# Tyres – the big environmental sinner?

Theme: microplastics

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## Däckbranschen Sverige

Däckbranschen Sverige – The Swedish Tyre Industry Association is a co-operation organisation for:

- DFTF: The Tyre, Rim and Accessory Suppliers' Organisation
- DRF: The Swedish National Association of Tyre Specialists
- SDAB: The Swedish Tyre Recycling Association





# Micro plastics

Definition <5 mm

Polymers and not just plastics (incl rubber) National and EU focus

Linked to tyres in mainly two ways:

- Artificial turf infill
- Tyre and Road Wear Particles







### Micro plastics from **artificial turf** fields - Media love this story



And...it all started..... in Denmark....



#### Micro plastics from artificial turf fields -2015 A nordic assumption epidemic starts. First case is in Denmark

Lassen\* (Denmark) micro plastics report 2015:

"**No studies** on the release of microplastics from artificial turfs have been identified."

"Parts of the infill granulates will disappear from the field to the surrounding area and must therefore be continuously replaced, while replacement sometimes is necessary due to compression of the infill granulates on the field. It is **estimated** that the consumption of infill granulates is 3-5 tonnes per year for a standard football field (DHI 2013). It is **assumed** that the release is equal to **half** of the consumption of infill granulate i.e. 1.5-2.5 t/year."

\*Microplastics Occurrence, effects and sources of releases to the environment in Denmark



#### Micro plastics from artificial turf fields - 2016: The assumption worry mutates in Sweden

Magnusson, Olshammar\* (Sweden) micro plastics report 2016: "The company Unisport (www.unisport.se) recommends that about 3-5 tons of rubber fill is used for refill every year to preserve the properties of the artificial turf... ...That **could be a rough** measure for the yearly loss of rubber fill from artificial football fields... ...**means that** a total of around **2 300-3 900 tons** of rubber granulates per year **will be lost** from the surfaces.... And can end up in the sea".

\*Swedish sources and pathways for microplastics to the marine environment



#### Micro plastics from artificial turf fields - 2016: Norway catches the worry

Mepex\* (Norway) micro plastics report 2016:

" In the former Mepex report, we categorized emissions of rubber granulate and artificial grass from football fields as "other commercial uses" of designed microplastics. However, the report included no estimates. At that time, we had the understanding that any loss from the fields was collected."

Magnusson/Olshammar have by this time released the swedish report and Mepex references this and says:

" In Norway, based on data from Sweden, we roughly estimate an annual loss to the environment of **3.000 tonnes** of granulates from football fields annually."

\*Primary microplastic pollution: Measures and reduction potentials in Norway



#### Micro plastics from artificial turf fields - 2018: The worry is brought to the EU

Eunomia\* (UK) in a micro plastics report to the European commission 2018:

A loss of between 1.5 and 5 tonnes per year (the upper and lower estimates of previous studies identified in Appendix A.3.4.1)

349 Kerstin Magnusson, and et al. (2016) Swedish sources and pathways for microplastics to the marine environment, Report for Swedish Environmental Protection Agency, March 2016

350 Carsten Lassen (2015) Microplastics - Occurrence, effects and sources of releases to the environment in Denmark, Report for The Danish Environmental Protection Agency, 2015

351 Mepex (2016) Primary microplastic- pollution: Measures and reduction potentials in Norway, April 2016

Based on the Nordic reports, they conclude figures for Europe as a whole:

"Total microplastics generated from artificial sports turf pitches 18,000 – 72,000 tonnes per year".

\*Investigating options for reducing releases in the aquatic environment of microplastics emitted by (but not intentionally added in) products



- The reports mentioned are all based on **assumptions** 

No measurements are made, only assumptions are made Hypothesis chain:

- Re-fill is a good measurement of infill loss
- In-fill lost ends up in sea (although the reports themselves does not say this, the media as well as politicians, leaps to this conclusion)

But are these reasonable assumptions? We will show that this is not the case!



#### Micro plastics from artificial turf fields - Some facts about granulate compaction

Rubber granulates is a porous material which compacts:

- Through use
- Through its own weight

Scientific study\* from 2014 shows resulting effect on artificial turf fields:

Field test showed compaction of on average 10 %. Fields were 1-3 years old and had been maintained regularly during that time.

10 % compaction equals ca 12 tonnes of granulate!

\*Understanding the effects of decompaction maintenance on the infill state and play performance of third generation artificial grass pitches



- Lab test\* shows that compaction effect comes fast and is only partly reversed by raking



- Teknologisk Institut (Denmark) 2018/2019, considers compaction but does not measure



 Massebalancer af gummigranulat, som forvinder fra kunstgræsbaner – med fokus på udledning til vandmiljøety



- Other estimates have also gone down but are still theoretical



Simon Magnusson, Ecoloop/Luleå Technical University, Konstgräs och Miljö, 10 april 2019



- Actual measurements made, have shown low losses

A norwegiean study\* in 2017 measured amount of granulate brushed off 12 500 players.

On average they brushed off 0,88 grams per player per occasion

Considering amount of player occasions, this result translates to 14 kg of potential losses per pitch per year for Sweden.

Other studies had looked at storm water wells, drainage, or surroundings. None had made before and after measurements, and none had looked at all potential factors at the same time. There was a need for a scientific experimental site. This is the background for Bergavik IP in Kalmar, Sweden.

\*Sjekk kunstgressbanen



- Bergaviks IP in Kalmar, was purposely built in 2018 to measure and verify in a closed system





- The pitch has been built as a closed system, and maintained according to SvFF recommendations





- Four type of measurements regarding micro plastics have been made



Measurements: storm water, players, operation and surface and drainage water



- One year later, preliminary results\* are in

Captured trough players brushing off: 27 kg Captured through brushing off maintenance equipment: 14 kg Captured through filters in storm-water wells: 6 kg Amount through to recipient, not captured: 0,3 kg **Amount of granulates (SBR) through to recipient: less than 1 gram** Amounts are extrapolated to yearly volumes

\*Ecoloop 2019 – Mikroplastspridning från Bergaviks IP, Kalmar – Preliminära resultat



Worry: 3-5 tons granulate in the sea per pitch per year

Fact: less than 1 gram passing through to water systems

If establishment, use and maintenance are done according to recommendations





### Why important?

- Prefered infill by players
- Environmental benefits from LCA-perspective (land use, CO2, acidicy, etc)
- Lower cost
- Health concerns have been dismissed by ECHA
- Important not to disqualify a recycled material
- Important not to establish a faulty picture of tyre rubber
- EU is considering to prohibit this infill

#### Important to reach out with the facts!

- To enable the safe use
- To contribute to health by excercise
- To re-use resources





- From safety concerns to environmental concerns

Tyres are a vehicles single point of contact with the road surface and are designed to optimise dry traction, wet traction, rolling resistance, comfort, cabin noise, resistance to punctures and service life, with safety being of paramount importance.

For this friction is needed, and through friction you get tyre wear.

The issue is total wear of tyre and road!



- From safety concerns to environmental concerns

Actual wear depends on many factors but can be measured

- Kole\* 2017 estimates a global average of 0,81 kg per capita per year
- Other studies typically find 1 kg (plus/minus) of wear per tyre during lifetime of tyre
- Other studies look in lab environment at wear per km driven and build models from there
- When recycled we measure the weight and compare to new tyres: wear is determined to approx. 1 kg.
- IVL identified tyre wear as the **biggest source for microplastics in the ocean**
- The big question is **not whether there is wear**, but **where it ends up** and if this is a **problem**?

\*Wear and Tear of Tyres: A Stealthy Source of Microplastics in the Environment



- Several initiatives
- VTI (road reserach institute in Sweden)
- ETRMA
- Tyre Industry Project, TIP
- General research
- NILU/NIVA (Norway)
- Etc



#### ETRMA – www.tyreandroadwear.com





#### Tyre Industry Project -WBCSD





- Media\* announces proof\*\* of tyres as villain, in Stenungsund, Swedish West Coast.

Mikroskräp från bildäck lagras på havsbottnarna kring städer och längs vägarna

- "Wear from rubber tyres of our vehicles are one of the single biggest emissions of particles which are emitted and sedimented in the bottom of the sea around cities and along the high-ways. This a new report from Naturvårdsverket about so called microplastics shows."
- "We find tyre particles in the sediment. It is sediment which is quite close to cities and where there is rather lot of traffic, says professor Martin Hassellöv"
- "According to professor Martin Hassellöv these particles from tyres are dangerous."

\*SR interview with Professor Hassellöv 13 may, 2019

\*\*Undersökning av mikroskräp längs bohuslänska stränder och i sediment



- But what did they really find?
- Of the microplastics found in the sediment 3 percent was "black elastomers"
- One particle was examined by FTIR spectra
- The resulting absorbance graph was found to bear a resemblance to SBR, which is the rubber used in tyres



- But what did they really find? continued
- However no black elastomers were found in samples on beaches closer to roads!
- The area where the elastomers were found is heavily trafficked by big sea vessels!
- Stenungsund has a huge plastics industry, with known pollution of the sea earlier studied by the same professor!
- The resulting absorbance graph also had a close resemblance to EPDM (pure as well as NR-mix), and was closer to unreinforced EPDM and SBR, than reinforced SBR (Black Carbon)!



- But what did they really find? - continued

No elastomers on shore Elastomers found under sea traffic lane Lots of plastics- and other industries on shore



gur 32 Geografisk fördelning av mikroskräp 100-300 µm, där bubblornas area är proportionell mot ncentrationen (antal per kg torrsubstans), vilket visas med referenspunkter. Notera att skalan är



- But what did they really find? - continued





#### Hassellövs "proof" to the left

The omitted graph of EPDM to the right

We have approached Professor Hassellöv with our questions and findings, unfortunately he has not responded.

#### Media and "researchers" feed politicians

- **Any** statement of tyres gets huge attention
- The products and the material is stimaticed
- Hypothesis are presented as facts
- Not all studies are scientific
- "Fear sells"
- There is a lack of systems perspective
- Tyres are a mature product and industry has been fighting to find the best solutions for over 100 years
- What are the alternatives? Are they better?



#### Common issues Artificial turf and tyre/road wear

- We have some knowledge about spreading
- The material is heavier than water
- Very little material has been found
- Some findings close to source (pitch and within meters from roads)
- The material is chemically stable
- Chemicals are not leached or migrating
- We need to know more about exactly what is happening with the particles and if there is any (long term) harm. We can not see any alarmistic short term effects.



#### Micro plastics – are tyres the villain? Some conclusions

- The debate about microplastics from artificial turf is not built on scientific methods or measured facts
- In fact, potential spread is normally quite small and relatively easy to prevent
- Also, the material is rated highest by players and is the most environmentally friendly on many measures
- Road and tyre wear is a fact, but more serious research is need to understand where it actually ends up and if it is a problem
- Any measures taken to reduce emissions of tyre wear at source must be balanced against safety issues with road friction



#### Overall conclusion

- NO REASON TO PANIC
- There are probably bigger environmental challenges to address
- We need to learn more
- Research is welcomed

- THANK YOU!

