Morton Extrusionstechnik

Fiber, the quality factor for artificial turf

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Morton Extrusionstechnik

1988 Fundation motech, automatisation of fiber extrusion lines

- Installation of over 1000 computer control systems for fiber extrusion lines
- Installation of over 200 computer control systems for Monofilament lines, market share > 70 %
- Sold 2010 to the company Reifenhauser

2000 Foundation Reimotec , Monofilament Extrusion lines

- Installation of over 130 Monofilament extrusion lines, world wide market share > 80 % (2010)
- Over 70 % of all Monofilament fiber for artificial turf are produced on Reimotec extrusion lines.
- Most of this fibers has been developed at Abtsteinach.
- Sold 2010 to Reifenhauser.

Morton Extrusionstechnik

2008 Foundation Morton Extrusionstechnik, producing Monofilamenten

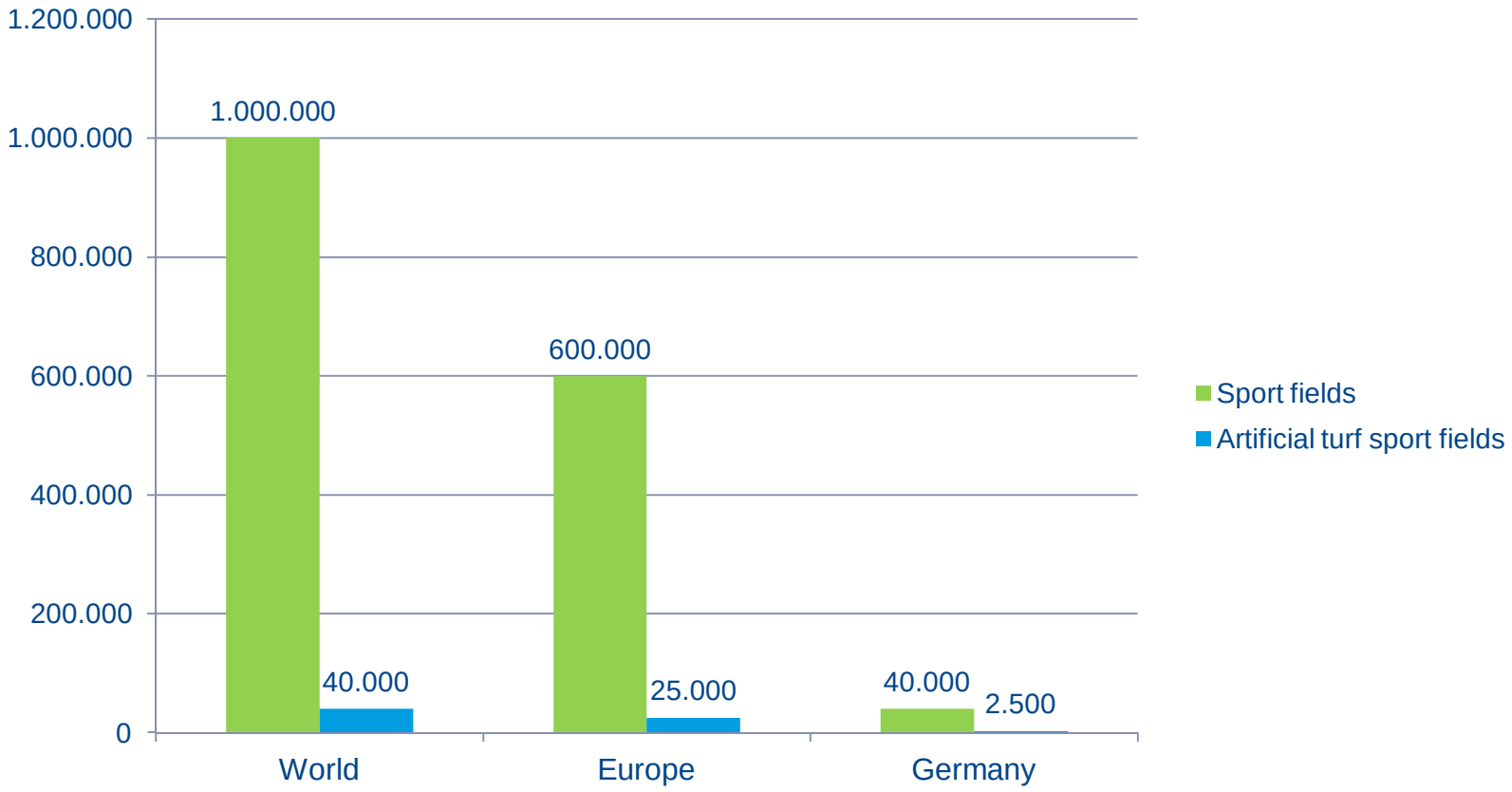
- Artificial turf fibers
- Concrete reinforcement
- Medical application
- Production capacity over 3000 Tons per year.

2010 JV with Fieldturf Tarkett

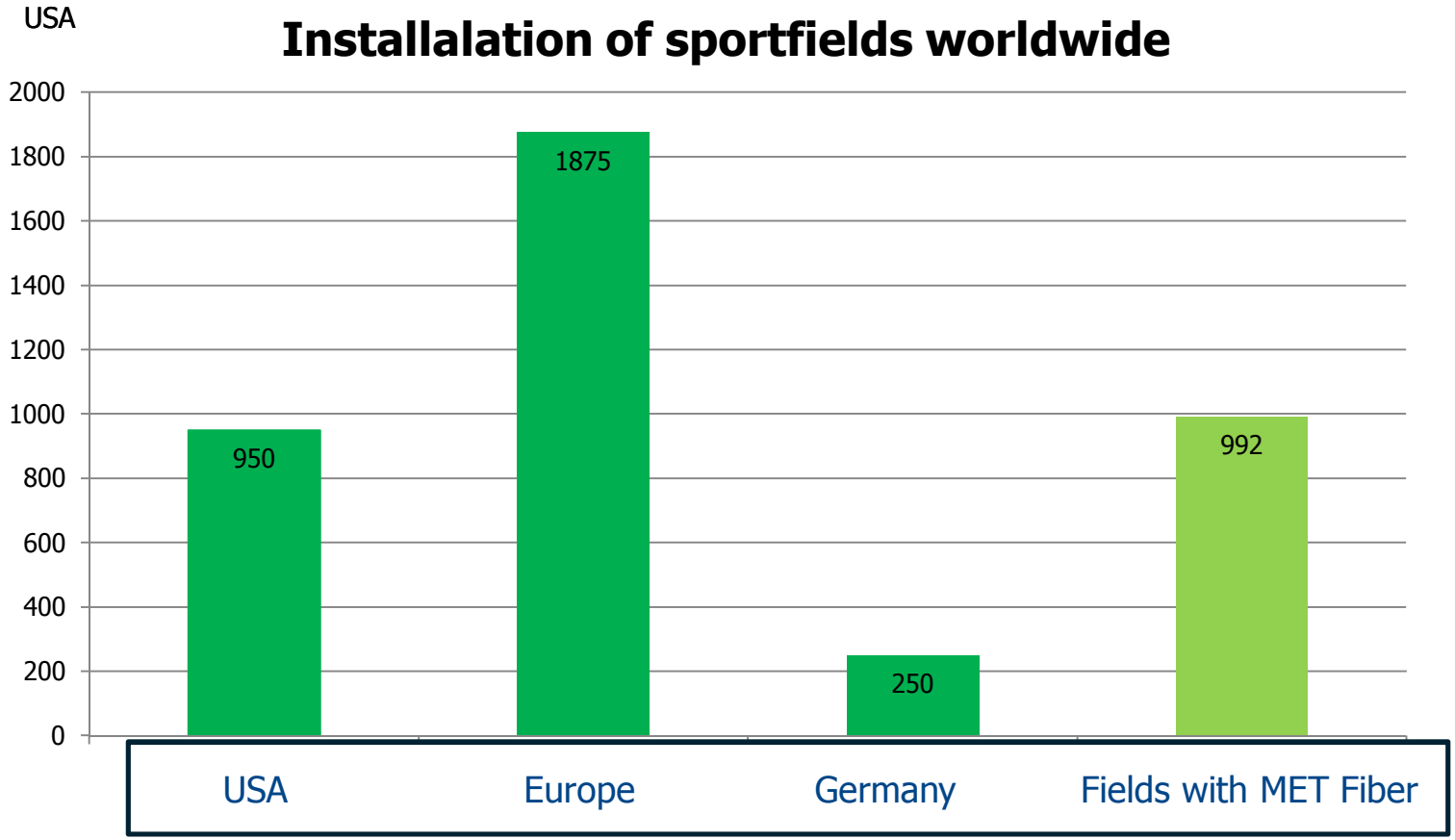
- 2011 Extension of the fiber production capacity to 15.000 tons per year.
- 2015 Extension of the fiber production capacity to 17.000 tons per year.
- 2017 Extension of the fiber production capacity to 20.000 tons per year.
- 2015 Start PE Infill production
- 2017 Extension of the PE infill production capacity to 4000 tons per year
- 2015 start of BiCo Fiber production
- 2017 Extension of BiCo fiber production capacity to 2000 tons per year
- Investment between 2000 and 2015 over 50 Million Euro
- Sales 2016 over 55 Million Euro / > 230 employee / 15 engineers in R&D team

Over 40 patents pending (motech, Reimotech und Morton Extrusionstechnik)

Market share turf installations

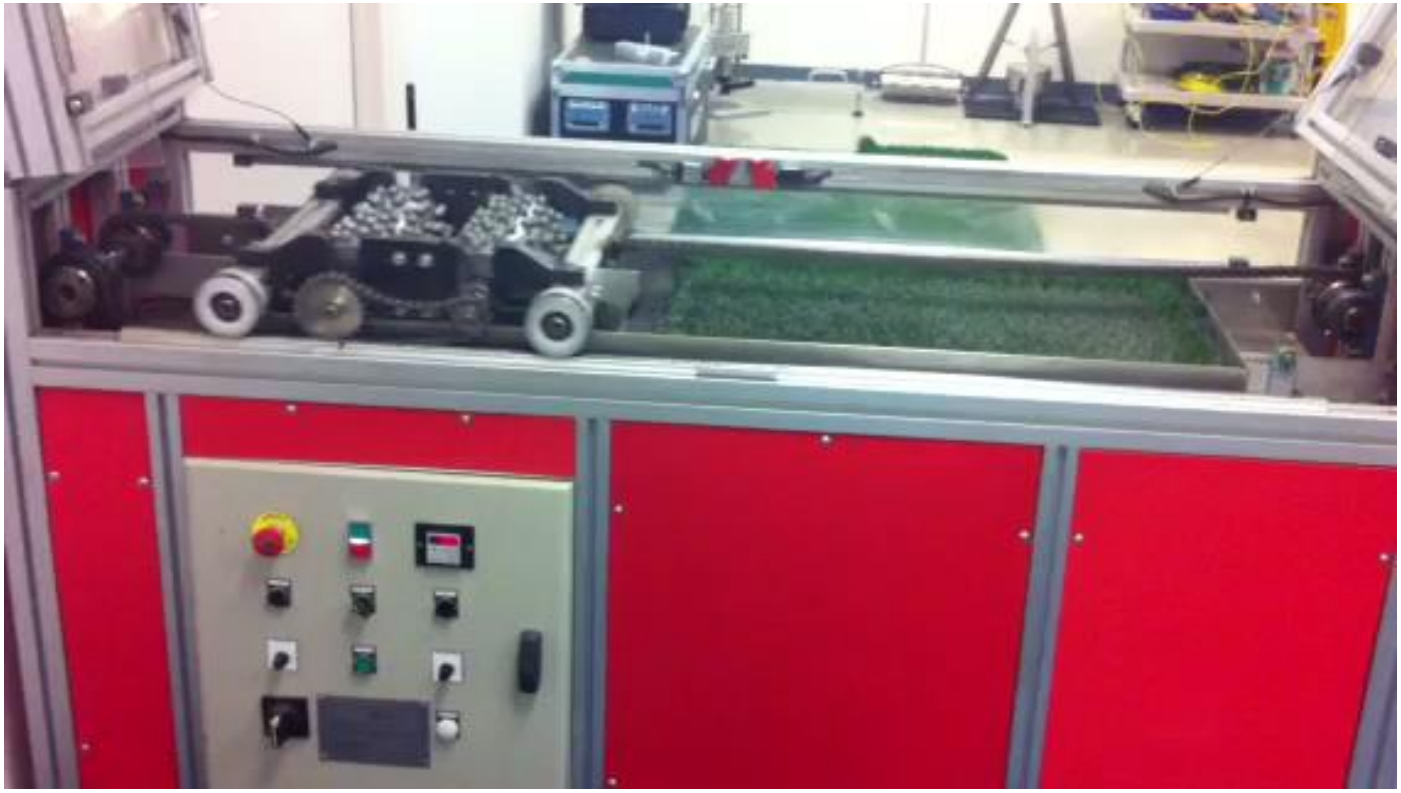


Market share of fiber for sport application



Since 2008 MET has produced over 65.000 tons fiber for artificial turf.
More than 6500 sport fields world wide are equipped with fiber from MET

Wear simulation



Lisport Test unit, simulation of fiber stress by the athlete

Status Fiber 2012

Competitor after 30 000 Cycles at Lisport test, Produced in the middle east

Status Fiber 2012

Competitor after 30 000 Cycles in the Lisport test, produced in the middle east

Status Fiber 2012

Competitor after 30 000 Cycles in the Lisport test, produced in Spain

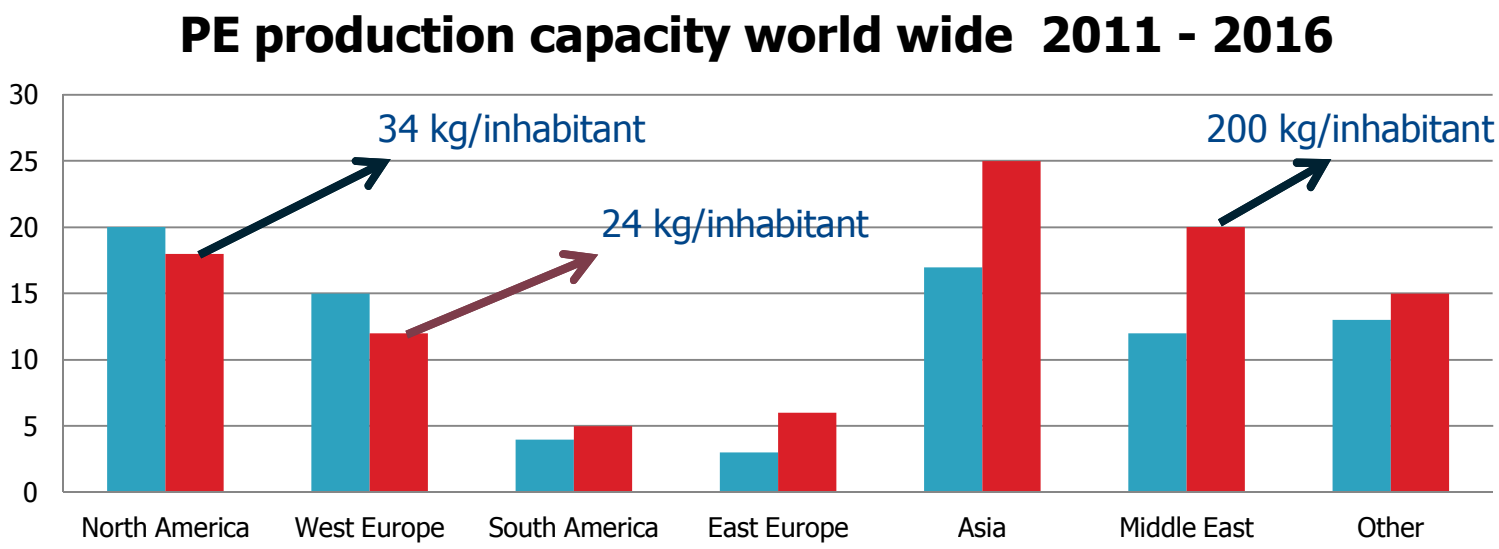
Status Fiber 2012

Competitor after 30 000 Cycles in the Lisport test, produced in USA

Status Fiber 2012

Fieldturf 360 after UV (DIN Spec) and 150 000 Cycles in a Lisport test (independent institute)

Polymer



- Worldwide production capacity 2011 over 84 Million tons (mainly for film => plastic bags)
- Strong capacity growing in Asia and middle east, capacity reducing in EU und USA. Dow is starting in 2017 world wide biggest production plant for PE = 3.5 Mill tons / year in Saudi Arabia
- Demand for Turf 0,1 Mill Tonnen = 0.1 % of the worldwide installed production capacity for PE, too small for a development of a special Turf Polymer.

The result → a new Polymer -> made for Fieldturf

➔ Butene : C4 ➔ LLDPE C4

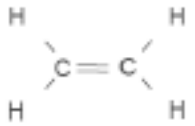
➔ Hexene C6 ➔ (m)LLDPE, MDPE, HDPE

➔ Octene C8 ➔ (m)LLDPE

ETHYLENE

C=C

or more precisely



1-BUTENE (C4)

C=C
I
C
I
C

1-HEXENE (C6)

C=C
I
C
I
C
I
C
I
C

1-OCTENE (C8)

C=C
I
C
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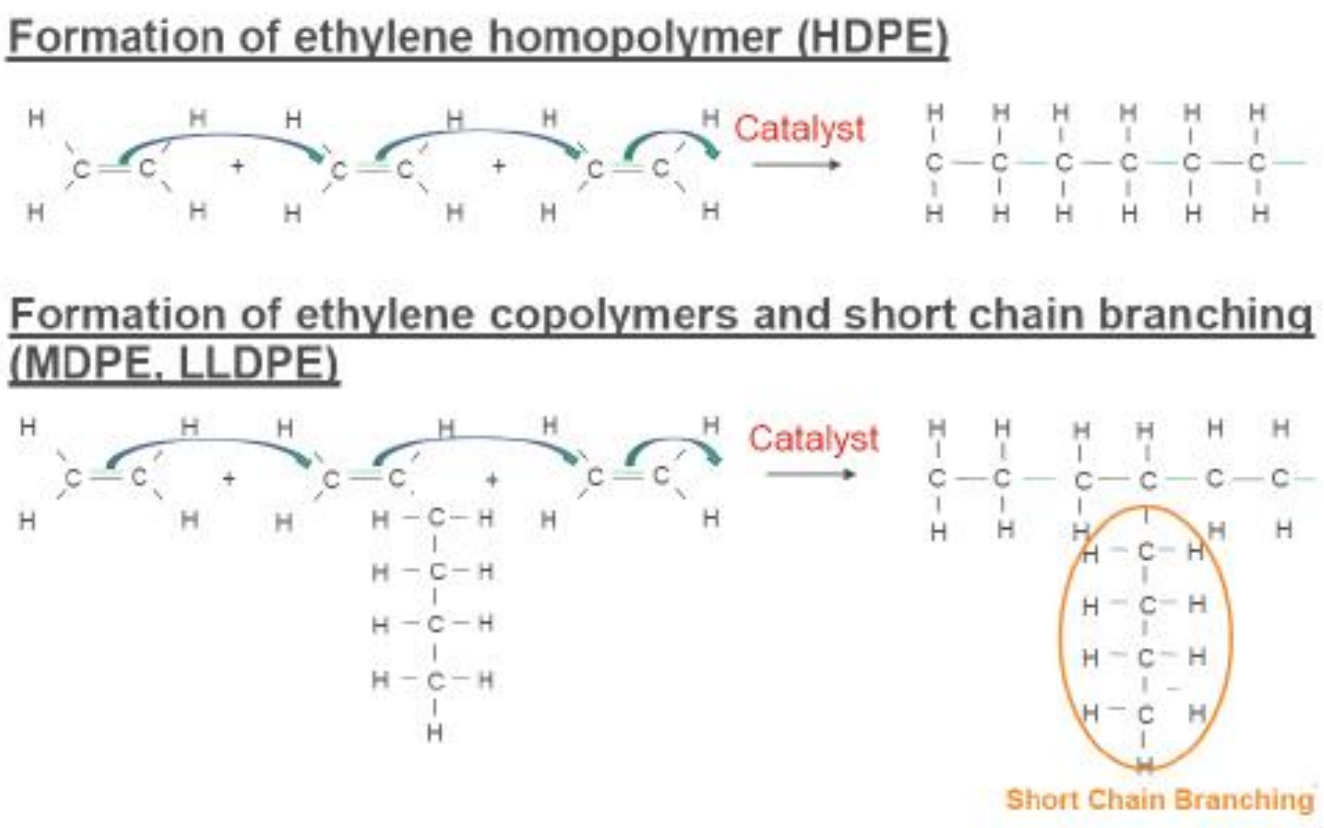
C
I
C
I
C
I
C
I
C

The result → a new Polymer -> made for Fieldturf



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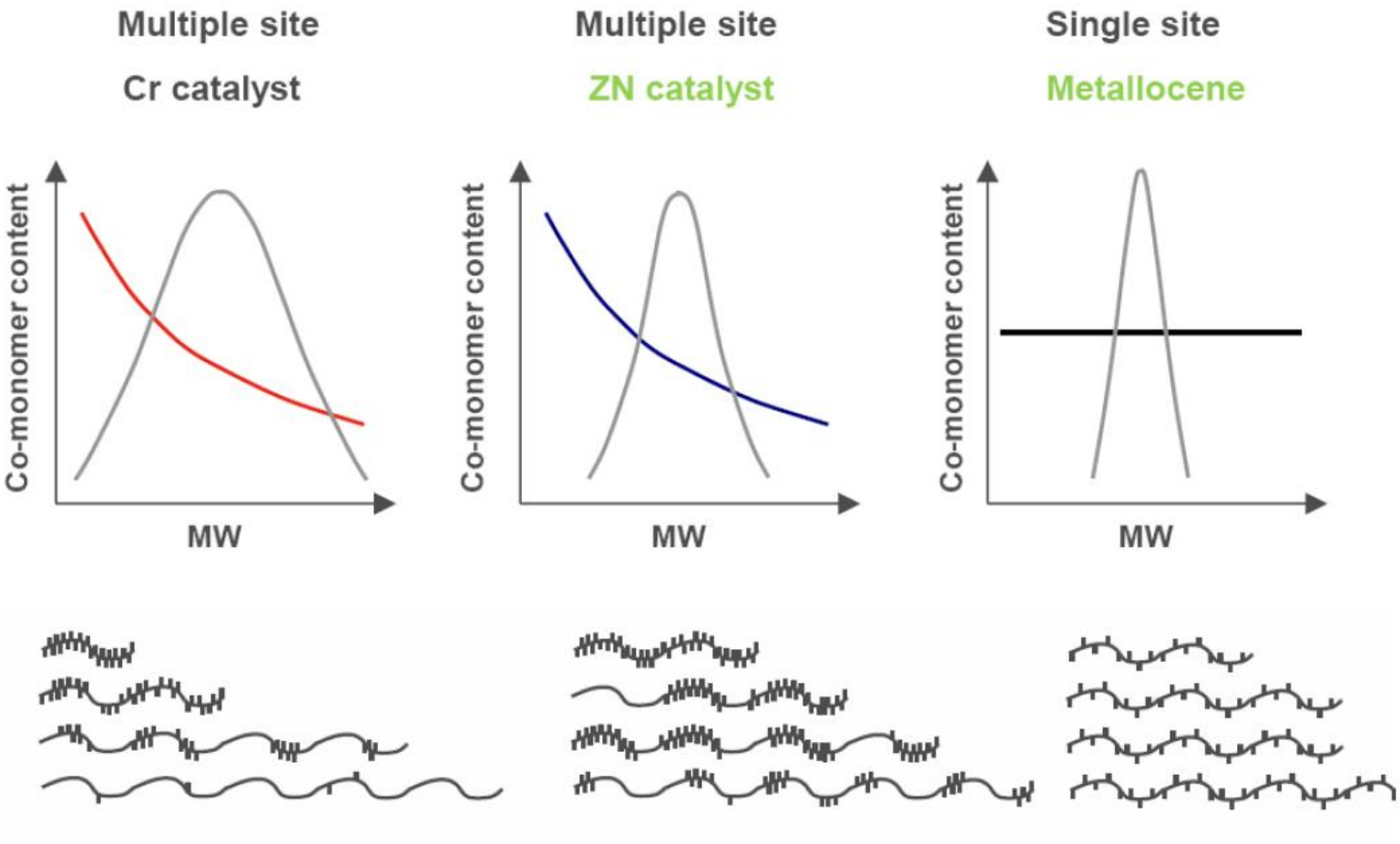

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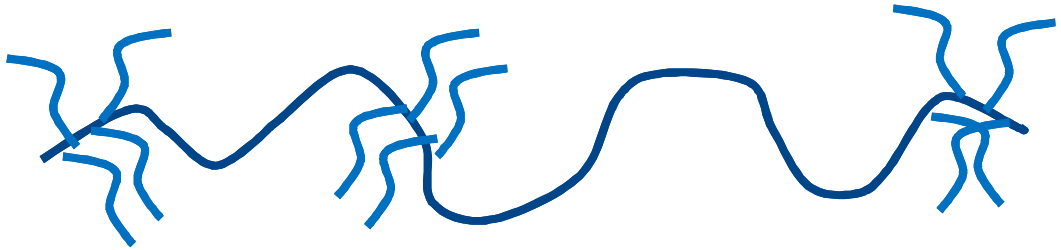
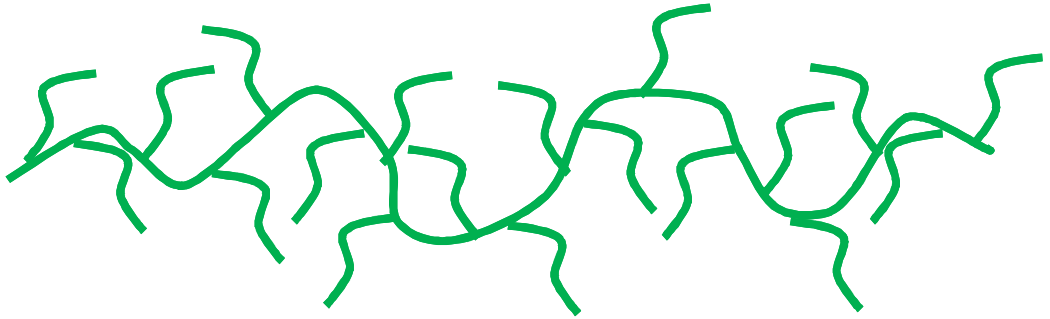
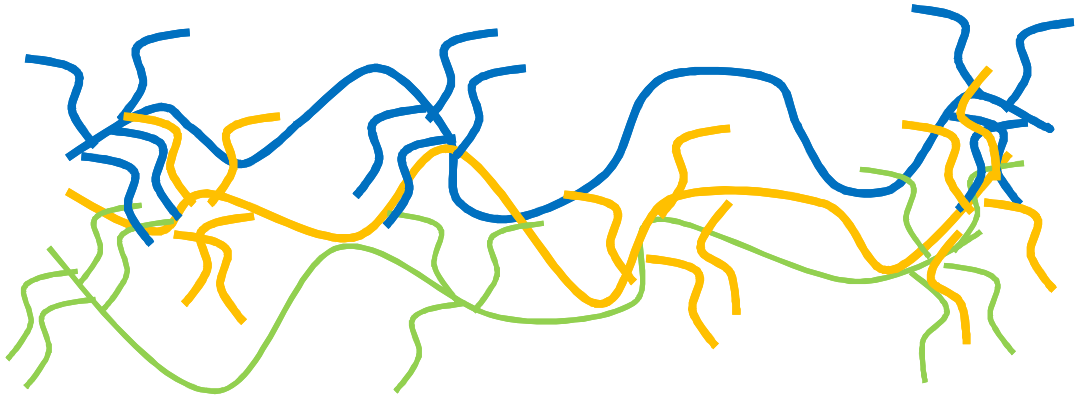


Molecular structure with non-uniform distribution of the side arms (standard film polymers)



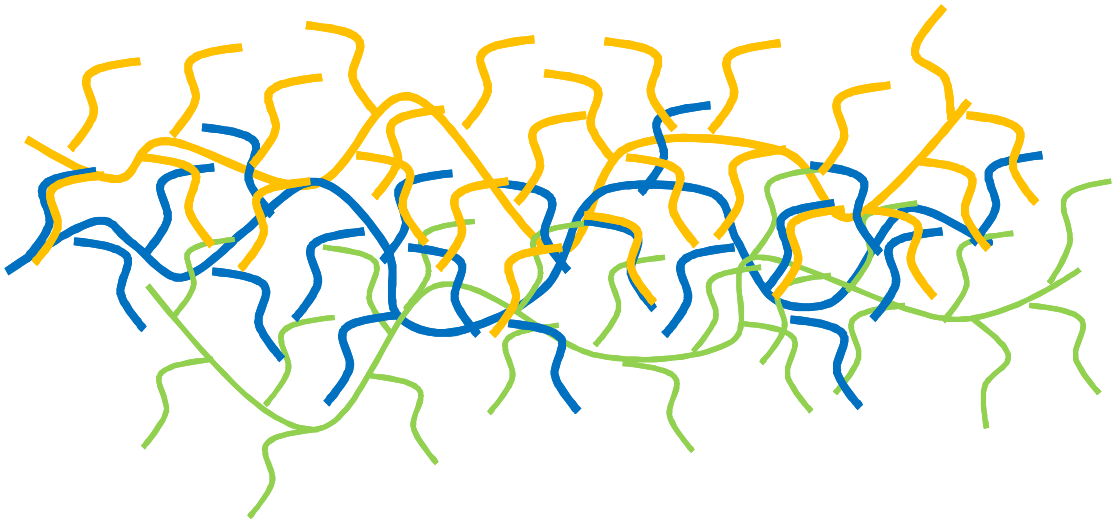
Molecular structure with uniform distribution side arms, specially developed for Fieldturf (MET)

The result → a new Polymer -> made for Fieldturf



Molecular structure for plastic film polymer

The result → a new Polymer -> made for Fieldturf



Molecular structure of polymer specifically developed for Fieldturf (Exclusive for MET)

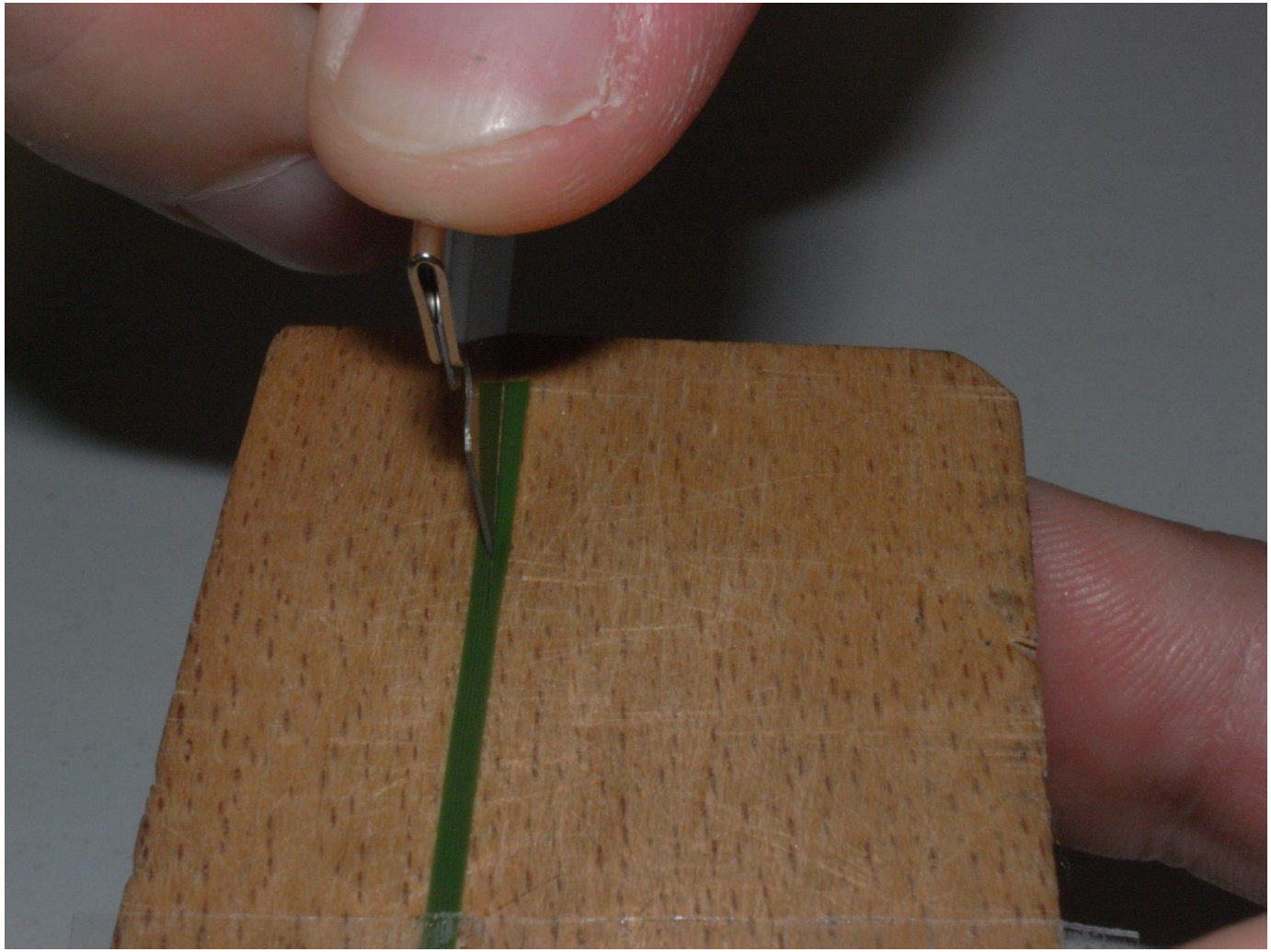
Low budget Faser <-> hig end Faser

Left side Fiber after 30.000 cycles Lisport <-> Rigth side Fieldturf 360 after 150 000 cycles Lisport

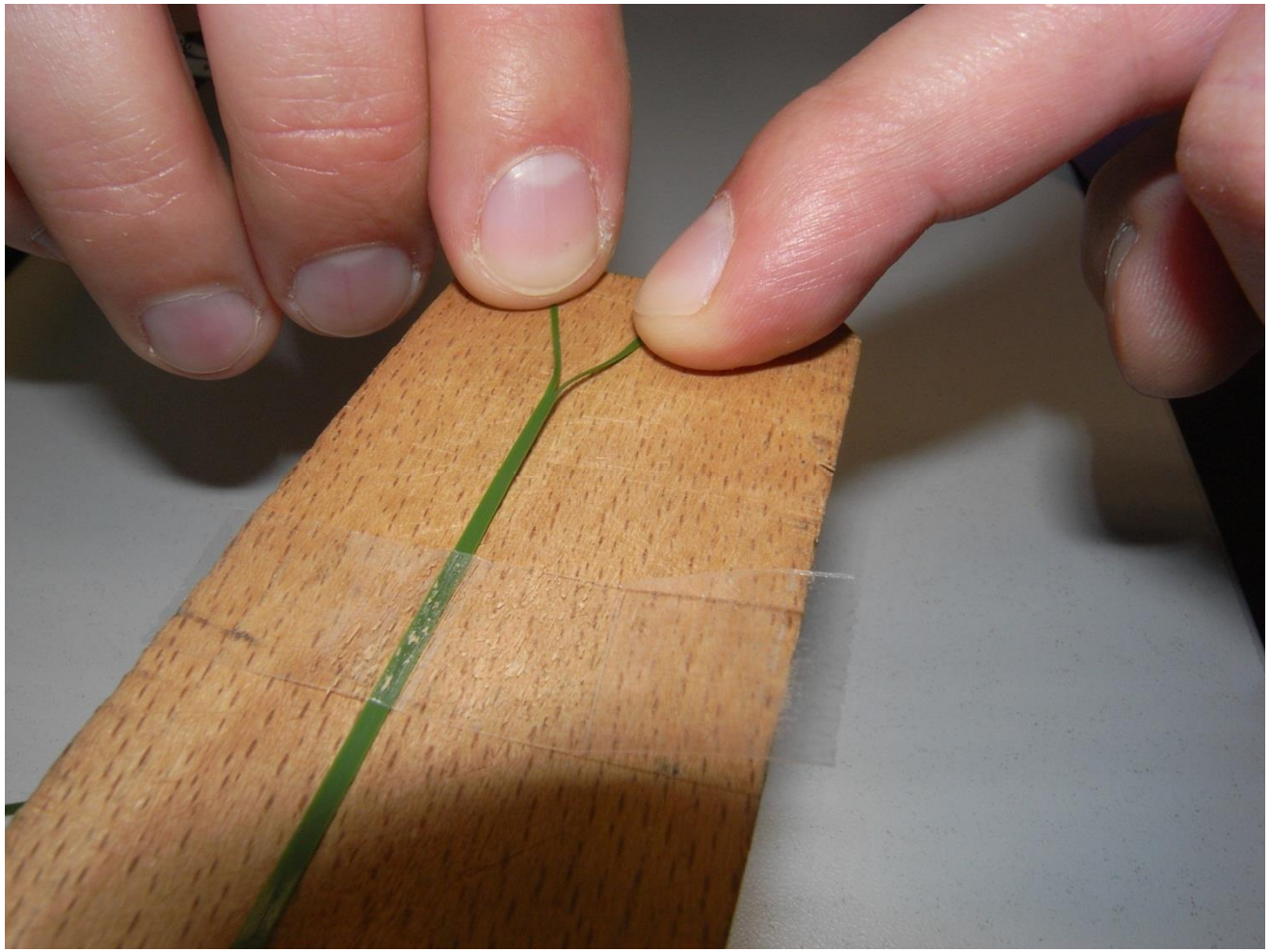
Fiber made form plastic bag raw material (1,04 ú/m²)l

Fiber made from Fieldturf raw material(1,39 ú/m²)

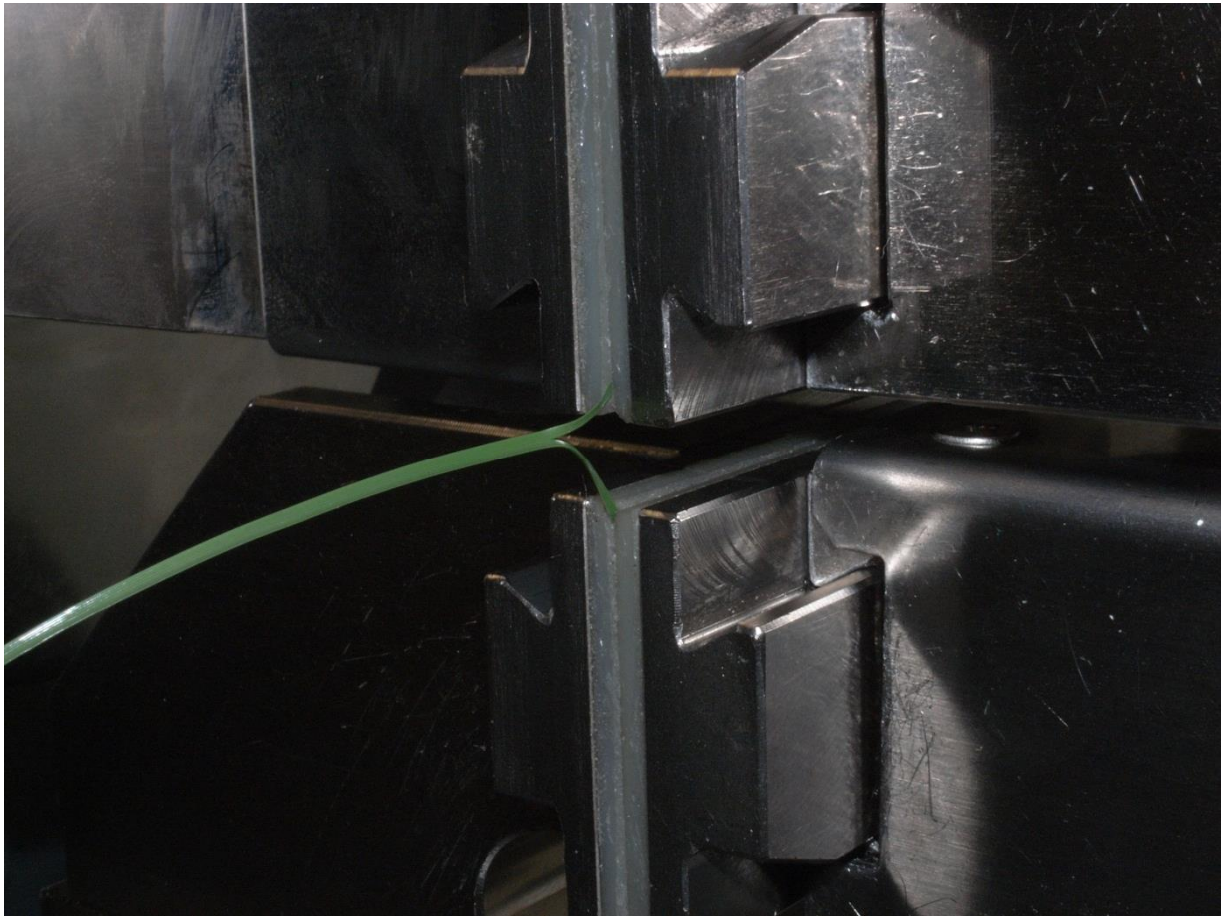
Geometry - Cross Tenacity - Durability



Geometry - Cross Tenacity - Durability



Geometry - Cross Tenacity - Durability



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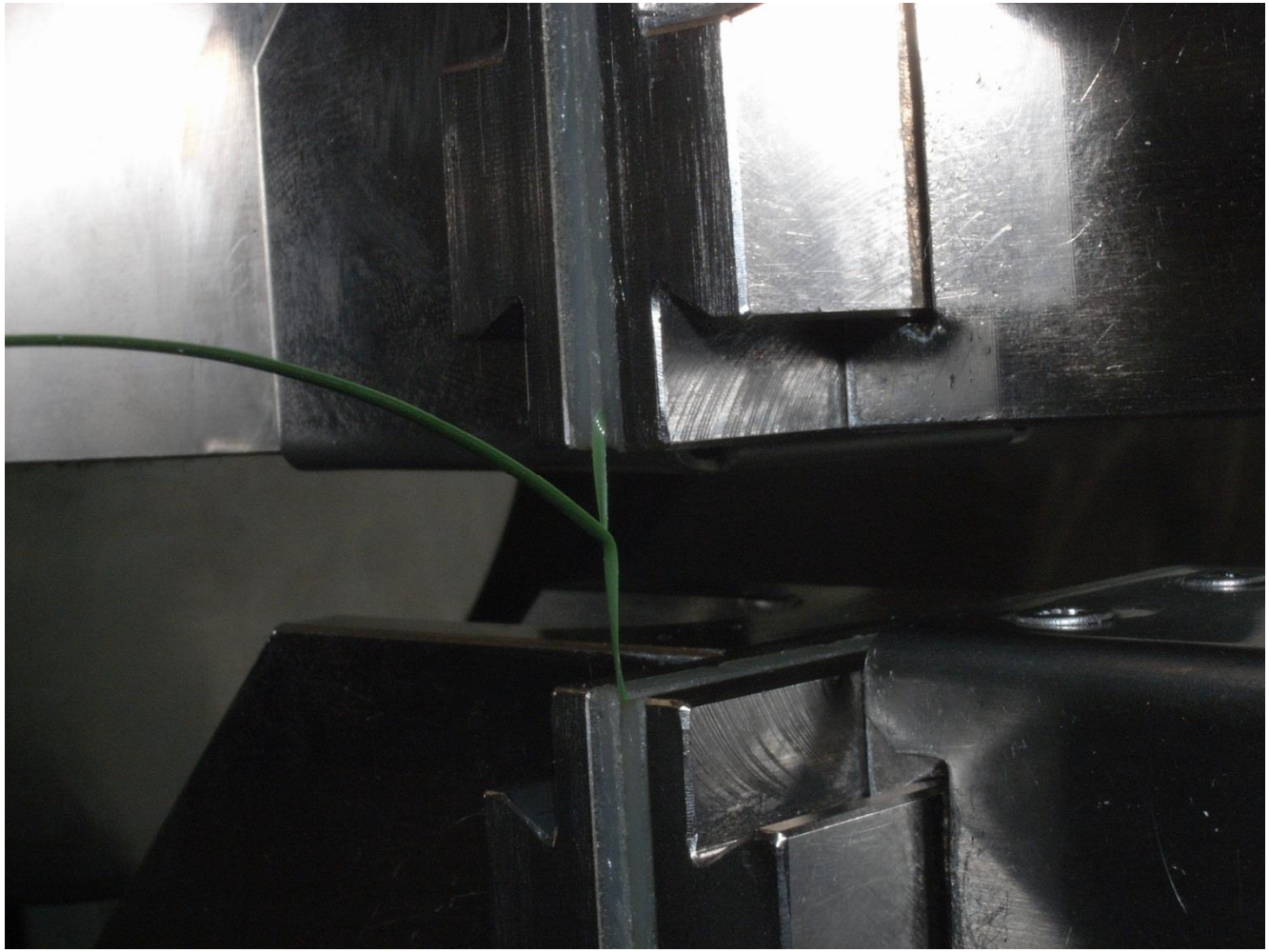
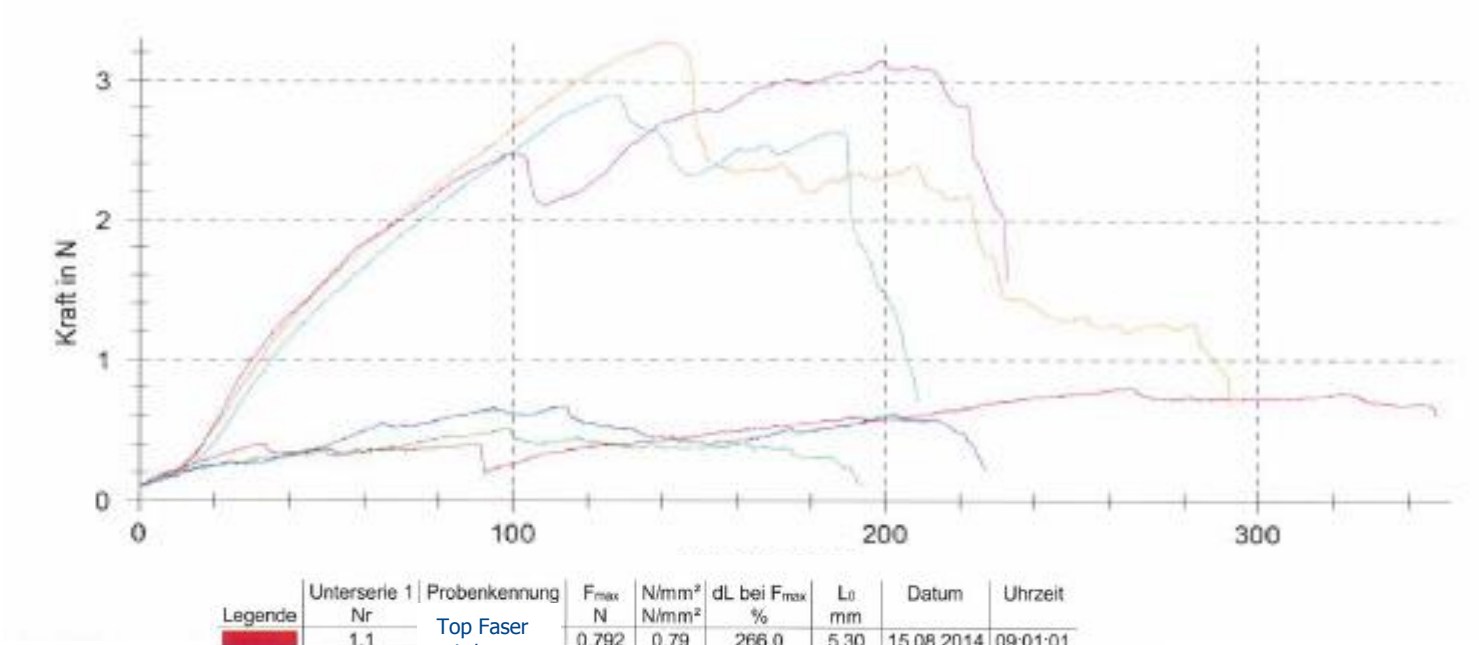


Geometry - Cross Tenacity - Durability

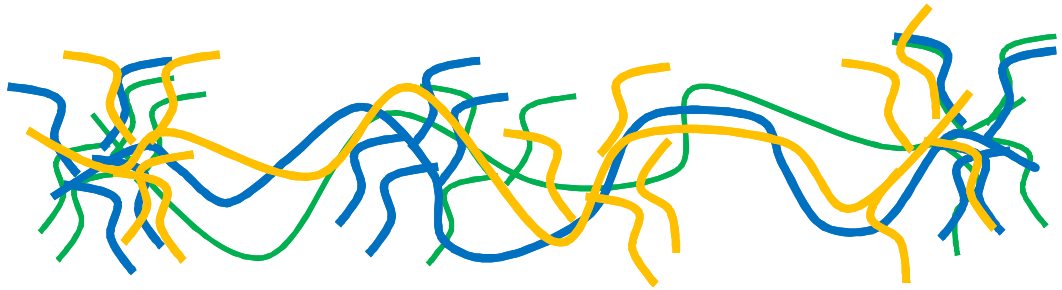


Legende	Unterserie 1 Nr	Probenkennung	F_{max} N	N/mm² N/mm²	dL bei F_{max} %	L_0 mm	Datum	Uhrzeit
	1.1	Top Faser mittlerer Osten	0,792	0,79	266,0	5,30	15.08.2014	09:01:01
	1.2		0,511	0,51	97,9	7,33	15.08.2014	09:02:49
	1.3		0,669	0,67	113,0	6,97	15.08.2014	09:05:43

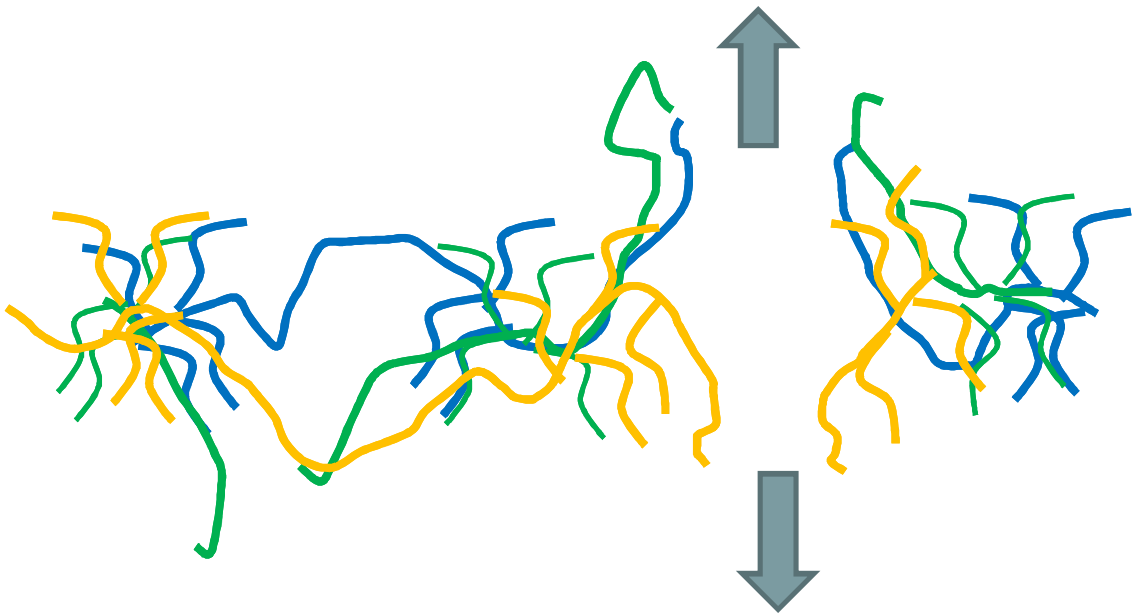
Legende	Unterserie 2 Nr	Probenkennung	F_{max} N	N/mm² N/mm²	dL bei F_{max} %	L_0 mm	Datum	Uhrzeit
	2.1	360 XL	3,27	3,27	139,8	7,72	15.08.2014	09:15:49
	2.2	360 XL	3,14	3,14	198,7	9,78	15.08.2014	09:17:50
	2.3	360 XL	2,90	2,90	126,9	7,78	15.08.2014	09:20:40

Cross Tenacity of different raw material types

Molecular structure
Plastic bag Polymer
without cross stress



Molecular structure
Plastic bag Polymer
With cross stress

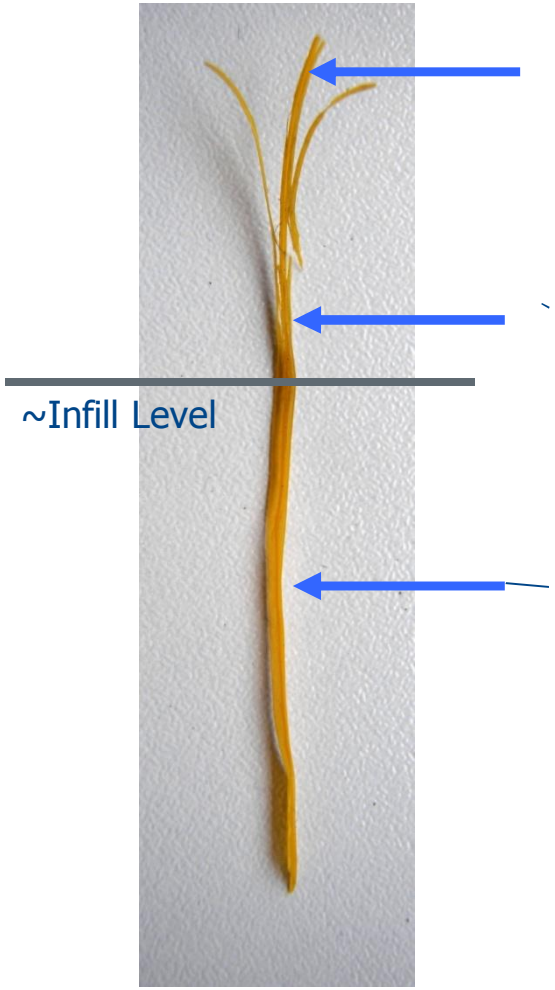


UV Stabilisierung

Polyethylen sensitive against Sun light

- To protect PE against sunlight, UV stabilizer are necessary
- The UV stabilizer are very expansive, approx 25% of the raw material costs
- The norm (EN 15330-1) is describing the UV test in the EN 13 864
- This test shall confirm that the fiber has a sufficient UV protection
- For this test the fiber will be aged with 3000 hours UV radiation, after this aging, the tenacity must be minimum 50% of the tenacity before aging
- From our point of view this test is completely insufficient, if the fiber is losing 50% of the tenacity, the fiber is not usable any more.
- We think this test is not sufficient

Fiber degradation by sun ligth



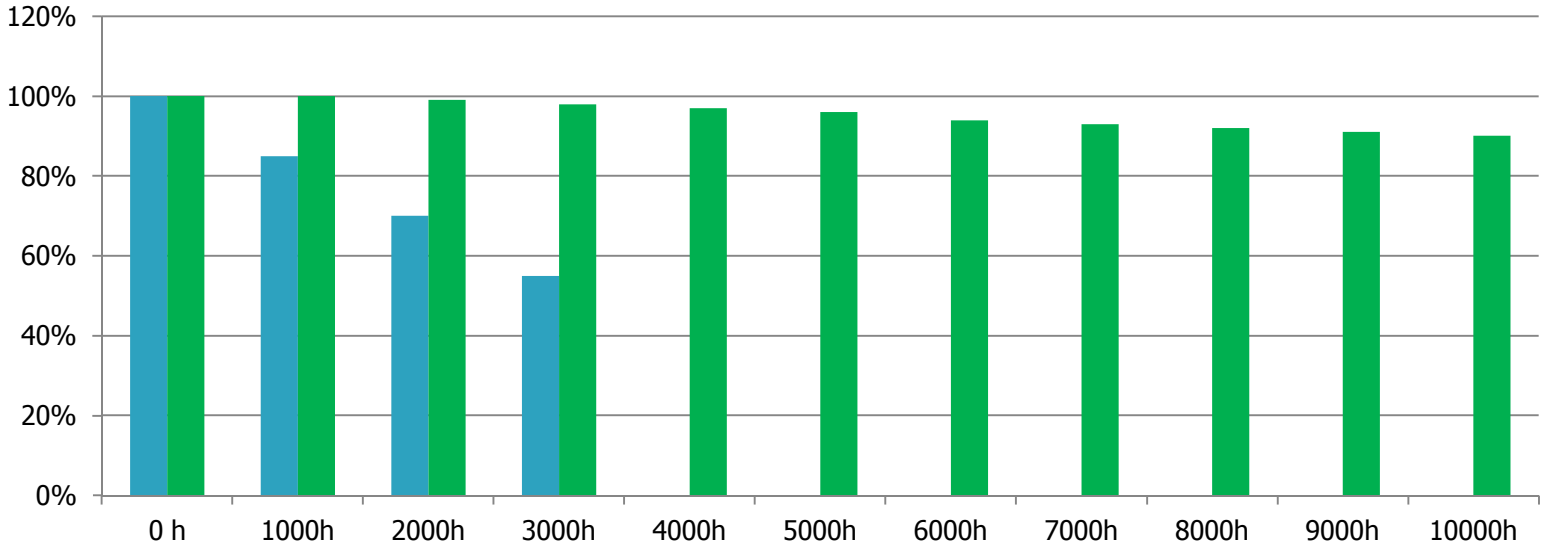
Fiber made in the middle east

- Flexural strength of the fiber above the granules, in the area in which the fiber is exposed to sunlight ~ 35 mN. The fiber loses strength and becomes brittle
- Flexural strength of the fiber is in the range in which the fiber is protected from the sun by the granules 70 mN.
- This fiber has passed successful the FIFA UV test.

UV Stabilisierung

Test Methoden

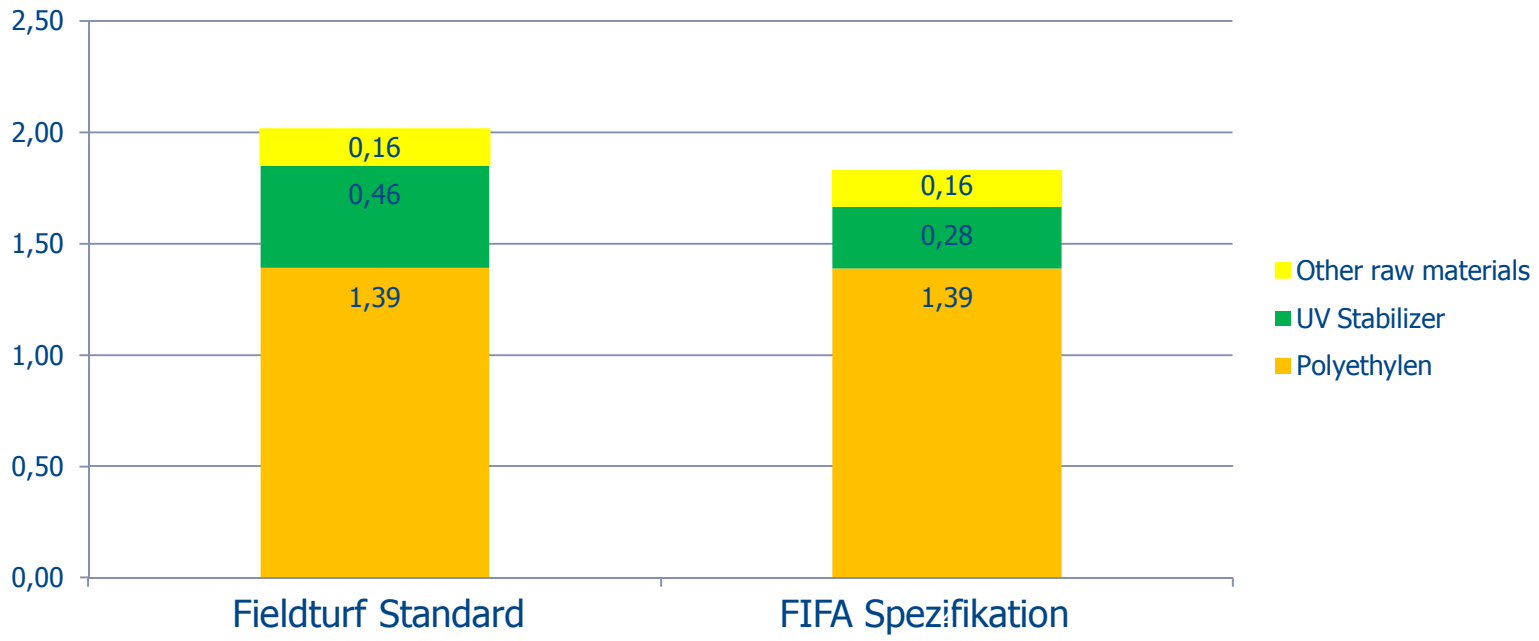
- EN 15-330-1, standard UV test for turf, tenacity after 3000 hours aging minimal 50% => absolutely insufficient



- MET standard ‚ISO 4892-2A over 85% tenacity after 10.000 hours aging

UV Stabilität

- For the FIFA test a dosing of the UV stabilizer of 6 000 ppm would be sufficient (about 28 cents per square meter).
- MET is using a UV stabilizer level of 10 000 ppm (about 46 cents per square meter).



UV Stabilisation

6000 ppm UV Stabillizer 5000 h
Xenon Test and 150 000 cycles Lisport

<->

10 000 ppm UV Stabilizer, 5000 h
Xenon Test and 150 000 cycles Lisport

Fiber with 6000 ppm UV Stabilizer (0,28 ú/m²)l

Fiber with 10 000 ppm UV Stabilizer (0,46 ú/m²)

Status Resilience today

Feedback of test field in Wald Michelbach (2014)

- We installed 3 different fibers BiCo, 360 XL and 500 XL, field size 1400 m²
- The field is used for training of 14 local kid teams, daily using, average player 30 kids.
- Ranking of fiber in Wald Michelbach

  BiCo absolute straight no tip curling

  500 XL slightly tip curling

  360 XL strong tip curlin

Feedback installation Mainz 05 (2015)

- German junior national team is using this pitch for training

- Comments from team members

  ball roll very good

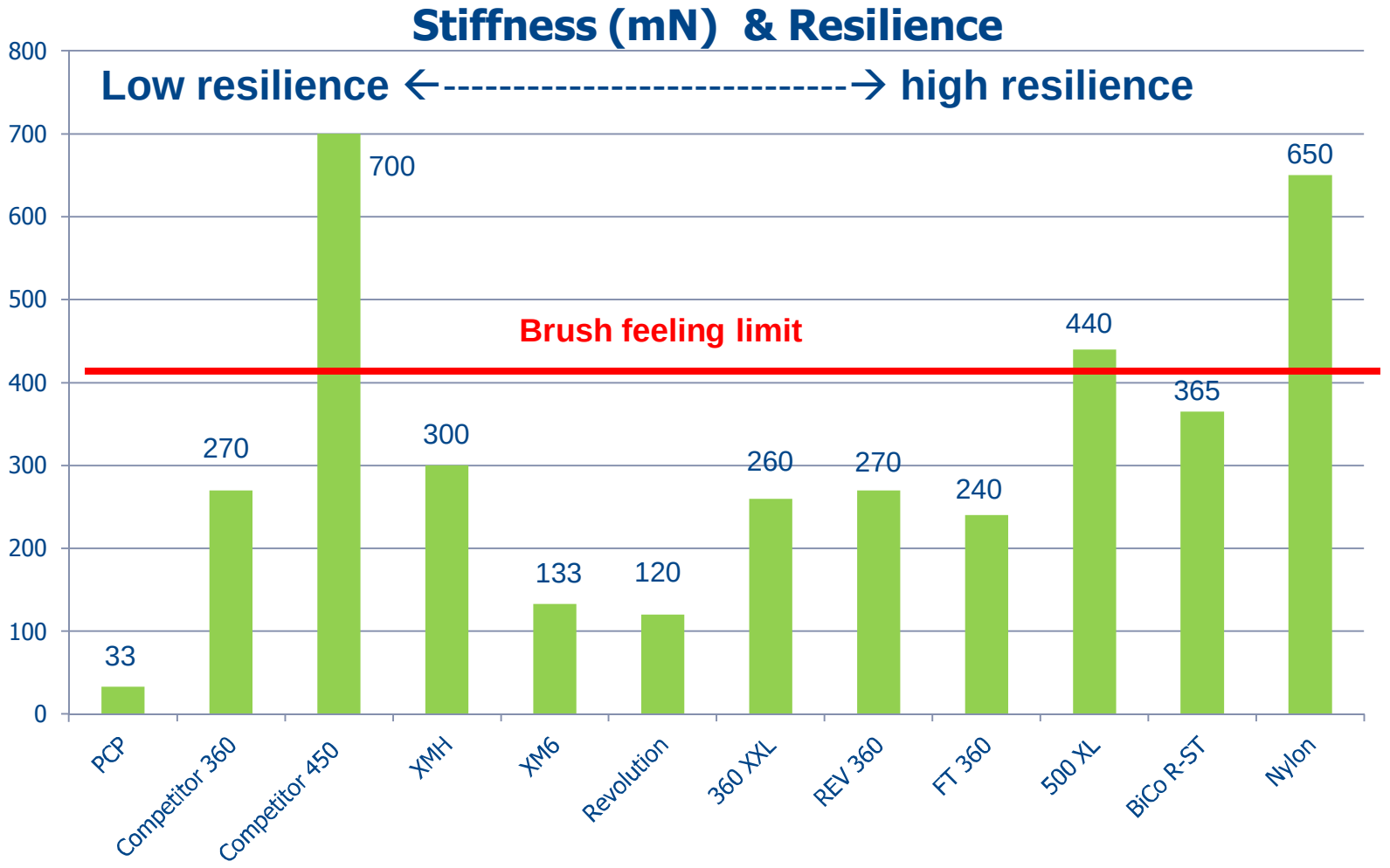
  sliding feeling very good

  Total ranking very good

- 20 References fields in DACH and Benelux are installed, (2016) overall feedback very good
- Increasing production capacity in 2017 to 200 full size sport fields

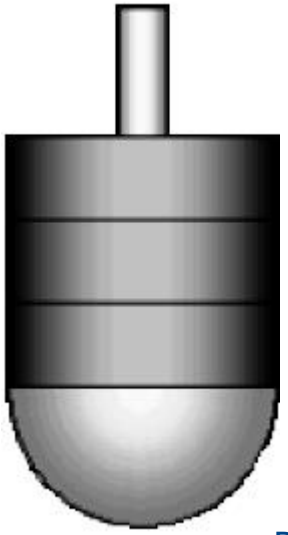
Resilience ⇔ stiffness

Stiffness and Resilience



Dart-drop-test => Energy Absorption of film

Dart drop test unit to measure energy Absorption of film

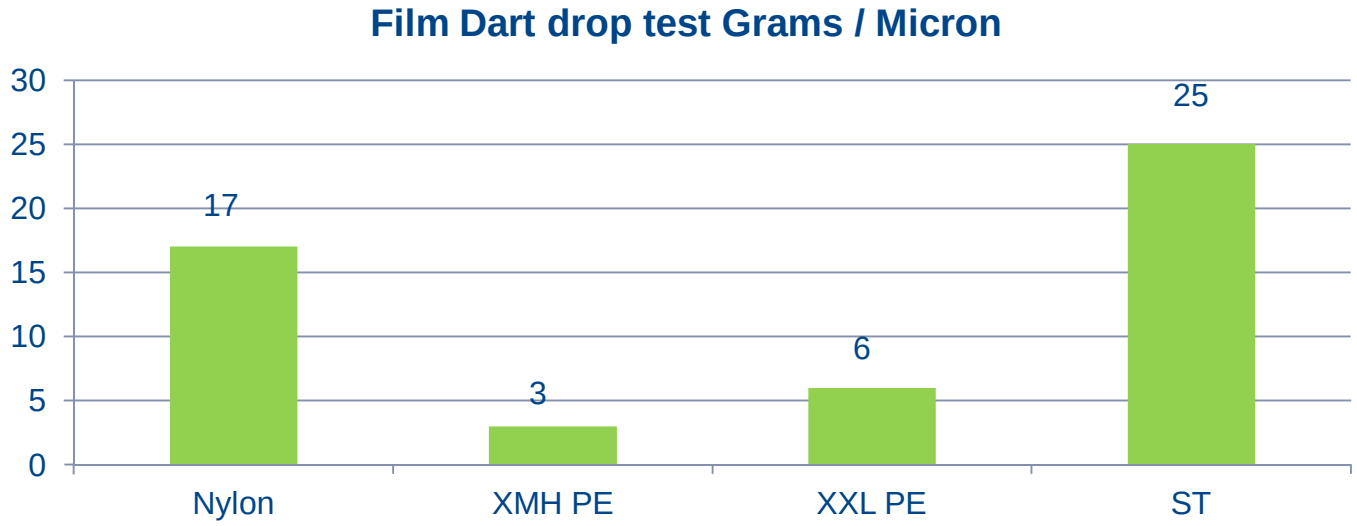


„Dart" weights'

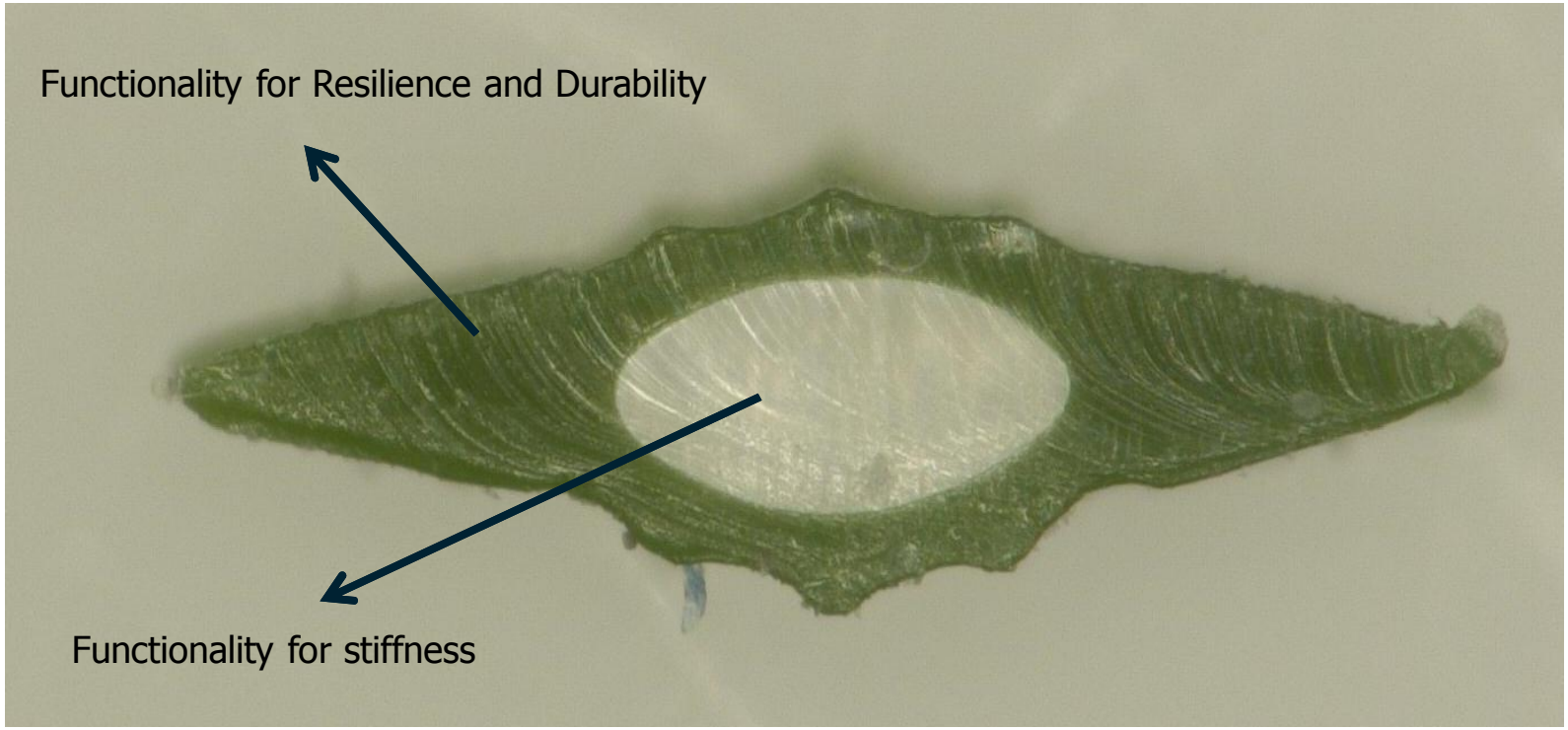
„Dart" tip

Standard test for Film development to measure the energy absorption ASTM D 1709-75

Dart drop test for film



BiCo fiber R-ST



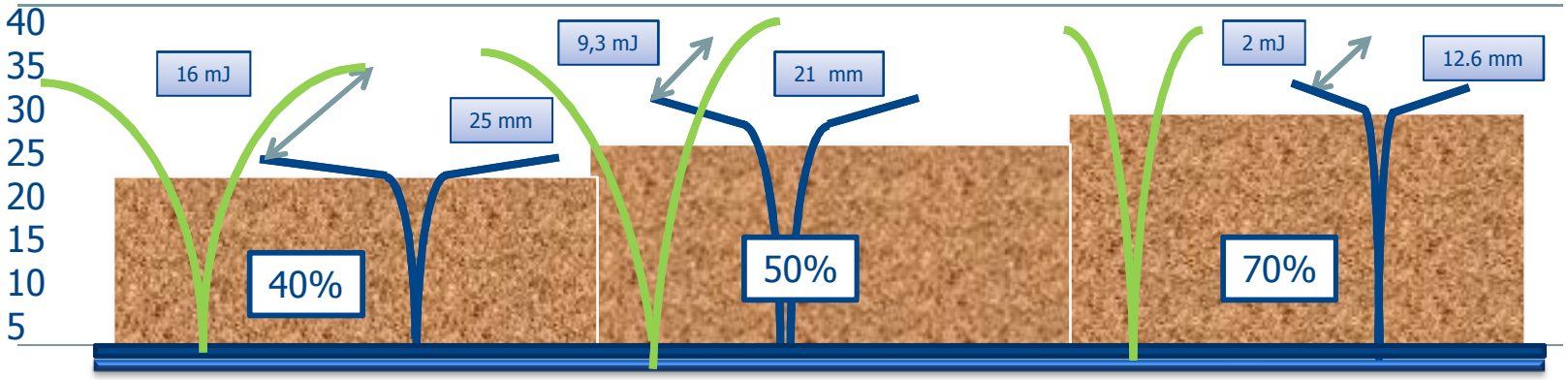
2-layer monofilament for Turf)

Durability for BiCo " Core "

Fieldturf BiCo fiber (Core) after 200.000 Lysport cycles

Resilience and level of Infill

Pile heigth (42 mm)				
Level of Infill (%)	40%	50%	60%	70%
Fiber length over the Infill level (mm)	25,2	21	16,8	12,6
Weigth of the fiber above the Infill (Milli g)	5.04	4,2	3,35	2,52
Erect force (Mikro N)	635	441	282	158
Power to erect fiber back(Mikro Joule)	16	9,3	4,7	2,0



At a Infill level of 70% (our recommendation) has the fiber for each erecting a Perform work of 2 micro joules, at a filling rate of 40% the work is 16 micro joules. A good fiber which has a very good resilience for 4 years at 70% filling level, loses this performance at 40% fill level after 6 months

Quality Management

Zertifikat

kiwa
Partner for progress

Nummer 59569

Gültig vom 2010-12-22
Gültig bis 2013-12-21 Seite 1 von 1

Kiwa International Cert GmbH
bescheinigt hiermit, dass die

morton
extrusionstechnik gmbh

Im Pfarrgrund 5
69518 ABTSTEINACH

für den Geltungsbereich
Entwicklung, Herstellung und Vermarktung von Extrusionsprodukten auf Polymerbasis.

ein Qualitätsmanagementsystem eingeführt hat und anwendet, das den Anforderungen der

DIN EN ISO 9001:2008

entspricht.

Kiwa International Cert GmbH
Geschäftsführung

Kiwa International Cert GmbH
Leiter Zertifizierungsstelle

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e-mail info@kiwa.de
www.kiwa.de

DQA-ZM-05-09-00

INTERNATIONAL CERT

International DIN ISO 9001 certifikation

Thank You.

Morton Extrusionstechnik

The New Age of Artificial Turf.

FieldTurf
A Tarkett Sports Company
THE ULTIMATE SURFACE EXPERIENCE