

RUBBER INFILLED ARTIFICIAL TURF

ENVIRONMENTAL AND HEALTH RISKS ASSESSMENT

Because of a discussion on the environmental and health aspects of rubber infill from recycled car tyres, this document wants to underline the result of recent research studies conducted in Europe on potential environmental and health risks of the use of rubber infill from recycled car tyres on artificial turf. Because of their comprehensiveness and the independent research organisations involved, three studies carried out in different European countries were selected. In this paper these studies and main conclusions are summarized. References are reported in the bibliography.

- **France** (ALIAPUR et al, 2007). The project researched and evaluated possible environmental and health effects linked to the transfer of meteoric water into the natural environment as a result of its percolation through the components of the sports surface and the gaseous emissions likely to be generated by the substances used in the composition of the sports surface. Three analytical approaches were followed: 1) chemical analysis for the determination of the concentration of potentially polluting elements and substances present in the **percolates**, 2) measurement of **ecotoxicity of the percolates**, and 3) analysis of **volatile organic compounds** (VOC) and **formaldehyde** emitted and their respective concentration in an indoor sports surface usage scenario.
- **Switzerland** (Müller, 2007). In 2004 the Swiss Federal Office of Sport BASPO set up a working party to scrutinise and adapt Guideline 105. After detailed prior consultations, the working party has decided to carry out a field trial under conditions which are as close to realistic as possible to act as the basis for drawing up a new assessment programme. Using this trial and other supplementary chemical and physical analyses (eluate tests and material analyses), investigations were carried out between November 2005 and May 2007 into which substances and groups of substances were released from synthetic surfaces (artificial turf and resilient polyurethane-bound surfaces) into watercourses with precipitation under natural weather conditions. The main objective of these investigations was to determine the **behaviour of the various surfaces (surface types) and not to examine individual products**.
- **The Netherlands** (INTRON et al, 2007). The investigation consists of a **literature research** supplemented with **experimental research** to fill the gaps in the knowledge (PAHs and Zinc) and to verify already available data. For the literature research 17 research reports and 13 supplementary sources were investigated, in addition to that use was made of Dutch and European legislation and guidelines. A separate literature research was conducted to allergies caused by **skin contact** with rubber products. For the experimental investigation samples were taken on 3 production plants of rubber infill and samples were taken on 14 artificial turf pitches according to the FIFA protocol. The experimental investigation on health aspects was focussed on the uptake of **polycyclic aromatic hydrocarbons** (PAH's) due to skin contact with rubber infill. Additionally, a field study was conducted among football players to determine the presence of **PAH metabolites in the urine** after they had intensive skin contact with rubber crumb on an

artificial field pitch. The results from both the laboratory test and the field study were compared with internationally accepted health limit values for PAH's.

Even if the three mentioned studies were conducted independently, without a global coordination and following different procedural methods for designing and implementing the experiments, consistent conclusions can be deduced on both environment and human health.

Environment conclusions

- Physicochemical results of the percolates show for potentially polluting substances a kinetic independent from the type of granulates used both in-situ and in-lab tests. Analytically detectable trace substances/compounds are dissolved from the surface and from the polymer matrix of the granules in a **concentration which falls over time** (ALIAPUR et al, 2007). The concentrations of the measured individual substances, the Dissolved Organic Carbon and the organic nitrogen decrease very rapidly initially, subsequently slowing down to a minimum in a time-dependent, substance-specific manner both in the lysimeter trials and the eluate tests. Towards the end of the trial period, after a year, values have already **fallen below the limit of determination** for most of the individual substances (Müller, 2007).
- The **very low PAH concentrations** from the granules were found at an identical level in the blank sample (gravel layer without surface); they correspond to ambient (ubiquitous) contamination levels (Müller, 2007).
- Leaching of heavy metals and organics chemicals such as Phthalates and Pah's, from recycled car tyres as infill in artificial turf systems stays well within the Dutch limit values for soil and surface water quality. Leaching of zinc is an exception but is not expected to exceed limits values within 10 years. Follow up research on long term zinc leaching will be published in 2008.
- According to current research, after a year's experimentation, the results on the 42 physicochemical parameters identified and on the ecotoxicological tests show that water passing through artificial turf using as filling either virgin elastomers granulated or granulates from used tyres are **not likely to affect water resources in the short and medium term** (ALIAPUR et al, 2007).

Human health conclusions

- The assessment of VOC and aldehydes emission by elastomers were conducted by using the standards in force for characterising construction products air emissions. The analysed **emissions are generally low** (ALIAPUR et al, 2007).
- An Health Risk Evaluation (HRE), based on 112 substances identified in the emission chamber, was applied to a "worst-case scenario" (poorly ventilated small gymnasium). The HRE showed to have **no causes of concern for human health** (ALIAPUR et al, 2007). In case of floor installation, a minimal 2 vol.h⁻¹ air renewal rate is recommended (ALIAPUR et al, 2007).
- Based on the available literature on exposure to rubber crumb by swallowing, inhalation and skin contact and our additional experimental and field studies on skin exposure, we conclude, that there is **no significant health risk** for football players due to the presence of rubber infill from used car tyres on artificial turf pitches (INTRON et al, 2007).

Bibliography

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