Synthetic turf in brief

The first third-generation synthetic football pitch in the Netherlands was laid in 1996. Of course, there is a history leading up to this event. What are the origins of synthetic turf and what is the state of affairs now? What do players think about synthetic grass? This section will answer these questions, as we discuss the history and evolution of synthetic turf.

History and evolution

Synthetic grass worldwide

The problem of covered grass pitches in stadiums was addressed for the first time in the Houston Astrodome (USA) in 1965. This stadium had a covered baseball field of natural grass, which needed to be kept nice and green of course. Natural grass needs sunlight to thrive, which was why the Astrodome had been built with a transparent roof, but the glinting of the sun on the roof impeded the players when catching high balls. It was then decided to paint the roof to solve this problem but then the grass would not grow properly. Another solution had to be found.

Stadium owners and engineers decided to lay an artificial playing surface, the first of its kind. This was a grass carpet made from nylon fibres. The surface was first installed in the summer of 1966.

First Generation

The synthetic grass carpet was introduced to Europe in 1970. This carpet was not made of nylon fibres' but of a different synthetic fibre called polypropylene. Not only was this cheaper, it was also more comfortable. The advantage of polypropylene was that it is softer than nylon, so the players were at less risk of injury. We now call these carpets, with closely packed tufts (both nylon and polypropylene), first generation synthetic turf.

First generation synthetic turf

Second Generation

The second generation of synthetic grass was developed in the late 1970's. It had longer tufts that were spaced more widely apart. Sand was spread between the fibers to create sufficient firmness and stability for the players. Second generation synthetic turf pitches provide a flatter playing surface than natural grass, which gives better ball control and prevents balls from shooting off in unexpected directions. This was a great improvement, especially for hockey. Acceptance of artificial grass for field hockey was slow in coming; artificial grass as a substitute for natural grass was still completely unknown. It was to take 10 years before the adoption process really got going. Today there are few hockey clubs that do not have an artificial pitch.

Second Generation synthetic turf

The second generation artificial synthetic turf is less suitable for football however. The playing characteristics and behaviour of the ball on these pitches is not comparable to natural grass, and sliding tackles can result in painful abrasion injuries from the sand. Nevertheless, some football clubs did try to play on these pitches in the 1980's. It was to take until 1996 before a surface was developed that was really suitable for football: the third generation.

Synthetic grass for football

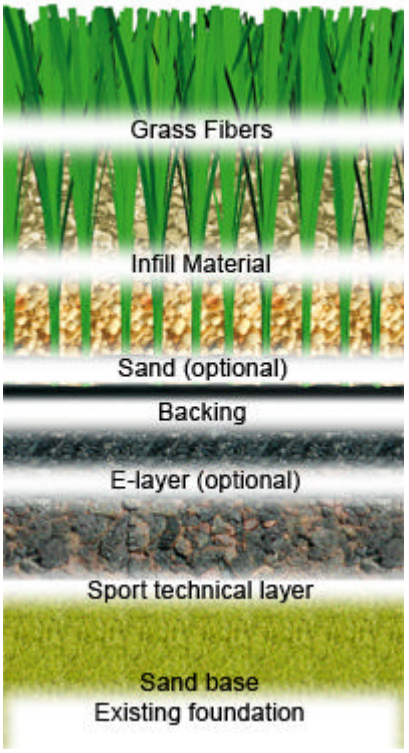
Third Generation

After the arrival of the pitches spread with sand, scientific and technological advances led to the third generation of pitches. A third generation synthetic turf pitch is in a class of its own and cannot be compared with the earlier generations. This grass has longer fibres (>55mm) which are spaced further apart in the caret. They are not usually made of polypropylene but polyethylene, which is softer and so kinder to the skin. These pitches are spread with rubber granules in addition to sand. The combination of fibre and infill ensures a comfortable playing surface; even sliding tackles are no longer a problem on these pitches. As there is plenty of space between the grass fibres, football boot studs sink well into the surface, which puts less stress on the players joints and also allows the foot to get under the ball. These developments have made third generation pitches excellent for football.

Third generation synthetic turf

Structure of a pitch

An artificial football pitch is divided into a substructure and superstructure. The substructure consists of the drainage, the base, a sport-technical layer and a geotextile membrane. The visible part of the pitch, the superstructure, consists of the grass carpet and the infill. A diagram of the structure of the pitch is shown on the right. A brief description of the different components of a pitch is given below.



Drainage

Most sports fields have a drainage system. These consist of underground pipes that drain off surplus water as soon as the groundwater level rises, preventing the artificial pitch from flooding.

Base

The sub-base and earthwork vary from continent to continent, country to country and even region to region. The advantage of a well-planned base is that it does not have to be rebuilt each time the turf itself is replaced. A good stable and suitable base is extremely important for the overall quality of the pitch and its lifespan. A well constructed base consists in most cases of a porous drained sub-structure (exception in countries with hot climates). The base must have sufficient load-bearing capacity to support the playing surface and any machinery used to maintain the surface without any deformation. The sub-base is usually made of crushed stone aggregates or asphalt.

Sport-technical layer

The sport-technical layer, between the base and the grass carpet, affects the way the ball behaves and the players' movements on the pitch. This layer determines the stability of the pitch to a large extent. A good sport-technical layer prevents bumps in the pitch and so helps to prevent injuries. This layer consists in some countries of a mixture of sand, lavarocks and/or rubber. Pitches with a "hard base" (base made from materials other than sand) are in most cases installed with an e-layer (elastic pad). An e-layer is an elastic rubber layer, 10 to 20 mm thick, which has the same function and properties as a sport-technical layer.

Geotextile

The term geotextile is short for geosynthetic textile. These materials are used in artificial dykes, for instance, or in other places where surfaces need to be stabilised. It is a membrane that spreads the load and lies between the grass carpet and the base (sport-technical layer). This membrane protects the backing of the grass carpet, whilst at the same time ensuring an even spread of the load so that the underlying layers do not deform during later installation works and sport activities.

Grass Carpet

The grass carpet is the most conspicuous part of a synthetic football pitch. The grass carpet and the infill together determine the playing properties of the pitch to a large extent. You only have to think of the number of player-field and player-ball interactions, such as sliding tackles, the grip of the boots and the roll of the balll. The grass carpet is made of a backing cloth and grass yarn. The yarns are punched through the backing cloth by a machine known as a tufter, similar to the process used when making residential carpets. The "blades of grass" produced by the tufter are usually 50 to 70 mm long. The finished grass carpet is supplied on a roll and is rolled out over the geotextile during installation. The rolls or strips are then joined together (with glue, seams, or both) and spread with infill.

Tufting process

Infill material

A combination of sand and rubber granules is used as infill between the fibres for most synthetic football pitches. As a rule, 20 to 25 mm of sand is spread first and then toped with 10 to 20 mm of rubber granules. The purpose of the infill is first to weigh down the grass carpet to ensure that it stays in position and, second, to provide a surface that the studs of the players' football boots can sink into. This prevents damage to the grass carpet and prevents the players from suffering joint injuries. The combination of grass carpet and infill is largely responsible for how comfortable the pitch is to play on. It affects boot grip, the behaviour of the ball and properties, such as shock absorbency and energy restitution.

Infill material

Acceptance

The beginning

Third generation synthetic turf, developed especially for football, gained acceptance slowly at first. People were highly sceptical about the products performance versus natural turf. This was partly because of players' bad experiences with second generation pitches but it also had a lot to do with emotion and tradition. Everyone grew up with natural grass and looked upon synthetic grass as necessary evil in sports. This sceptical attitude was also due to the lack of familiarity with the product. Very few people knew exactly what a synthetic grass football pitch looked like or what it was like to play on.

The present situation

Many players still prefer natural grass over synthetic but the sceptical attitude toward synthetic turf is gradually disappearing. Most footballers, once they have played on the surface for a few weeks, are very positive about synthetic grass. Synthetic pitches have now gained even broader acceptance among youth and university programs.

Associations

Football associations (UEFA and FIFA) were wary about synthetic pitches at first. It was only after positive opinions started to appear from the membership that they have adopted a favorable attitude. Both organizations have now approved the use of synthetic turf for various competitions and venues. Thus, the stage is now set for a huge growth in the adoption of synthetic turf for football applications.

Synthetic turf and professional football

In 2003, the first division club Heracles in Almelo (The Netherlands) took part in a UEFA pilot project in which five synthetic pitches were laid at various professional football clubs in Europe. Thanks to the experiences of the players at these clubs, UEFA now has more information about playing top-level football on synthetic grass. Based on the information gained from this project, UEFA announced that it would allow competitions on artificial pitches starting in the 2005/2006 season only under specific circumstances
(pitch must be certified FIFA two-star).