

Introduction

End of life tire rubber infill (ELT infill) is widely used in artificial turf systems for soccer and has a market penetration of about 95% of all artificial soccer turfs installed. Currently within the European Community there is a discussion on whether rubber infill is to be regarded under the scope of ENTRY 50.5 of Annex XVII of Reach. The Netherlands authorities have raised the question if rubber infill for artificial turf is an Article as defined by Reach or not.

The branch organizations VACO and RecyBEM (representing the ELT infill manufacturers) have therefore asked Tarkett (a major European artificial turf system manufacturer and supplier) the following question:

Does the shape, surface or design of (ELT) rubber infill used in artificial turf determine its function to a greater degree than its chemical composition ?

To answer this question we will discuss the following functions of infill needed for a successful artificial turf for soccer:

- Injury prevention
- Sports technical performance
- Durability

For the terms Shape and Surface we look into the effect of shape of the granules on the mentioned functions. For the term design we look into the effect of size distribution of the granulate on the mentioned functions.

Function: Injury prevention

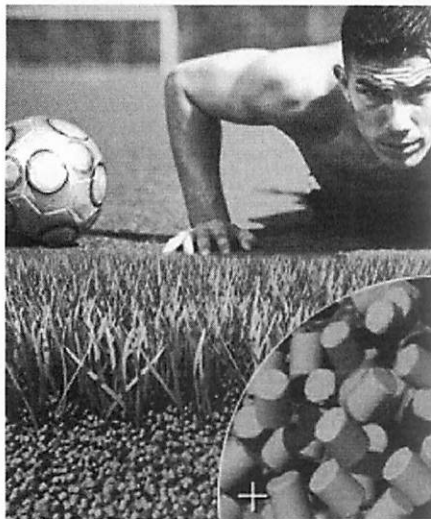
In the past (before 1998) sand (silica) was used as infill in artificial turf for soccer (football), in the same way as it was and still is used for sand filled hockey fields and tennis courts. However sand causes abrasions during slidings and falls. Slidings and falls are very frequent during football play. The resulting serious injuries in combination with „unnatural” sports performance were the main reasons why artificial turf with sand infill was not accepted by football players. Therefore artificial turf soccer fields were not installed in large numbers in the early "90s.

Around 1998 specifically for soccer Fieldturf (now Tarkett Sports) developed and introduced an artificial turf construction with rubber infill. In this turf construction the abrasive sand is covered by a 2 to 3 cm layer of ELT rubber infill. With the use of rubber infill instead of sand the resulting injuries during

play are minor. This clearly shows that material properties of infill are key for the function injury prevention.

From an economic perspective it is also clear that material properties of infill are key for its function. Sand, gravel and granulated glass are roughly a factor 10 cheaper than ELT rubber infill and a factor 100 cheaper than organic and TPE infill. If sand, gravel or granulated glass would provide the necessary function of injury prevention these materials by laws of economics would be used in artificial turf for soccer. No such hard, inflexible and abrasive materials are however applied in artificial soccer fields.

Is the shape and size distribution of the infill granulates of influence on the injury prevention ? The three infill materials currently used (ELT rubber, TPE and organic fibres) have about the same material properties (soft, flexible and non abrasive) but clearly have different granular shapes and size distribution. Despite this difference all three infill materials provide injury prevention.



Thermoplastic Elastomer (TPE infill)



ELT rubber infill



Coconut infill

We conclude that the material properties (soft, flexible, non abrasive) of the infill materials ELT rubber, organic fibres and TPE are a key aspect for the function injury prevention. For materials with comparable material properties granular shape and size has no impact on injury prevention.

Function: Sports technical performance

(ELT) rubber infill provides resilience in combination with an open structure of the artificial turf. The resilience of the rubber infill results in a more „natural“ sport technical performance of the artificial turf construction in terms of ball bounce and roll resistance. For optimal shock absorption and foot stability ideally the rubber in the system is dense and compacted.

In a dense and compacted situation clearly the flexibility of rubber (material property) provides the shock absorption. However a more open structure is needed to enable the players to get their shoe “under” the ball. A specific granular size distribution of the rubber granulate is needed in order to obtain the open structure. The granular shape is of some influence on the level of compaction of the infill over time. The open structure is maintained by regular maintenance of the field (raking).

The material properties of the rubber provides a part of the necessary sports technical function. Granular size distribution and shape also provides a part of the required sport technical function. We conclude that for the function sport technical properties both material properties and granular shape and size distribution are relevant aspects.

Function: Durability

On average an artificial turf pitch for soccer has a lifetime of 10 to 15 years. The infill material used has to last as long as possible in order to prevent intermediate replacement at high costs. Durability of the infill therefore is an important function.

Twenty years of experience with ELT rubber infill has proven that ELT infill has a high inertia to climatic circumstances in outdoor application in artificial turf constructions. Currently many 15 year old fields are renovated (replacement of the artificial turf) and the 15 year old ELT infill is then often re-used as infill.

Experience has learned us that TPE infill and organic infill have a shorter lifetime than ELT infill. Organic infill, TPE infill and ELT infill are different infill materials with a different chemical composition. Shape, size and size distribution have no influence on the function durability.

We conclude that the material properties (chemical composition) of the infill is key for the function durability.

Conclusion

Injury prevention, sports technical performance and durability are important functions of infill, required for a successful artificial turf construction for soccer.

Material properties (chemical composition) of (ELT rubber) infill is a key aspect for three functions of infill: injury prevention, sports technical performance and durability.

Infill shape and size distribution is a key aspect of (ELT rubber) infill for one function: infill sports technical properties. Infill shape and size distribution has no function for injury prevention and durability.

Therefore on the question of VACO and RecyBEM,

“ Does the shape, surface or design of (ELT) rubber infill used in artificial turf determine its function to a greater degree than its chemical composition ?” ,

to our opinion the answer to this question should be no, the chemical composition of rubber infill used in artificial turf determines its functions to a greater degree than shape, surface and design.



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