / artificial turfs better or is it a mix of all of them?

This question cannot easily be answered, but it can be affirmed that: As previously explained, if all the pitches could have similar qualities as the natural grass pitch in Barcelona (and of course some very few other pitches in Europe), all the older professional players would like to play exclusively on such pitches. However, the younger professional players who trained on good quality artificial pitches as juniors are used to a game which may be a bit different from natural grass. My view is that whatever the type of pitch will be used by the players, the footballistic qualities should be very similar. As shown in our study, this is actually not the case.

Let's talk about artificial turf: Are there standard criteria?

Today's artificial turf products shows big differences:

- Turf fibres length from 30 mm to 60 mm
- With or without shock pad
- Shock pads with various shock absorption values
- With or without any infill
- Granular infill with different materials (SBR/EPDM/TPE etc.)
- Thickness of the granular infill from 8 mm to 20 mm
- Thickness of the basic sand infill from 5 mm to 30 mm

Conclusion: the products are very inconsistent. FIFA requires that the footballistic qualities are consistent and accepts any Football Turf product as long as, when installed, it fulfils the FIFA 1 Star or 2 Star tests criteria.

Are the footballistic qualities of artificial turf similar to natural grass?

No, they are not. Today's valid basic footballistic tests were developed between 2002 and 2003. Since then no more stringent footballistic test criteria have been implemented so as to incite the industry to develop products whose qualities are closer to natural grass.

Is it necessary to install a shock pad and if yes, what should be the ideal shock absorption value?

Medical test results seem to show that an elastic shock pad is recommended, but it should not be too soft (UEFA, Prof. Jan Ekstrand). So far no new research has been undertaken regarding the ideal shock absorption value! No other medical studies have been undertaken in order to include the reinforced turf systems as a separate category in addition to natural and artificial turf.

What are you doing to improve this lack of knowledge?

With the collaboration of some turf manufacturers and test laboratories, I started my own footballistic quality study on football pitches in 2009. The scope of this study is to distinguish between:

- Natural grass (organic top soil)
- Reinforced natural grass (artificial turf carpet with organic seeded infill)
- Reinforced natural grass (artificial or organic fibres implanted or mixed into a sand-base and seeded)
- Football Turf (tested and approved according to FIFA 2Star / 1Star and CEN-EN)

Note: Due to the technical and footballistic characteristics, the reinforced natural grass pitches have to be divided into

two distinct groups. This study shows significant differences in the footballistic qualities between the different pitch solutions. The differences are especially important when comparing the results of the energy restitution and the shock absorption.

Could you give us some more details?

A) Natural organic grass pitch
They allow the lowest intensive use of all pitch solutions. Until today natural grass is considered by the players to be the best surface and therefore its footballistic qualities are used as the basis for any footballistic quality comparison between the different turf systems.

B1) Synthetic turf installed on top of a gravel base, filled with top soil and seeded and
B2) Synthetic turf installed on top of volcanic soil, filled with a mixture of organic material and seeded
They allow a more intensive use and their footballistic qualities, e.g. shock absorption and energy restitution, are very similar to those of a natural grass pitch.

C1) Synthetic or organic fibres mixed with sand and
C2) Synthetic fibres implanted into a sand base
They allow a more intensive use, but are often harder, have lower shock absorption and a higher energy restitution.

D) Artificial grass (Football Turf)
They (FIFA and CEN tested turfs) allow the most intensive use of all pitch solutions, but one of its footballistic qualities, namely energy restitution, is 3 times higher than natural (organic) grass pitch.

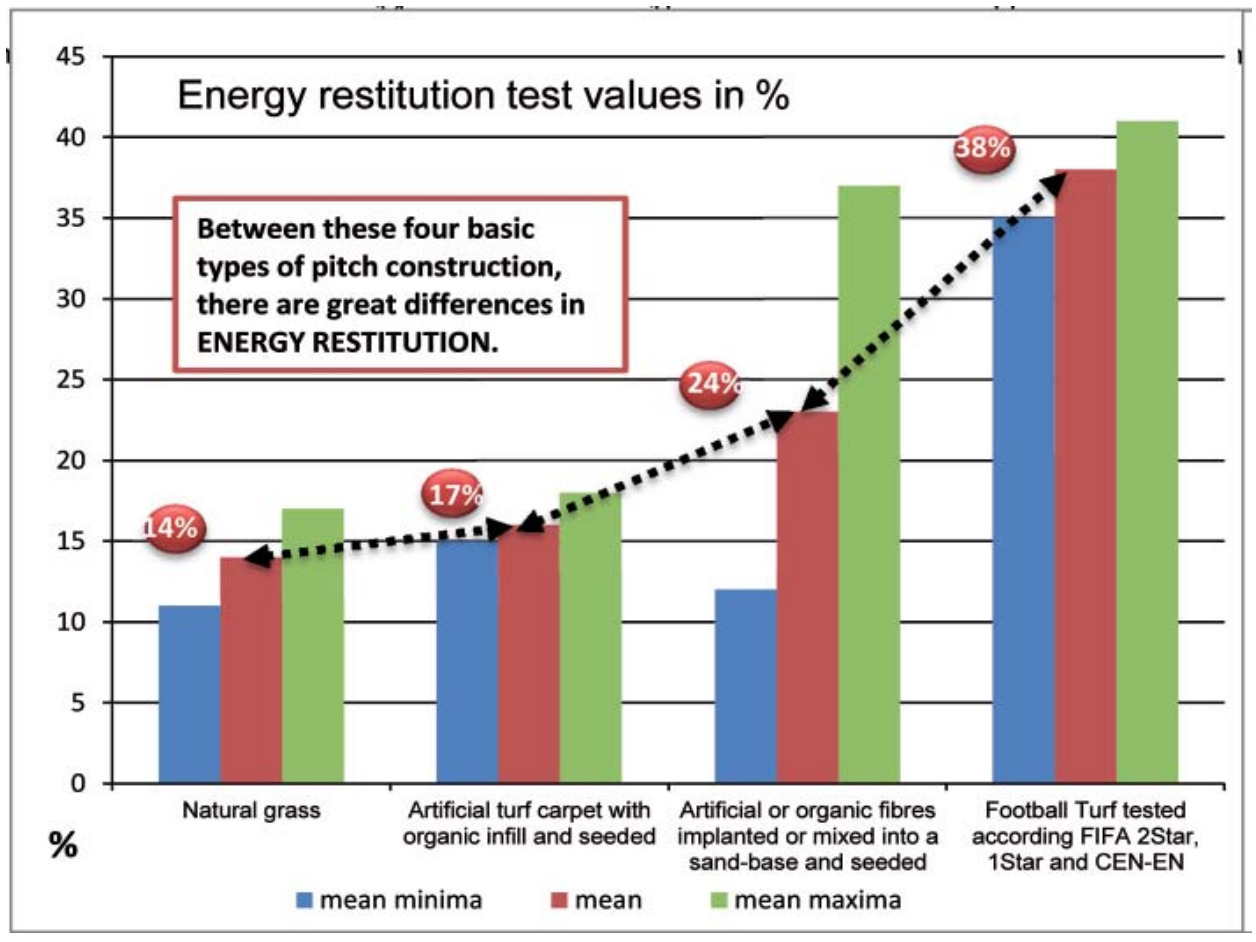
On the basis of your study, can you make some conclusions / recommendations?
Even if it is a small scale study without much funding's the results show

- that the artificial turf industry has still a lot of work to do for its products to achieve a quality similar to natural grass,
- that the various reinforced solutions are good alternatives to natural grass and artificial turf. However, some of the most widely used systems seem to need some adjustment in their construction in order to reduce the hardness of the surface,
- that it is possible to recommend identical footballistic qualities (not criteria) for all types of football pitches (natural, reinforced and synthetic).

If these recommendations were used, it would oblige the turf industry to ameliorate the quality of their pitch constructions and finally reach the level of the best natural grass pitches used in European stadia.

On the basis of these recommended values, a club with any type of turf (natural, reinforced or artificial) could test its qualities regularly and compare the test results to the above minima / maxima values of best natural grass quality and if necessary were proceeded to modify their pitch.

The result would be quality turfs with happy players risking fewer injuries!



Important footballistic tests	Recommendations	Comments
Vertical ball rebound	75 - 95cm	Similar to FIFA
Ball roll	5m - 6.5m	Similar to FIFA
Rotation	38KN ±5	Similar to FIFA
Shock absorption studded foot, 1st impact only	74% ±4	This test is executed with a flat foot, registering the mean of the second and third shock
Energy restitution studded foot, 1st impact only	15% ±4	This test is not part of the FIFA Quality Concept (FQC)