

RESEARCH REPORT - LABORATORY

PROJECT	: rubber granulate "EcoGom Sport"
PURPOSE RESEARCH	: testing the suitability of a rubber granulate for infill in football constructions (intermediate report)
PRINCIPAL	: EcoPneum Polska Sp. z o.o. Contact: Mr. B. Cecuła
EXECUTION	: Kiwa ISA Sport B.V. Project Manager: Ms. N. Siemes <i>ne.</i>
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APPENDIX	: I: TGA II: photos colour resistance tests

10th December 2013

Kiwa ISA Sport B.V.



R. van Bremen
Business Unit Manager

RESEARCH DESCRIPTION

EcoPneum Polska Sp. z o.o. asked Kiwa ISA Sport B.V. to execute a laboratory research to test a rubber granulate "EcoGom Sport" to be used as infill rubber in artificial turf football constructions. In order to test the quality of the rubber granulates the following characteristics are investigated:

- bulk density;
- granulate size;
- granulate shape;
- colour;
- Thermogravimetric Analysis (TGA).

The environmental compatibility of the rubber granulate is determined in accordance with DIN V 18035-7. This research includes the following items:

- DOC (Dissolved Organic Carbon);
- EOX (Extractable Organic Halogen);
- Heavy metals content of the following metals:
 - Lead (Pb);
 - Cadmium (Cd);
 - Chromium (Cr);
 - Mercury (Hg);
 - Zinc (Zn);
 - Tin (Sn).

The environmental research is performed by a third party.

The rubber granulate is subjected to a climatic simulation (according to standard ISO 4892-3). The climatic simulation runs for 3000 hours, including temperature changes, UV-light, moisture. After the climatic simulation the following characteristics are examined:

- colour change (grey scale);
- visual change.

In order to test the durability of the coloured SBR rubber the colour resistance of the material is determined after:

Abrasion

The abrasion resistance of the rubber granulate is determined with a Hardgrove tester. The rubber granulate is subjected to an abrasion test with steel balls rotating in a cavity (500 rotations). The colour change is determined visually with photographs of the rubber before and after the test. The test is repeated after the climatic simulation test.

Water resistance

The colour resistance is also determined by submitting the rubber granules to hot water (70°C) for two weeks. The colour change is determined visually with photographs of the rubber before and after the test.

All tests except for the climatic test are performed at a temperature of approximately 23°C and a relative humidity of approximately 50%.

The results of the research are described in the next pages.

This research is restricted to measurements on the climatic resistance of the infill rubber. Other characteristics like sports functional characteristics can only be assessed after application in an artificial turf construction. The results of this research therefore give an indication of suitability.

RESEARCH RESULTS

Description rubber granulate

The rubber sample "EcoGom Sport" consists of green coated spherical, moderate angular granulates.

Figure 1: photo of rubber sample "EcoGom Sport"



Test results

Table 1 shows the results of the research. The result of the TGA analysis is enclosed in appendix I (analysis number 2013110069). Photos of the rubber sample before and after the abrasion and water resistance test are enclosed in appendix II.

Table 1: research results

Characteristic	Results	
	Before simulation	
bulk density	0.41 g/cm ³	
granulate size	1.0 – 3.15 mm	
granulate shape	A2: spherical, moderate angular	
Colour *	colour	green
	grey scale	In progress
TGA	% organic	64%
	% inorganic	36%

Remark *: the climatic resistance test is still in progress.

Conclusion:

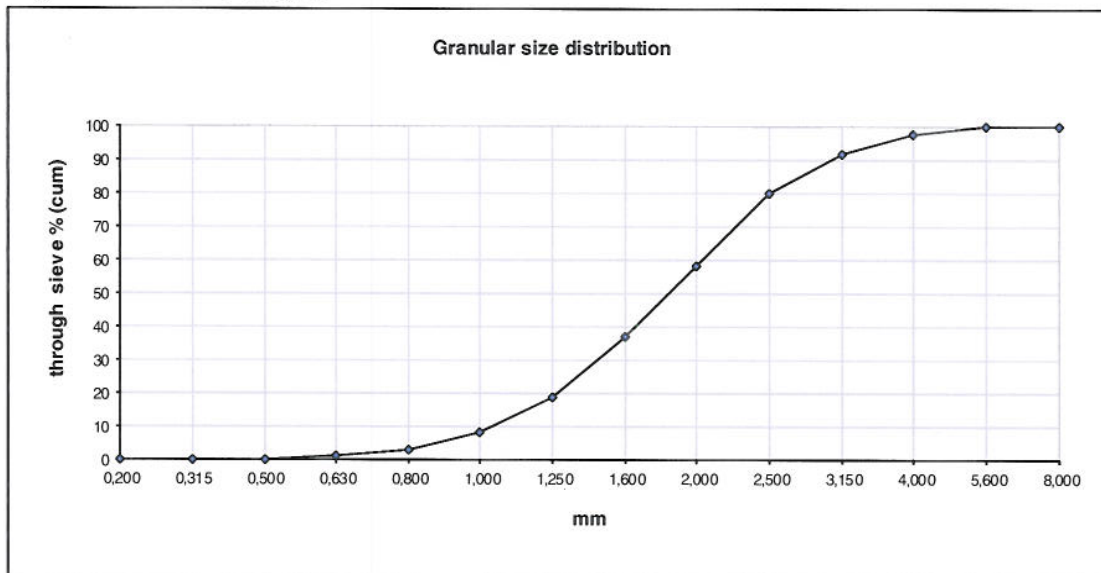
There is no significant colour change after the abrasion and water resistance test. The SBR granules are still entirely coated (see appendix II).

Table 2 and figure 2 show the granular size distribution of the material.

Table 2: granular size distribution

Sieve (mm)	% through sieve
8	100
5,6	100
4	98
3,15	92
2,5	80
2,0	58
1,6	37
1,25	19
1,0	8
0,800	3
0,630	1
0,500	0
0,315	0
0,200	0

Figure 2: sieve size analysis



Test results environmental research

The results for the DOC and EOX research of the rubber granulate are given in table 2.
The results for the heavy metals research are listed in table 3.

Table 2: DOC and EOX

Characteristic	Result	Standard
DOC	26.5 mg/l	≤ 40 mg/l
EOX	46 mg/kg	≤ 100 mg/kg

From the results listed in table 2 it is concluded that the rubber granulate "EcoGom Sport" meets the requirements from the DIN V 18035-7 standard for the DOC and EOX.

Table 3: Pb, Cd, Cr, Hg, Zn and Sn content in eluate

Metal	Content [µg/l]	Standard [µg/l]
Lead (Pb)	<40	≤ 40
Cadmium (Cd)	<5	≤ 5
Chromium (Cr)	<50	≤ 50
Mercury (Hg)	<1	≤ 1
Zinc (Zn)	<3000	≤ 3000
Tin (Sn)	not detected	≤ 50

From the results listed in table 3 it is concluded that the rubber granulate "EcoGom Sport" meets the requirements from the DIN V 18035-7 standard for the heavy metals content.

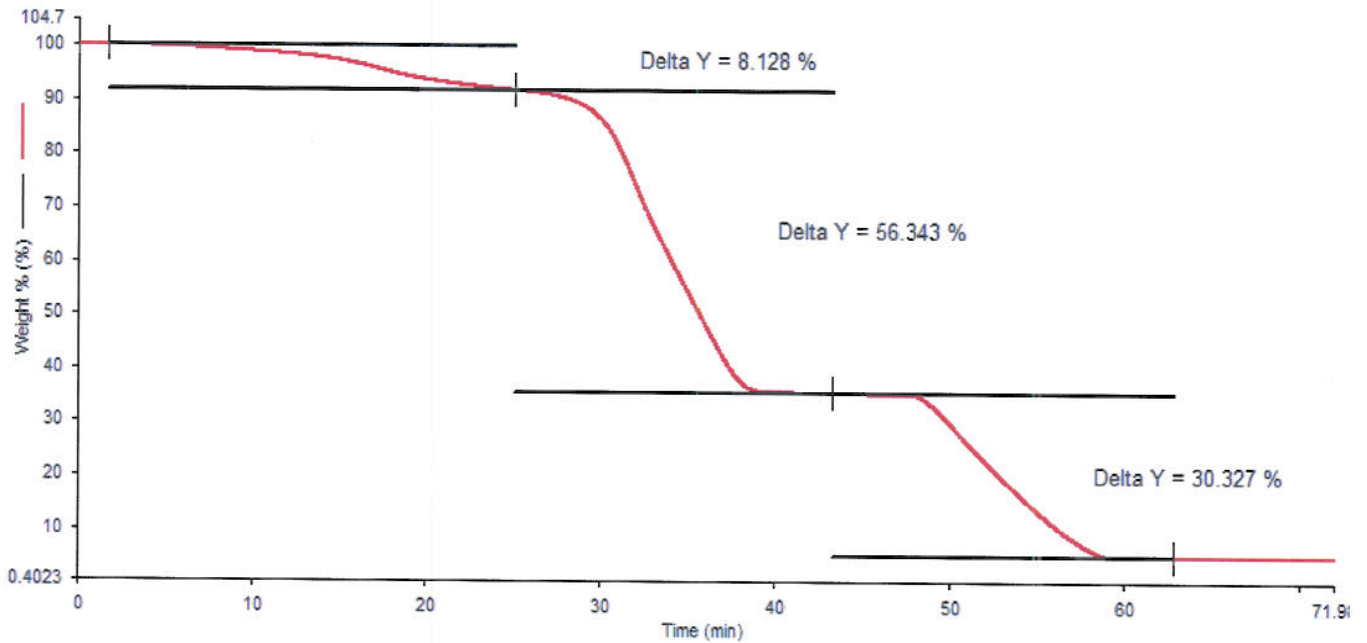


APPENDIX I

TGA ANALYSIS

Material : infill rubber
Sport : football
Principal : Ecopneum

Analysis number : 2013110069
Date : November 13th 2013
Project number : 131100462



- | | |
|--|--|
| 1. Heat from 50.00 °C to 300.00 °C at 15.00 °C/min | 4. Heat from 650.00°C to 850.00°C at 10.00°C/min |
| 2. Hold for 8.0 min at 300.00°C | 5. Hold for 15.0 min at 850.00°C |
| 3. Heat from 300.00°C to 650.00°C at 15.00°C/min | |

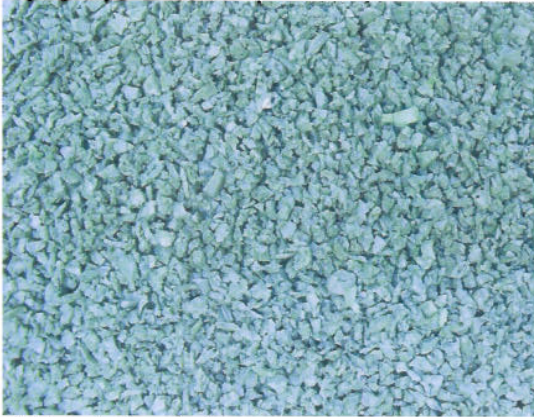
i.a. van

Leendert Kersten
Manager Laboratory

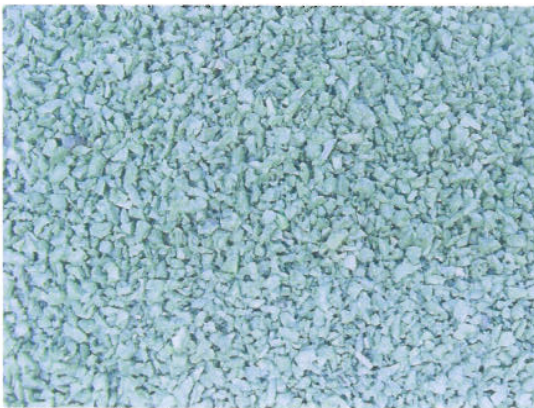


APPENDIX II

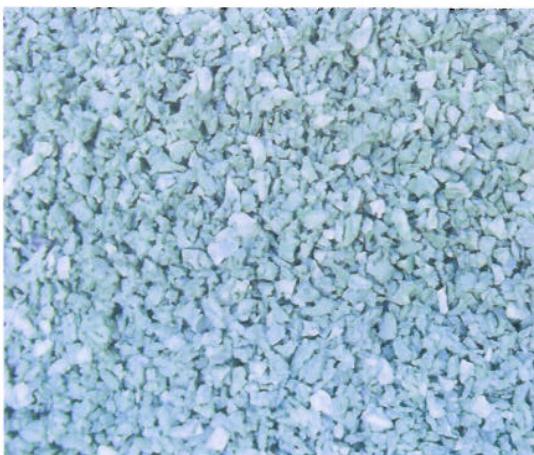
Photos colour resistance test



Rubber before test



Rubber after abrasion test



Rubber after water resistance test

