Solution approaches to reduce the transport of tyre and road wear particles (TRWP) and other microplastics from road runoff into the aquatic environment

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Chair of Urban Water Management

Management

• Prof. Dr.-Ing. Matthias Barjenbruch, Head of Department since 2006
• Director TU Campus El Gouna, Egypt
• 25 scientific staff and doctoral students
• Chairman of the DWA FA KA 8 "Advanced Wastewater Treatment"
• Presidium Member DWA

Co-worker

Daniel Venghaus, M. Sc.; WiMi
• URBANFILTER (Audi Environmental Foundation)
• Tire abrasion in the environment (RAU, Bmbf)
• Optimized materials and procedures for the removal of microplastic from the water cycle (OEMP, BMBF)
• Decentralized cleaning of roadways (DSWT, EFRE)

Microplastic-colleagues

Philipp Lau, Johannes Neupert, Luisa Reinhold, Salem Faroui, Iyad Al-Zreiqat.
• URBANFILTER (Audi Environmental Foundation)
• EU Study “Microplastics”
• RAU (Bmbf)
• OEMP (BMBF)
• DSWT (EFRE)
• REPLAWA (BMBF)
• MikroSep (AIF Zim BMWI)
• Mikrograu (AIF Zim BMWI)
**Accumulation of tyre wear**

<table>
<thead>
<tr>
<th></th>
<th>Urban</th>
<th>Rural</th>
<th>Motorway</th>
<th>TWP (Germany)</th>
<th>TWP (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>29 %</td>
<td>33 %</td>
<td>38 %</td>
<td>98,000 t/a</td>
<td>500,000 t/a</td>
</tr>
</tbody>
</table>

TWP: Tyre Wear Particles

<table>
<thead>
<tr>
<th>Environment</th>
<th>TWP (Germany)</th>
<th>TWP (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Water</td>
<td>17,1 %</td>
<td>~ 0 %</td>
</tr>
<tr>
<td>Soil</td>
<td>2.8 %</td>
<td>32.5 %</td>
</tr>
<tr>
<td>Air</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

[Baensch-Baltruschat et al. 2020] [Eunomia et al. 2018]
Tyre Wear Entry path: City

Transportation infrastructure

Separate system

Combined sewage discharge

Combined system

Household / Commercial / Industrial

Separate system

WWTP

surface waters

8.120 – 16.820 t/a

13.790 – 28.560 t/a

46 %
4.430 – 13.110 t/a

11 %
1.490 – 3.090 t/a

2%
300 – 620 t/a

[Baensch-Baltruschat et al. 2020]
Tracking
Urban Hot Spots

Total SBR 20-500µm

MW mg SBR/m side

SBR: styrene-butadiene rubber
Opportunities - URBANFILTER

Modular solutions for hot-spots of TRWP

Intelligent networks

Enlightenment of the citizens

(1) www.origmbH.de
(2) www.gbcc.eu
intelligent network

Street
- Tyre Wear
- Construction sites
- Traffic accidents

Locations
- Wait / Boredom Hotspots
- Service yards
- Sports field
- Event locations

diffuse

local
Street I

Tyre Wear

https://www.thetyrecollective.com/
Locations

- Wait / Boredom Hotspots
- Construction sites
9 modules at 3 stages

01 Side grid in curb
02 Retention space in curb
03 Sedimentation in road

04 Optimized foliage basket incl. granulate
05 Mesh skirt
06 Funnel

07 Infiltration
08 Magnet module
09 Sedimentation walls
Possible filter combination

Urbanfilter: microplastics

Porous asphalt

The Urbanfilter is partially integrated into the roadway – porous asphalt traps particles before they wash into the storm drain.

- Particularly good at trapping ultrafine particles
- Reduces the amount of fine debris washed off by rain
- Easy to clean with street sweepers
- Retrofittable

Filter skirt

- Directs the water downwards so that it can collect there
- Stainless steel mesh
- High flow rate, easy to clean
- Traps particles of all sizes

Magnet module

- Particularly binds fine and ultrafine particles
- Easy, simple maintenance
- Extremely easy to retrofit
Video Teststand

Video: Cheng 2019
Test substances
In situ
In situ – Clayallee

Reference Manhole

CM1

CM2

CM3

CM4

CM5

CM6

Berlin Standard-manhole

Special manholes

[Quelle: DIN 19583]
Optimized leaf basket
Optimized leaf basket - in situ
Other in situ locations

Absehbare klimatische Veränderung in den Klimaraumtypen

- Küsten
- Nordwesten
- Trockenste Region
- Wärmste Region
- Südosten
- Mittelgebirge
- Gebirge

Trockenheit (Sommer) Starkregen

Public Relations

www.gbcc.eu
16 stops for exhibition
EUROPEAN SDG ROUNDTABLE - Multi-stakeholder Actions to Address the Tyre Sector Sustainability Challenges

Monday, 11 October 2021
14:00 – 15:30

Google Calendar - ICS

Co-Organized with: European Tyre & Rubber Manufacturers Association, Tire Industry Project
Die Key Facts der IFAT 2018 auf einen Blick

- **3.305** Aussteller aus 58 Ländern und Regionen
- **142.472** Besucher aus 162 Ländern und Regionen
- **260.000** Quadratmeter Ausstellungfläche

30.05.- 03.06.2022 Projekt URBANFILTER mit Daniel Venghaus von der TU Berlin

- Personal and exhibit
meet the scientist: Eine grüne Innovation – der URBANFILTER: Mikroplastik herausfiltern, wo es entsteht

1. Mai 2022 | 11:00 Uhr - 16:00 Uhr
URBANFILTER EXPERIENCE

UrbanFilters are filtration systems for street drains that filter debris for various locations. Before it is washed into the sewer system by rain. Learn about the three areas of the system and their filters in our UrbanFilter Lab. Try out individual filter systems in our Mini Game and understand the challenge of different, combined environmental impacts.

https://URBANFILTER.org/urban-filter-lab
Thank you for your attention