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MONITORING OF AN ARTIFICIAL TURF FOOTBALL PITCH

Assessment of risk management measures to prevent the release of microplastics

February 2023

SIGNUS

SISTEMA COLECTIVO DE GESTIÓN DE NEUMÁTICOS FUERA DE USO

Monitoring Pitch Study

SIGNUS in collaboration with IBV has launched the project **“MONITORING OF AN ARTIFICIAL TURF FOOTBALL PITCH”**

Aim of the study: Monitoring pitch to assess the effectiveness of risk management measures (RMM).

Project duration: **21 months**

June 2021 – February 2023

Video: https://www.youtube.com/watch?v=rpxgay_TtPA&t=48s

Monitoring Pitch Study

SCHEDULE

June 2021	June - December 2021	January - May 2022	June - September 2022	October 2022 - January 2023	February 2023
Project Start	RMM Definition & Installation	Monitoring	Incident Resolution	Monitoring (restart)	Project End

Monitoring Pitch Study

FOOTBALL PITCH FOR THE STUDY

SELECTION CRITERION:

Adverse weather conditions of rain in order to reproduce the most unfavourable conditions.

SELECTED PITCH:

- Federated 11-a-side football pitch
- Surface of 5,680 m^2
- Built in 2017
- Located on the north-west coast of Spain

Risk Management Measures (RMM)

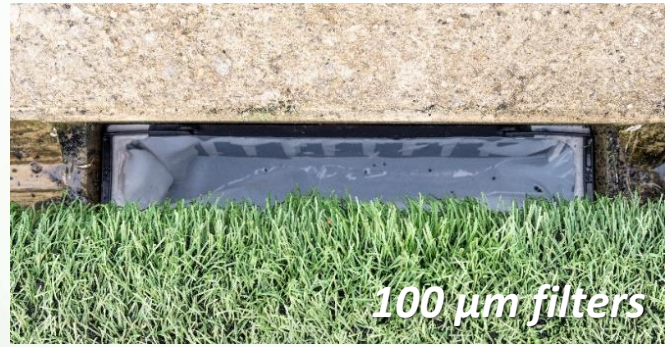
DEFINITION AND IMPLEMENTATION OF RMM

Based on CEN/TR 17519 according to the points of loss of infill material:

- Players
- Water drainage systems
- Pitch perimeter

Fencing panels

Brushing station



Filter system in the pitch water drainage

Filter system in the general drainage

Incidents & Solutions during the study

***INCIDENT*: Identification of a new source of microplastics**

Filters clogged in the general drainage, mainly due to free fibres arising from the wear of the artificial turf.

SOLUTION:

New design of the system in the general drainage, increasing its drainage capacity.

Incidents & Solutions during the study

***INCIDENT*: Identification of a new source of microplastics**

Filters clogged in the drainage gutter manholes, mainly due to free fibres arising from the wear of the artificial turf.

SOLUTION:

Remove filters.
The new design of the filter system in the general drainage is sufficient.

Monitoring Pitch Procedure

INITIAL & FINAL SAMPLING OF INFILL MATERIAL IN THE PITCH

To characterize the infill material present in the pitch at the beginning and at the end of the monitoring period.

Initial sampling:

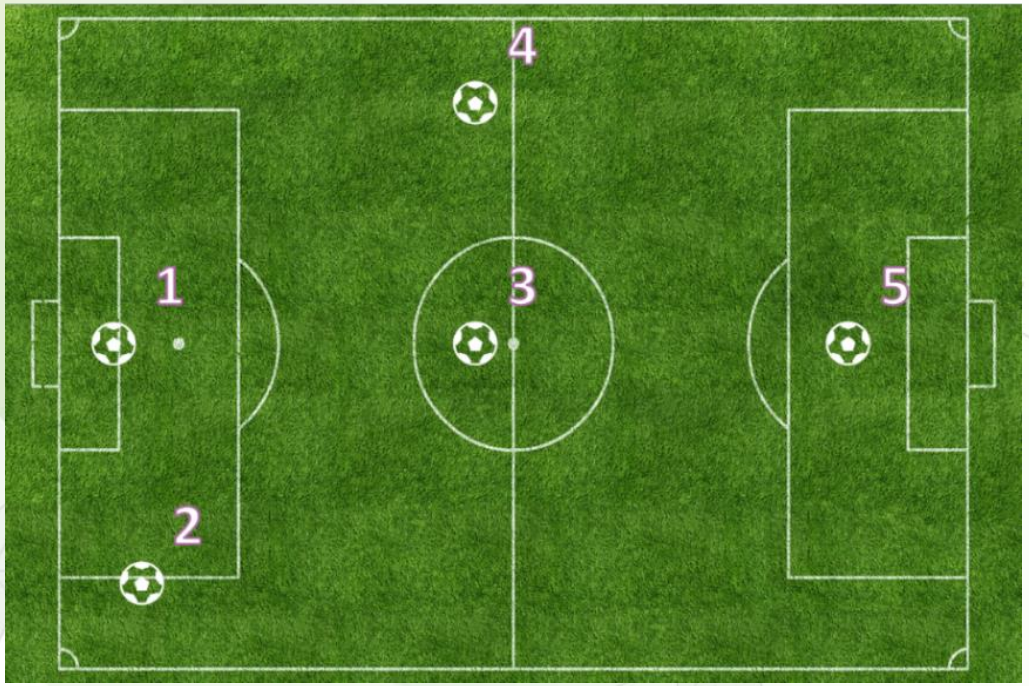
October 2022

Final sampling:

January 2023

Vacuuming of the infill material (rubber and sand) from a square area of 0.5 metres on each side

5 points distributed in the field according to EN 15330-1



Monitoring Pitch Procedure

SAMPLING POINTS: Sampling collection **once a month**

Monitoring Period:

Oct 2022 – Jan 2023

Brushing station

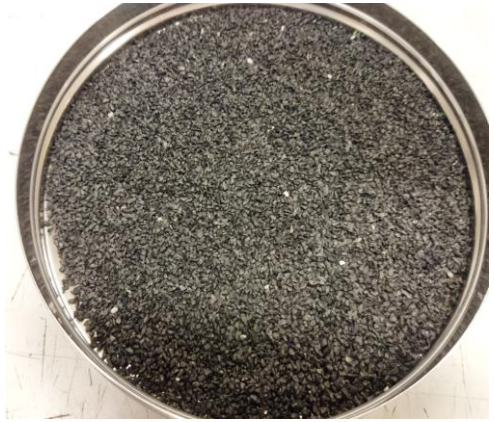
- Quantification of rubber infill
- Quantification of artificial turf fibres
- Particle size distribution of rubber+sand
- Particle size distribution of artificial turf fibres

Filter system in the general drainage manifold

- Quantification of rubber infill
- Quantification of artificial turf fibres
- Particle size distribution of rubber+sand
- Particle size distribution of artificial turf fibres

Sample Analysis

SEPARATION OF COMPONENTS



RUBBER

TURF FIBRE

(LONG FILAMENT)

TURF FIBRE

(POWDER)

SAND

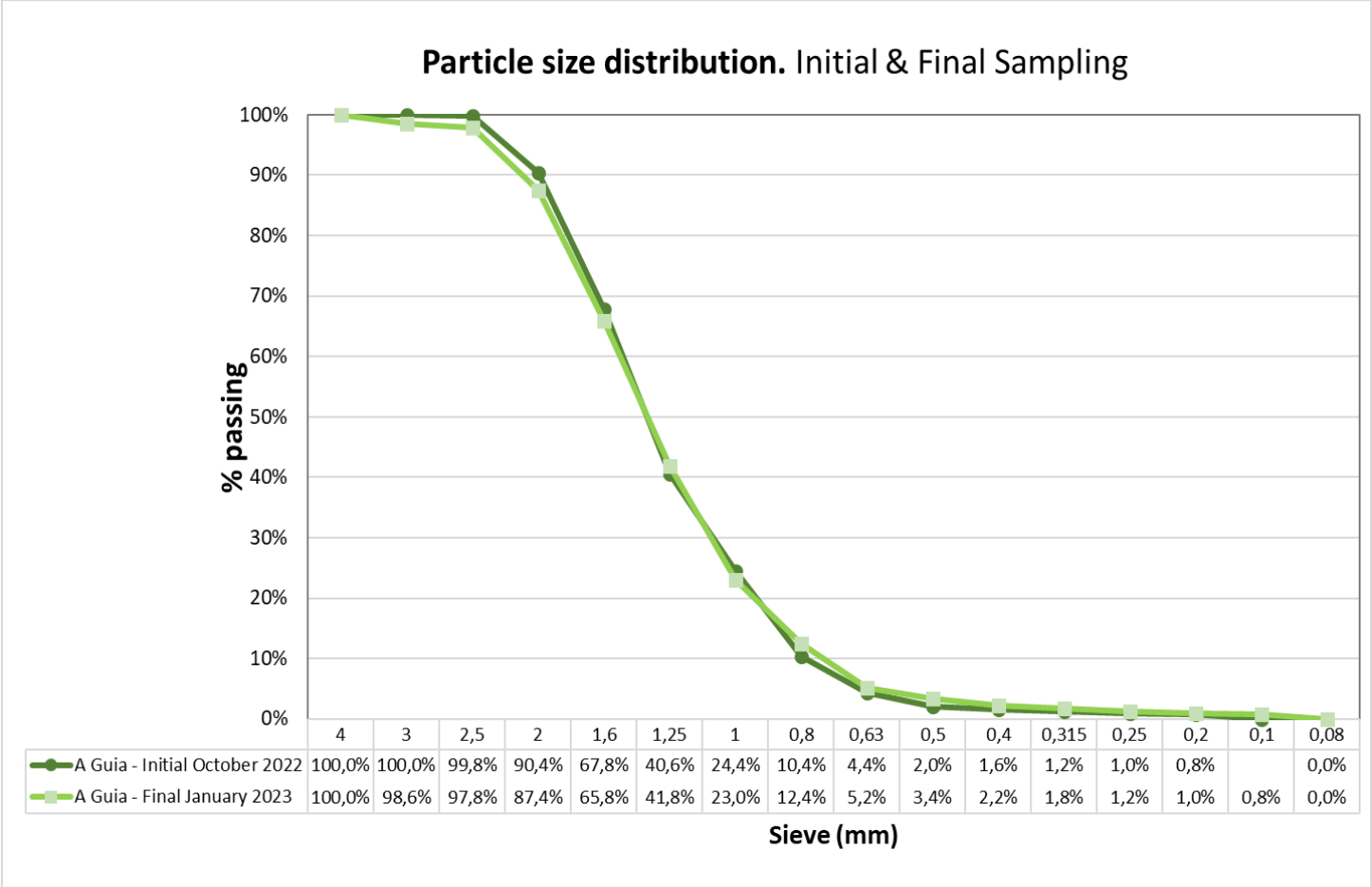
IMPURITIES

Results

INITIAL & FINAL SAMPLING OF INFILL MATERIAL IN THE PITCH

Particle size distribution of rubber infill particles present in the pitch:

- About 1.4% have a size below 0.2 mm.
- Only 0.8% have a size below 0.1 mm.
- No particles below 0.08 mm are detected.



	4	3	2,5	2	1,6	1,25	1	0,8	0,63	0,5	0,4	0,315	0,25	0,2	0,1	0,08
A Guia - Initial October 2022	100,0%	100,0%	99,8%	90,4%	67,8%	40,6%	24,4%	10,4%	4,4%	2,0%	1,6%	1,2%	1,0%	0,8%		0,0%
A Guia - Final January 2023	100,0%	98,6%	97,8%	87,4%	65,8%	41,8%	23,0%	12,4%	5,2%	3,4%	2,2%	1,8%	1,2%	1,0%	0,8%	0,0%

Results

RETAINED MICROPLASTICS IN THE RMM

- per sampling point
- per type of microplastics retained

	GENERAL DRAINAGE		BRUSHING STATION		TOTAL	RAIN*
Sample collection period	RUBBER (kg)	ARTIFICIAL TURF FIBRES (kg)	RUBBER (kg)	ARTIFICIAL TURF FIBRES (kg)	(kg)	(l/m^2)
4 October - 8 November	10.25	0.19	1.69	0.05	12.18	**259.8**
9 November - 13 December	11.71	0.78	1.32	0.08	13.89	**260.2**
14 December - 17 January	12.64	1.18	0.77	0.04	14.63	**340.7**
Total microplastics	**34.60**	**2.15**	**3.78**	**0.17**	**40.70**	

*Source: METEOGALICIA https://www.meteogalicia.gal/observacion/estacionshistorico/historico.action?idEst=10049

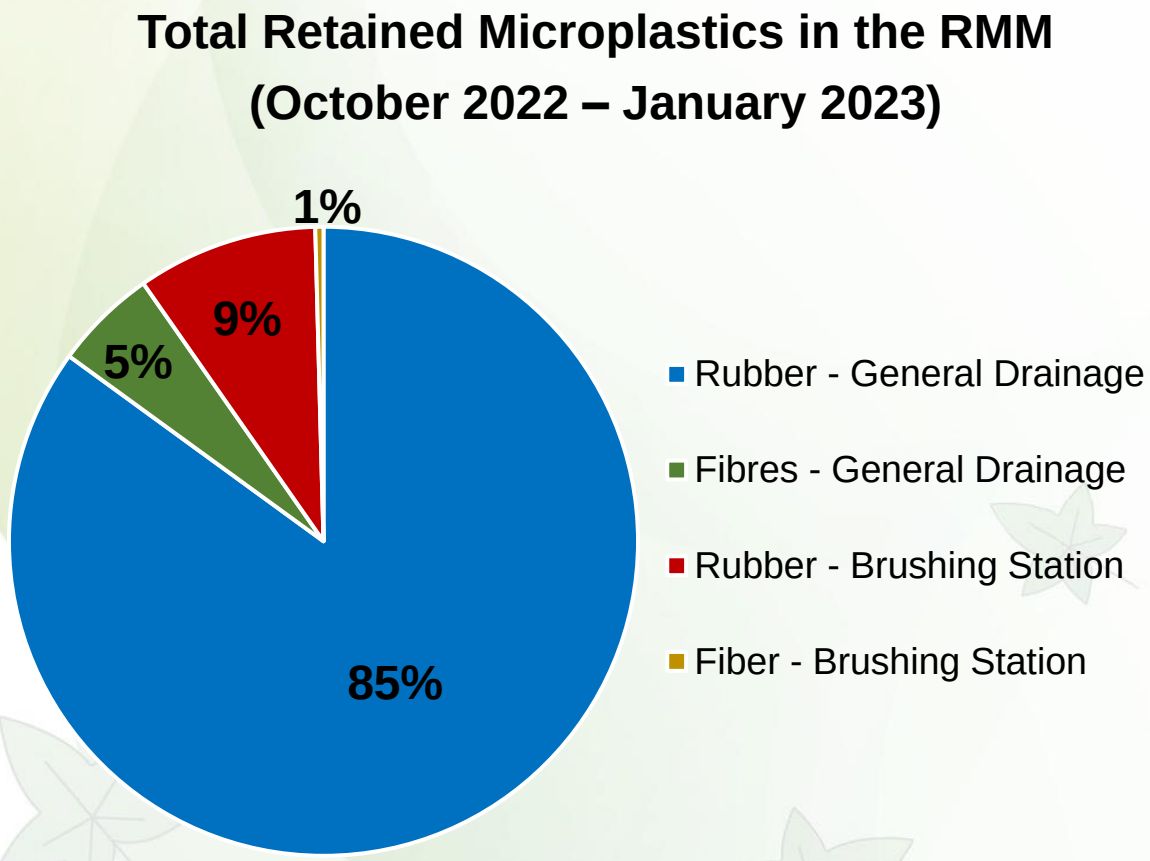
Results

RETAINED MICROPLASTICS IN THE RMM

Estimated annual quantities retained:

- 24 g/m^2/year of rubber infill
- 1.5 g/m^2/year of artificial turf fibres

Source of Microplastics	Monitoring period (102 days)		Total (kg/year)	Per m^2 (g/m^2/year)
	kg	%		
RUBBER	38.4	94	137.3	24
ARTIFICIAL TURF FIBRES	2.3	6	8.3	1.5



Results

MICROPLASTICS RELEASED BY PLAYERS

Two monitored training sessions:

- Dry conditions (irrigation water)
- Wet conditions (rain)

Two sample points:

- Brushing Station: retained
- Boots and clothing: released by players

		Dry Conditions Training	Wet Conditions Training
Duration (minutes)		45	90
Players' description		8 children 8-10 y/o 1 coach	20 children 8 - 11 y/o 8 children 5 - 8 y/o 16 children 4 - 5 y/o 4 coaches
Number of players	Total in training	9	44
	Monitoring boots and clothing	8	22

Results

MICROPLASTICS RELEASED BY PLAYERS

Estimated annual quantities:

		RUBBER (g/player/year)	ARTIFICIAL TURF FIBRES (g/player/year)	TOTAL (g/player/year)
Dry conditions	Brushing Station	43.3	8.7	52
	Boots & Clothing	31.9	0	31.9
Wet conditions	Brushing Station	319.7	24.6	344.3
	Boots & Clothing	125.7	8.4	134.1

* 2.5 times the pitch usage per player per week, during the 52 weeks.

Rubber infill material released by players:

1 – 4 g/m^2/year

(5.7 – 22.6 kg/year/pitch)

* 180 players in the football club.

CONCLUSIONS

RISK MANAGEMENT MEASURES (RMM)

1. It has been **confirmed the effectiveness of the installed RMM** designed according to the recommendations of the technical report CEN/TR 17519:

RMM	Effectiveness
Filters in general drainage	Particles below 100 µm retained
Brushing station	67% - 72% effectiveness
Fencing panels	Prevents the release of material from the pitch

2. **Selection and design of RMM**, especially on existing pitches, **must be adapted** to the intrinsic conditions of each installation.

CONCLUSIONS

MICROPLASTICS

1. From the characterization of the retained microplastics:

Retained Microplastics
A very small quantity has a size below 0.2 mm
No particles below 0.063 mm are detected

Sieve 0.125 mm

Sieve 0.063 mm

2. **New source of non-intentionally added microplastics from the wear of the artificial turf fibres.**

Sample of artificial turf fibres collected in the drainage gutter manholes in May 2022.

CONCLUSIONS

POTENCIAL SCENARIOS

a) WITH RMM the estimation of annual release microplastics is **BELOW** the **ECHA LIMIT**

Scenario	Microplastics		
	POINT OF LOSS	**RUBBER INFILL**	
With RMM	Released by players	**1 g/m²/year**	no rain
		4 g/m²/year	worst case conditions: rain 365 days/year
ECHA limit (SEAC)	***< 7 g/m²/year***		

CONCLUSIONS

POTENCIAL SCENARIOS

b) In case of a BAN, microplastics from the wear of the **artificial turf fibres are released into the environment**

Scenario	Microplastics	
	POINT OF LOSS	**ARTIFICIAL TURF FIBRES**
Ban of rubber infill	• Players • Water drainage systems • Pitch perimeter	**1.5 g/m²/year**

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For many more hours of environmentally responsible play!