



FACT SHEET ON THE APPLICATION OF RUBBER GRANULATE FOR SYNTHETIC TURF FIELDS

THE PREVALENCE OF SYNTHETIC TURF FIELDS

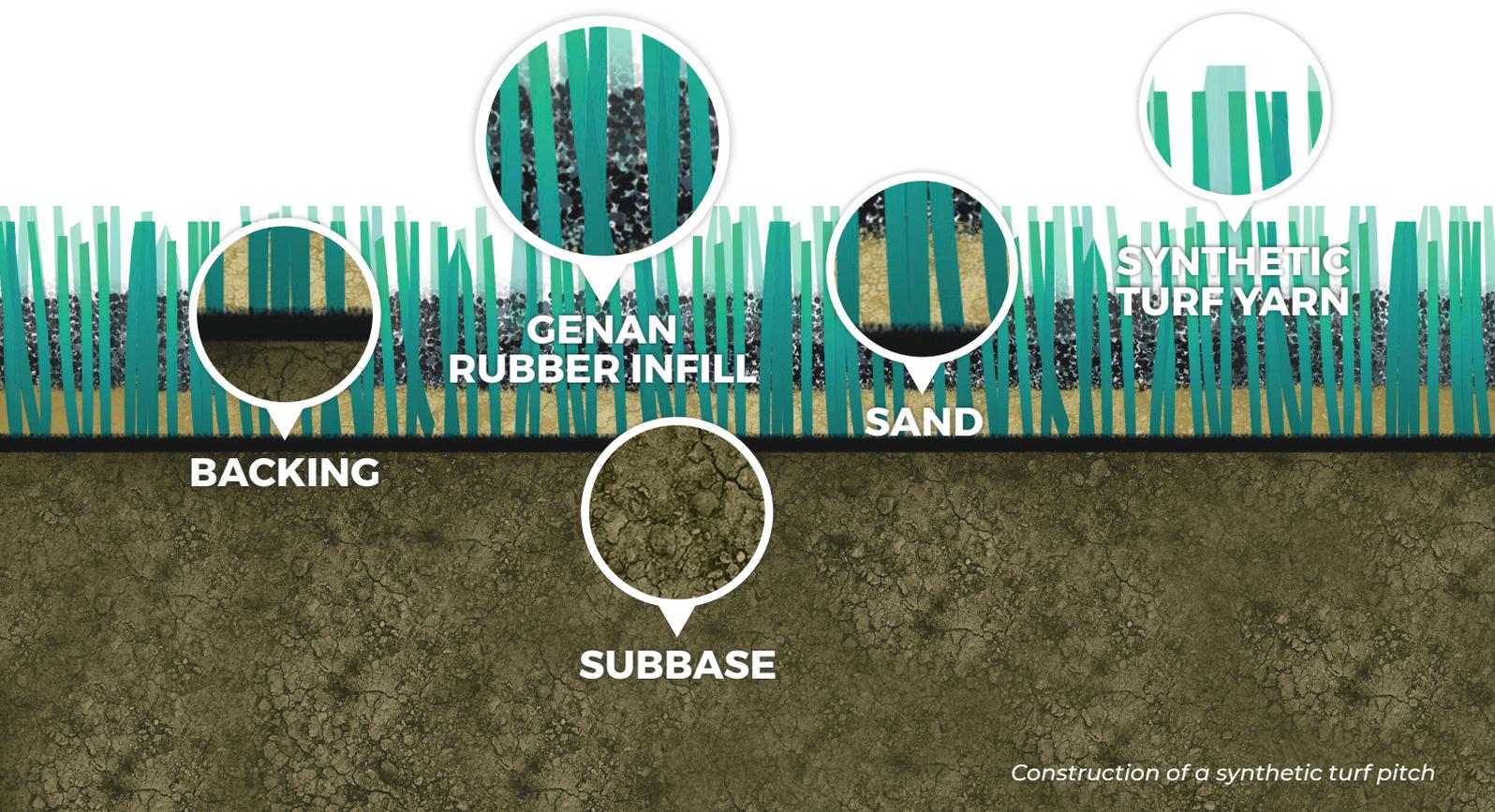
- The use of synthetic turf fields for football and other sports is gaining ground. You can play on them all year round, and they withstand more frequent and intensive use than conventional grass fields. This increases the amount of activity year round and has a positive impact on public health.
- In the USA, synthetic turf was first installed in 1964 on a recreation area at the Moses Brown School in Providence, Rhode Island. The material came to public prominence in 1966, when it was installed in the Astrodome in Houston, Texas.
- Currently, there are between 12,000 and 13,000 synthetic turf sports fields in the USA, with approximately 1,200 – 1,500 new installations each year.
- Synthetic turf is a popular and versatile solution for other sports, such as field hockey, baseball, tennis, lacrosse, soccer and rugby.
- About half of all NFL teams currently play their games on synthetic turf. Since 2003, over 70 FIFA U-17 and U-20 World Cup matches have been played on synthetic turf soccer fields.
- There are approximately 25,000 people per synthetic turf field in the USA.
- Synthetic turf fields are fully accepted by the NFL, MLS, FIFA, UEFA and NCAA – and are approved for matches at all levels, incl. Super Bowl, Champions League and the World Cups.

SYNTHETIC TURF FIELDS AND RUBBER GRANULATE

- In a typical synthetic turf field, the application of rubber granulate (also known as infill) is an all important factor for playing properties to resemble those of natural grass as much as possible. Rubber infill is spread across the stabilising sand layer, and granules lie between and support the grass blades, providing the right resistance and shock-absorption for the ball to roll and bounce naturally. Infill granulate also protects players from getting injured.
- The most commonly used rubber granulate for infill material is made from end-of-life tires (ELT). The tire industry has spent decades developing a durable, elastic material with high friction. End-of-life tires possess some fantastic properties, which are put to good use in infill material.
- Rubber granules are typically between 0.03 – 0.1 inch (0.8 – 3 mm) in size – and are therefore categorised as microplastics.
- The quality of infill is pivotal for field properties. The right particle size distribution ensures that the infill material falls in perfect place around the blades, offering shock-absorption and providing the right ball and stud resistance at the same time.



- In the same way that users of conventional grass pitches cannot avoid contact with grass, nor can users of synthetic turf pitches avoid contact with turf yarn and infill material.
- Rubber granules can get caught in the shoes and clothing of players, which makes it possible for rubber to leave the field after use. Rubber granulate may also be removed from fields during field maintenance or snow removal.
- As infill material consists of different particle sizes, rubber granules will gradually compact as the synthetic field is being used. In order to minimise this compaction, field maintenance must be carried out regularly – in the form of raking and brushing.
- Minimal, continuous compaction is inevitable, though, requiring occasional re-fill of infill to ensure an even layer of granulate.
- Different prevention measures can be set up to ensure that granules stay on the field, so the field may be regarded as a closed installation. There should be a barrier / infill fencing panel around the field – as well as a clean-down exit area, where clothes must be brushed off and shoes emptied.
- Apart from occasional re-fill of rubber granulate, a synthetic turf field must also be maintained – just like a conventional grass field must be maintained.
- Maintenance costs are much lower for synthetic turf fields than for conventional grass fields, as you don't need to rely on natural resources such as water. You will also eliminate the need to purchase fertilizer or pesticides.



Construction of a synthetic turf pitch



NO INCREASED HEALTH RISK FOR USERS OF SYNTHETIC TURF FIELDS

- Critics have expressed concern:
 1. that playing on synthetic turf fields implies a health risk due to the use of PAH (Polycyclic Aromatic Hydrocarbons) plasticiser oils in tire rubber, and
 2. that environmentally unfriendly substances contained in the granulate may leach out through the percolation of water.
- Several scientific studies conclude that rubber infill made from end-of-life tires do not pose any elevated health risk. The European Chemicals Agency, ECHA, has e.g. analysed granulate samples extracted from more than 100 synthetic turf fields in Finland, the Netherlands, Great Britain, Italy and Portugal. Among these fields were also fields laid before the adoption of the more restricted EU regulations which today apply to xenobiotics in car tyres. ECHA found no reason to advise against playing sports on synthetic turf fields.

Since the U.S. Environmental Protection Agency, EPA, began its research into the use of crumb rubber under the Obama Administration (2016), five additional studies have been released that have all concluded that crumb rubber has no or very low potential for any negative impact on human health. These include studies published in Environmental Research and Sports Medicine and studies published by FIFA, Washington State, and the European Chemicals Agency.
- By choosing an infill supplier that recycles end-of-life tires from countries within Europe or the US, infill that complies to regulations for the European and American markets respectively is guaranteed.

ENVIRONMENTAL CONSEQUENCES OF USING RUBBER GRANULATE IN SYNTHETIC TURF FIELDS

- On average, 4,850 lbs. of granulate a year is added to each field (re-fill). This quantity varies a lot from field to field – depending on daily routines and maintenance efforts. In recent years, increased focus on optimising routines related to both use and maintenance has led to a reduction of re-fill volumes.
- Most of this annual re-fill does not replace material which has disappeared from the field. Compaction (i.e. the natural compression of rubber granules) accounts for approx. 66-87% of the need for re-fill. This may sound like a whole lot, but 10 years of such compaction will only increase the thickness of this layer by about 1/10 of an inch. Compaction is thus nearly invisible to the naked eye.
- The average loss of material removed in the shoes and clothing of players totals approx. 90 lbs. per field per year. Lost material will end up in waste water treatment plants, e.g. through washing machine drains. Alternatively, it will be swept up from e.g. changing room floors and collected for waste incineration. This will result in an annual discharge of rubber granulate to the aquatic environment of approx. 2 lbs. per field – i.e. if players do NOT brush off their clothes and empty their shoes before they leave the field.
- Rubber granulate discharged with water from the field will end up in waste water treatment plants, stormwater ponds or as direct discharge. According to a comprehensive literature study made by the Danish Technological Institute in May 2019, this will result in an annual discharge to the aquatic environment of approx. 5.5-80 lbs. per field. A recent Swedish study from October 2019, prepared by Ecoloop on behalf of the Municipality of Kalmar, has registered and monitored the specific channels through which granules might spread from a newly installed synthetic turf field with an impermeable bottom. Findings are that discharge of microplastics to the aquatic environment amounts to about 1/10 of a pound, of which approx. 10% is rubber granulate.
- In Denmark, a study shows that many initiatives have been taken in order to avoid the migration of rubber granulate to the environment – in the form of fencing, percolation and closed wells. As far as Denmark is concerned, the expected discharge to the aquatic environment should thus be at the low end of the 5.5-80 lbs. per field per year interval.
- In comparison, theoretical calculations show that wear from shoe soles accounts for an annual discharge to the aquatic environment of between 10 to 260 tons of microplastics.
- Other sources of migration of microplastics to the water environment are wear and tear from car tyres, paint particles, the washing of synthetic clothing/fabrics as well as personal care products.



HOW THE RECYCLING OF END-OF-LIFE TIRES INTO RUBBER GRANULATE AFFECTS THE CLIMATE

- As long we humans drive vehicles with tires – and the total amount of driving increases every year – there will be a worldwide need to dispose or recycle large amounts of rubber from car tyres (so-called End-of-Life Tires – ELT in abbreviation).
- Each year, approx. 20 million tons of car tires are scrapped worldwide. This corresponds to approx. 5 million tires a day. There are several ways to dispose of these large amounts of tires. Tires can be incinerated in e.g. cement kilns, buried (landfilling) or recycled. Tire recycling is the most climate-friendly disposal method. With Genan's technology, 90% of the tire is recycled.
- For each ton of tires recycled through Genan technology instead of being incinerated, the climate will be spared a minimum of 0.7 tons of CO₂ emissions.
- In the EU, more than 1 million tons of car tires are incinerated each year. This is a waste of good resources and raw material, and the environment would be spared 700,000 tons of CO₂ emission as a minimum, if tires were instead recycled.
- Infill in synthetic turf is important for the circular economy of the sustainable application of end-of-life tires. If the recovery of rubber granulate through the use in synthetic turf fields should stop, tires will instead be incinerated, and the climate will be negatively impacted by considerably increased volumes of CO₂.

THE FACT SHEET HAS BEEN PREPARED ON THE BASIS OF INFORMATION FROM I.A.:

- *Facilitetsdatabasen.dk (information about the number of synthetic turf pitches in Denmark)*
- *Idrættens Analyseinstitut, "Boom i kunstgræsbaner har ændret idrætslandskabet", 2018 ("Synthetic turf boom has changed the sports landscape", 2018)*
- *Miljøstyrelsen, "Vejledning om kunstgræsbaner", 2018, samt rapport nr. 1793, 2015 (the Danish Environmental Protection Agency, "Guide on Artificial Turf Pitches", 2018, as well as report no. 1793, 2015)*
- *The "Life Cycle Assessment" report, 2018, prepared for Genan by a number of European experts from i.a. IFEU (Germany) and FORCE (Denmark)*
- *European Chemicals Agency (ECHA), "Annex XV report: An evaluation of the possible health risks of recycled rubber granules used as infill in synthetic turf sports fields", February 2017*
- *The report "Massebalancer af gummigranulat, som forsvinder fra kunstgræsbaner – med fokus på udledning til vandmiljøet", november 2018. ("Mass balances of rubber granulate disappearing from artificial turf pitches with focus on discharge to the water environment", November 2018). A literature study of all recent, available Danish and international, scientific sources on this topic, prepared at the request of Genan by Hanne Løkkegaard, Bjørn Malmgren-Hansen and Nils H. Nilsson, Afdeling for Bio- og Miljøteknologi på Teknologisk Institut (the Department for Biotechnology and Environmental Technology at Teknologisk Institut (the Danish Technological Institute))*
- *The report "Dispersal of microplastic from a modern artificial turf pitch with preventive measures - Case study Bergaviks IP, Kalmar", October 2019, prepared by Fredrick Regnell, Ecoloop, at the request of the Municipality of Kalmar, Svensk Däckåtervinning and Ragn-Sells.*