From macro to micro material trends 22/23

A material forecast

by Michael Wolf

imat·uve design & engineering

BRAIN OF MATERIALS

Envisions design lab - Material Lookout - Brain of "Harvest"

"it´s a small world"

It's a world of laughter, a world of tears
It's a world of hopes and a world of fears
There's so much that we share
That it's time we're aware

It's a small world after all

There is just one moon and one golden sun
And a smile means friendship to everyone
Though the mountains divide
And the oceans are wide

It's a small world after all

by Walt Disney World®

RETHINK GLOBAL CHAINS

We must become aware that our current behavior no longer supports the demands of the future, especially from an economic and ecological perspective. Globalism fuels discrimination and exploitation of the weaker members of society and the depletion of nature. Our global flow of goods and production chains are vulnerable. The reasons are not only the Covid-19 pandemic and its consequences, but also unexpected disruptions which can cause massive delays in transport and production.

CONTENT

Through the last decades plastics were on the rise, products deriving from natural materials diminished. As fossil sources are limited and polluting, there currently is an increased demand for alternatives. Ancient techniques and raw materials as well as forgotten plant species are worth reviving. To narrow it down to innovative and feasible recommendations, this trend report focuses on three main categories.

PLANT BASED

summarizes projects that reevaluate plant based material streams and bring lost raw materials back to life. They shed light on forgotten and unused types of plants and the production processes. How can these ressources become a part of modern industrial production?

RETHINKING RAW MATERIAL

focuses on how to reuse and give value to waste or byproducts of industrial production. How can those resources be returned to the production process to extend and fully make use of the life of raw materials? What role could this unappreciated byproducts and waste play in a circular economy?

LEATHER ALTERNATIVES

shows how smart substitutes emulate the properties of original leather. Cattle farming is a major contributor to environmental degradation and is considered a massive CO2 polluter. Efforts to reduce global meat consumption cohere with the search for leather replacements.

Envisions design lab - Material Lookout - Brain of "Harvest"

PLANT BASED

GO TO REPORT

CHEER PROJECT

FOREST WOOL

EOACOUSTIC

STUDIO THUSTHAT

PALMFIL

DON KWANING

BANANATEX

BIOPUR

ADMAJORIS

BPREG

BLOOMMATERAILS

APM

APM

RETHINKING RAW MATERIALS

ACCEPTING IMPERFECTION FOR DOING IT BETTER

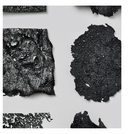
GO TO REPORT

PRECIOUS PLASTICS

SMILE PLASTIC

FIBERS UNSORTED

MATERIAL SENSE LAB



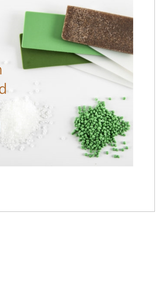
HEXPOL TPE

Dryflex circular

Dryflex Green is a family of biobased thermoplastic elastomer (TPE) compounds containing raw materials from renewable resources.

Since most biobased raw materials in the market are quite hard on their own, a major challenge has been to develop compounds with high renewable content, low hardness while at the same time maintaining mechanical properties at acceptable levels.

The Dryflex Green TPE compounds divert from the other soft thermoplastic materials on the market today by including also soft materials with high levels of renewable content and thereby covering a greater segment and opening up more design possibilities.

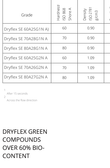


MAIN CHARACTERISTICS:

- Partially made from plant-based materials instead of fossil-based materials
- Reduction of Carbon Footprint
- Biobased content to over 90% possible (ASTM D6866)
- Made with certified, biobased raw materials for example from sugar cane, sunflowers ...
- Current projects: inlay mats, floor mats and chassis plugs

Figure 1 :

PERCENTAGE OF
BIO-CONTENT
VS HARDNESS



Dryflex Green TPE compounds display mechanical and physical properties close to and comparable to TPE compounds from fossil based raw materials.
In general the Dryflex Green compounds show very good bonding behaviour to PE and PP.
Like conventional TPE compounds, Dryflex Green TPEs can easily be coloured to give vibrant and appealing visual impact.

DRYFLEX GREEN COMPOUNDS OVER 20% BIO-CONTENT

Grade	Hardness ISO 868 Shore A	Density ISO 1183 g/cm³	Tensile Strength* ISO 37 Type 1 MPa	Stress at 100% Strain* ISO 37 Type 1 MPa	Stress at 300% Strain* ISO 37 Type 1 MPa	Elongation at Break* ISO 37 Type 1 %	Tear Strength* ISO 34-1 Method C kN/m	Compression Set ISO 815-1 Type A 72 h / 23 °C %	Compression Set ISO 815-1 Type A 72 h / 70 °C %	Resistant of Color Change ISO 105-A02 Grey Scale 72 h / 40 °C	Color Migration ISO 105-E04 72 h / 40 °C mg
Dryflex SE 604250/16 AL	60	0.90	4.6	1.6	2.1	> 700	19	19	47	25	0.39
Dryflex SE 763280/4 N	70	0.90	4.6	2.0	2.4	> 700	21	19	47	28	0.44
Dryflex SE 804280/14 N	80	0.90	5.2	2.6	3.1	> 650	29	22	51	28	-
Dryflex SE 894250/24 N	90	0.89	4.2	1.5	1.8	> 750	17	21	42	25	0.44
Dryflex SE 764260/24 N	70	1.09	4.6	1.8	2.3	> 600	16	21	46	26	-
Dryflex SE 856275/24 N	80	1.09	5.5	2.4	3.2	> 550	23	23	51	27	-

* After 12 seconds
Across the Flow direction

DRYFLEX GREEN COMPOUNDS OVER 60% BIO-CONTENT

Grade	Hardness ISO 868 Shore A	Density ISO 1183 g/cm³	Tensile Strength* ISO 37 Type 1 MPa	Stress at 100% Strain* ISO 37 Type 1 MPa	Stress at 300% Strain* ISO 37 Type 1 MPa	Elongation at Break* ISO 37 Type 1 %	Tear Strength* ISO 34-1 Method C kN/m	Compression Set ISO 815-1 Type A 72 h / 23 °C %	Compression Set ISO 815-1 Type A 72 h / 70 °C %	Resistant of Color Change ISO 105-A02 Grey Scale 72 h / 40 °C	Color Migration ISO 105-E04 72 h / 40 °C mg
Dryflex SC 604601/14 A	60	0.89	3.1	1.9	2.6	> 400	20	23	60	64	0.53
Dryflex SC 764601/24 A	70	1.09	3.8	2.8	3.5	> 400	27	24	66	63	-
Dryflex SC 804601/14 A	80	0.89	4.4	3.2	3.8	> 450	33	26	68	65	0.57

* After 12 seconds
Across the Flow direction

DRYFLEX GREEN COMPOUNDS OVER 80% BIO-CONTENT

Grade	Hardness ISO 868 Shore A	Density ISO 1183 g/cm³	Tensile Strength* ISO 37 Type 1 MPa	Stress at 100% Strain* ISO 37 Type 1 MPa	Stress at 300% Strain* ISO 37 Type 1 MPa	Elongation at Break* ISO 37 Type 1 %	Tear Strength* ISO 34-1 Method C kN/m	Compression Set ISO 815-1 Type A 72 h / 23 °C %	Compression Set ISO 815-1 Type A 72 h / 70 °C %	Resistant of Color Change ISO 105-A02 Grey Scale 72 h / 40 °C	Color Migration ISO 105-E04 72 h / 40 °C mg
Dryflex SC 504020/16 N	50	0.90	4.5	1.5	3.0	> 600	13	17	38	62	0.54
Dryflex SC 604020/16 N	60	0.90	4.9	1.9	3.3	> 750	32	26	42	62	0.68
Dryflex SC 704030/14 N	70	0.90	5.3	2.8	4.0	> 750	35	33	52	83	0.95
Dryflex SC 804040/14 N	80	0.9	5.6	3.5	4.6	> 850	40	40	55	84	0.96
Dryflex SC 504025/24 N	50	0.98	4.0	1.3	2.6	> 600	24	13	43	62	0.43
Dryflex SC 804062/24 N	80	0.98	5.0	3.3	4.4	> 600	38	35	53	84	0.91

* After 12 seconds
Across the Flow direction

DRYFLEX GREEN TPO COMPOUNDS

Grade	Hardness ISO 868 Shore A	Density ISO 1183 g/cm³	Tensile Strength* ISO 37 Type 1 MPa	Stress at 100% Strain* ISO 37 Type 1 MPa	Elongation at Break* ISO 37 Type 1 %	Tear Strength* ISO 34-1 Method C kN/m	Compression Set ISO 815-1 Type A 72 h / 70 °C %
Dryflex EP 604350/16 U	60	0.87	4.5	2.4	> 1100	27	33
Dryflex EP 704340/18 U	70	0.87	5.2	2.6	> 600	33	34
Dryflex EP 804360/16 U	80	0.87	6.4	4.3	> 600	42	36

* After 12 seconds
Across the Flow direction

Alongside Hexpols standard ranges, there are a number of qualified raw materials available which can be tailored to customer specifications in a modular system to build a compound. Depending on requirements regarding bio-content and hardness, food contact grades are available.

APPLICATIONS

Dryflex Green TPE compounds can be used in many applications that currently use conventional TPEs, such as soft-touch grips and handles, sealing and closures, automotive, consumer goods, sports equipment, toys and infant care.

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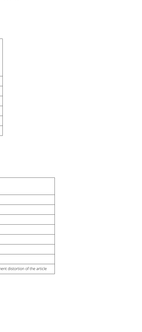
https://www.hexpol.com/hpe/de/

Lifocork

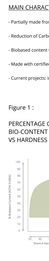
Cork

The main quantity of natural cork which is harvested today is used as pressed cork or mixed with PU or rubber. The processing of this kind of cork can be expensive and require a lot of energy. Hexpol developed a special manufacturing method to combine natural cork with thermoplastic raw materials. Meaning Lifocork can be processed using typical thermoplastic processing methods such as injection moulding, extrusion or thermoforming.



MAIN CHARACTERISTICS:

- Natural Look for visible sustainability
- New design possibility to make sustainability visible for the end customer!
- Lifocork compounds combine the properties of natural cork with the processability of plastics.
- Available in hardnesses from 50 to 98 Shorok and offer low density and UV-resistance.
- Can be processed by conventional thermoplastic processing methods such as injection moulding, extrusion and thermoforming.
- Lifocork compounds can be physically and chemically foamed and the finished product can be sanded.



Combining the sustainability, low weight & feel of natural cork with the processability of plastics

The main quantity of natural cork which is harvested today is used as pressed cork or mixed with PU or rubber. The processing of this kind of cork can be expensive and require a lot of energy. Hexpol TPE has developed a special manufacturing method to combine natural cork with thermoplastic raw materials. Meaning Lifocork can be processed using typical thermoplastic processing methods such as injection moulding, extrusion or thermoforming.

A renewable raw material

Cork is a natural product which comes from the bark of the cork oak tree. The removal of the bark does not harm the trees and the bark is only harvested after the first 20 years of growth. The removal stimulates a steady regeneration of the bark. Each cork tree provides on average 16 harvests over its 150-200 year lifespan. Cork itself has a cell-like structure which is light and highly compressible. It is used in construction, sports, industrial and household applications.

TYPICAL PROPERTIES

- Hardness 50 to 98 Shore A
- Low density
- Different base materials
- UV resistant
- Resistant against sweat and hand cream
- Resistant against moisture and water
- Non-slip
- Soft touch surface
- Natural cork optics
- Different colors possible
- Easy processing through injection moulding, extrusion or thermoforming
- Good abrasion
- Can be foamed with blowing agents
- Grindable

PROCESSING

Lifocork can be processed using thermoplastic processing methods. In injection moulding it can be processed using standard equipment. Lifocork can also be processed in two-component moulding. It has an excellent bond to TPE, PP and PE. Other processing methods include extrusion or thermoforming with a double belt press.

TYPICAL APPLICATIONS:

Handles, grips on sports equipment, tools and household items, Bowls, boxes, plant pots and toys.

CUSTOMIZED MATERIALS:

Below is a selection of grades to illustrate the versatility of Lifocork compounds.

PROPERTIES OF LIFOCORK GRADES

Grade	Hardness* Shore A	Base Material	
Lifocork LV 65/1012	50	TPE	Special soft grades
Lifocork LV 70/1012-2	70	TPE	Soft-touch grips, fulfills DIN ISO 10993-5 for skin contact
Lifocork TF 80/1016-5	80	TPE	Soft-touch grips, modified for high bonding to TPE, PP & PE, UV-resistant
Lifocork TD 95/1000	95	TPE	Grips in one or two component moulding. Easy to process. UV resistant
Lifocork TD 75/1004-4	85	EVA	For orthopaedic use, glueable, easy to thermoform
Lifocork TV 75/1014	75	TPE	For orthopaedic use, glueable, grindable, high flexibility

* After 12 seconds

Grade	
STORAGE	The product should be stored in a dry and cool place in the original packaging.
PRE-DRYING	For best results, Lifocork should be dried for 2 to 3 hours at 70 ° C in a dry air dryer.
INJECTION SPEED	Slow
INJECTION PRESSURE	Low
BACK PRESSURE	Very low
HOLDING PRESSURE	Must be adjusted for each grade to compensate for the shrinkage
CYCLE TIMES	Cycle times will be governed by temperature and section thickness.
COOLING	Care must be taken to allow sufficient cooling of the section prior to demoulding in order to prevent permanent distortion of the article

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