European Synthetic Turf Organisation

POSITION PAPER 'end-of-life' options for synthetic turf

March 2009

INTRODUCTION

Synthetic Turf (ST) or artificial grass is a relatively recent product addressing out- and in-door applications. Synthetic Turf presents many advantages for sports clubs, schools, municipalities, etc. gaining recognition and proving success. The usage is growing and so are the applications. In the beginning mainly in hockey but during the last decade it has demonstrated its usefulness in football, tennis, rugby and lately in landscaping. Its success is the consequence of three essential factors: technical innovation, economic advantages and excellent environmental benefits.

ST is **the** answer in areas where…

- water is scarce, expensive and needed for priority usages (agriculture and domestic)
- the soil needs to be intensively fertilized for growing natural grass and to maintain it
- the climate is such that growing and maintaining natural grass is almost impossible
- natural grass grows well; "the usage of a sports field remains limited to the resistance of natural grass…"

Under all climatic conditions, ST installations all over Europe offer 1500 playing hours per year. This is a considerable advantage compared to any alternative, a usage capacity worth the savings of three to four conventional fields. In large and highly populated urban regions, where space is limited, this is an essential consideration.

But, after years of good use, ST has to be replaced - what happens with the old ST?

This position paper looks into the important matter of "end-of-life ST". In the coming years there will be growing quantities of "end-of-life ST" entering the waste stream.

COMPOSITION & MATERIALS USED

Synthetic Turf is a carpet type of construction with a backing frame and fibres entangled to give a grass like appearance and behaviour. It is an assembly of various components made of polymers selected for their mechanical properties and binding materials. A layer of sand infill and a layer of rubber granules are often laid in between the pile to provide elasticity and bouncing properties. The rubber in the form of granules is usually recycled from tyres or other synthetic materials can be used. The different components are intimately combined together, but they have very different chemical structures.

RECOVERY OPTIONS

We have to consider the two main components separately:

1. Infill:

If it is technically relatively easy to separate the infill from the carpet and to separate the rubber crumb from the sand which is used as a bottom layer, the crumb may be reused as such but if the chemical structure has been partly destroyed due to aging and weather exposure it will have to be disposed of. If sand has been used, it can also be recovered but it may need to be cleaned particularly if it has been exposed for many years to outdoor conditions, a lot of organic residues and dust has accumulated in the system and if re-use is possible it does need cleaning.

2. ST carpet:

The carpet like structure without infill is a combination of several synthetic materials including binding components which have usually suffered from the weather conditions and have lost some of their original

properties because of chemical degradation. Recycling in the way this is practiced for example with PET bottles is in this case very difficult for several reasons:

- Cost of separation and high processing energy consumption
- Chemical degradation and oxidation of the components

Recovering some of the constituents of ST for recycling might be possible at very high separation cost and high energy consumption to produce lower end and less technically demanding usage applications. Such a process would have only marginal environmental benefits, if any…

The materials used to produce ST are well known polymers and these have over the years demonstrated to be environmentally friendly and harmless. The intrinsic chemical composition of these polymers is such that they contain a very high energy level which can be delivered in the form of heat when they are burned. Commonly the main components including the rubber infill materials have a calorific value close to heating oils in the magnitude of up to 40 mega joules per kilo.

Burning or combusting these materials need specific conditions such as low oxygen content and high temperatures. Ideally industrial kilns or metal blast furnaces offer such conditions and because the emissions do not present particularly harmful risks, ST residues can be incinerated and deliver high levels of energy. The heat can be used to generate high pressure steam which by the use of turbines delivers electricity.

Under appropriate conditions harmless, solid and energy rich waste fractions can also be used very effectively in industrial processes where heat is needed. Many industries need high levels of energy, for example cement production, metal blast furnaces, thermo-electric plants or even central district heating furnaces. These operations can use ST residues very effectively and under today's energy supply uncertainties the advantages are significant:

- Cost reduction of industrial energy,
- Less dependence on non-renewable fossil fuels
- Significant CO_2 emission reduction if coal is substituted by SRF*
- Biomass, today a very popular energy source, can be supplemented with SRF fractions and improves its burning performance substantially

The high heat value of "end-of-life ST" offers substantial benefits to our communities and it makes great sense to optimize its advantages.

Crude oil (besides coal) is the main non-renewable energy source. Almost 95 % of all the crude oil extracted worldwide is rapidly burned to deliver energy for transportation (on land, air and sea), heat generation and electricity production. Only about 5 % are used by the chemical industry to produce synthetic substances, such as polymers. When such synthetic substances after a long life are recovered in the energy cycle the savings are substantial and the benefits worth the effort.

CONCLUSIONS

ESTO recommends that "end-of-life ST" is actively used in the preparation of "Solid Recovered Fuels" where it provides a very high calorific value in industrial energy consuming operations to substitute fossil non renewable fuels. If this option is not available everywhere yet, ST can be safely disposed of in incineration units with energy recovery where it will deliver heat for the production of electricity or district heating.

The worst solution is landfill, in that case the entire resource is simply lost and all benefits of this interesting alternative energy source are abandoned.

** **SRF** is the acronym for "Solid Recovered Fuels" which are based on solid non-hazardous high caloric waste fractions in which "end-of-life ST" is an ideal source.*