TEKNOR APEX

BIOVINYL®

SUSTAINABLE FLEXIBILITY

Flexible **Durable** **Sustainable**

Good for the Planet

Good for People

Good for Business

Presenting BioVinyl® with Ecolibrium

Technology enabling sustainability

Our Commitment to Sustainability

Teknor Apex Company is committed to promoting solutions that help to protect our planet now and for generations to come. Whether it is the development of thermoplastic compounds like BioVinyl, using sustainable raw materials, or the company's position as one of the largest recyclers of flexible vinyl, Teknor Apex strives to use the latest compounding technology to promote both good business and good chemistry.

Unmatched Materials Innovation and Expertise

As the the exclusive North American compounder using Dow Ecolibrium™ bio-based plasticizers, BioVinyl is one of Teknor Apex's sustainable solutions for flexible PVC. Demonstrating renewable attributes while retaining the flexibility and durability of traditional compounds, BioVinyl is the sustainable choice for wire and cable, automotive, consumer, and building and construction applications. BioVinyl's unique, fully recyclable, non-phthalate composition enables manufacturers to meet their sustainability goals.

BioVinyl Advantages At a Glance

- Flexibility, durability, and processing comparable to standard PVC compounds
  - » Non-DEHP and non-phthalate
  - » Available in grades as low as 70 Shore A
  - » Processed via conventional thermoplastics processes, including extrusion and injection molding
- Fully recyclable
  - » Can be comingled with standard vinyl compounds in the recycle stream
- Physical properties can be tailored for specific applications
  - » Low temperature flexibility
  - » Tensile strength and/or compression set
  - » Sunlight resistance
- Flame-resistant performance benefits
  - » Can be formulated to pass UL-94 V-0 as well as large-scale flame tests

Flexible, Durable, and Sustainable PVC Compound Solution

Backed by the sound science of Dow and the expertise of Teknor Apex, BioVinyl offers product designers, architects, and engineers a sustainable, flexible, and durable PVC compound solution. Suitable for advanced applications ranging from wire and cable to consumer products, BioVinyl can be formulated to pass critical aspects of UL performance requirements including flame tests. BioVinyl, which complies with EU RoHS regulation may also help improve thelikelihood of achieving LEED credits in building and construction applications and the end product may be eligible for the US Department of Agriculture's Bio Preferred Label (biopreferred.gov).

Proven to Help Reduce Greenhouse Gas Emissions

BioVinyl leaves a minimal carbon footprint, rivaling petrochemically-derived polymers and some commercial biopolymers. The bio-based plasticizer in BioVinyl is made from 98% bio-derived carbon per ASTM D6866 standards. Each pound of BioVinyl consumed saves a measurable quantity of greenhouse gas (GHG) emissions. Specifically, for every kilogram of bio-based Dow Ecolibrium used to replace a traditional plasticizer, 3.1 kilograms of greenhouse gas emissions are avoided.

There is now the availability of low carbon emission PVC resin for incorporation in BioVinyl compounds further decreasing the compounds carbon footprint. There are two types of resins available – one where the product is made using energy from renewable sources and the other where bio-attributed raw materials are used in addition to the manufacturing process being powered by energy from renewable sources. These PVC resins provide 15% - 90% reduction of carbon emissions which will lead to significantly lower carbon footprint for BioVinyl compounds.

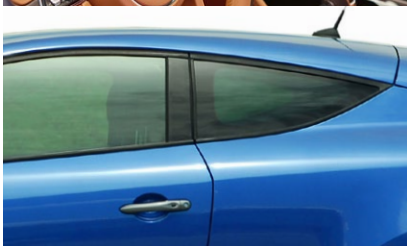
Global Warming Potential of Various Plastics
Kg. of CO^2 Emission per Kg. of Polymer

*<u>Now</u> is the right time to consider **BioVinyl**, the sustainable choice for your flexible PVC compound needs.*

Expertise and advanced testing capabilities

Typical Properties of *BioVinyl*® - Automotive Molding Applications

Application		Interior	Interior	Exterior
Compound Property	**Test Method**	**BV 91011-65**	**BV 91011-80***	**BV 1523-75-N-00**
SHORE HARDNESS Delayed	ASTM D2240	71A	80A	77A
SPECIFIC GRAVITY	ASTM D792	1.30	1.39	1.34
TENSILE STRENGTH MPa	ASTM D638	10.3	11.0	10.6
ELONGATION %	ASTM D638	350	330	350
BRITTLENESS TEMPERATURE °C	ASTM D746	-	-	-19



*Meets requirements for GMW 16084, Type 2, Grade I, Class B

Typical Properties of *BioVinyl*® - Wire & Cable Extrusion Applications

Application		AWM Insulation	AWM Jacket	Riser Insulation	Cat 5/6 Patch Cable Jacket	UV & Fungus Resistant Riser Buffer
Compound Property	**Test Method**	**BV 9013A01-110**	**BV 9033A01-85**	**BV 9011A01-110**	**BV 9031P01-87**	**BV 9021G01-92 UVF***
TEMPERATURE RATING °C	ASTM D794	105	105	75	75	75
SHORE HARDNESS Delayed	ASTM D2240	60D	85A	85C	87A	67C
SPECIFIC GRAVITY	ASTM D792	1.37	1.49	1.37	1.52	1.44
TENSILE STRENGTH MPa	ASTM D638	31.7	13.9	22.6	16.3	17.4
ELONGATION %	ASTM D638	230	345	320	220	230
BRITTLENESS TEMPERATURE °C	ASTM D746	-1	-22	-5	-31	-25
OXYGEN INDEX %	ASTM D2863	29	32	34	37	34

*Suitable for outdoor use

Typical Properties of *BioVinyl®* - General Purpose Molding Applications

Compound Property	Test Method	BV 21001-70A	BV 21002-75A	BV 21003-80A	BV 21004-85A	BV 21005-90A
SHORE HARDNESS Delayed	ASTM D2240	70A	75A	80A	85A	90A
SPECIFIC GRAVITY	ASTM D792	1.39	1.41	1.41	1.42	1.41
TENSILE STRENGTH MPa	ASTM D638	6.3	7.8	9.3	11.3	13.2
ELONGATION %	ASTM D638	238	230	233	230	225
BRITTLENESS TEMPERATURE °C	ASTM D746	-35	-31	-24	-21	-15

Typical Properties of *BioVinyl®* - General Purpose Extrusion Applications

Compound Property	Test Method	BV 21101-70A	BV 21102-75A	BV 21103-80A	BV 21104-85A	BV 21105-90A
SHORE HARDNESS Delayed	ASTM D2240	70A	76A	79A	84A	89A
SPECIFIC GRAVITY	ASTM D792	1.39	1.41	1.41	1.42	1.39
TENSILE STRENGTH MPa	ASTM D638	10.5	12.0	14.0	14.9	20.0
ELONGATION %	ASTM D638	310	285	300	290	260
BRITTLENESS TEMPERATURE °C	ASTM D746	-40	-31	-29	-27	-18

Typical Properties of *BioVinyl®* - Wire & Cable Extrusion Applications *(continued)*

Flexible Cord Insulation	Tray Cable Jacket	Tray Cable Jacket	Fiber Riser Jacket	UVF Fiber Riser Jacket	Cat 5/6 Riser Jacket	Cat 5/6 Riser Jacket
BV 9013A01-90	**BV 9032T01-89**	**BV 9033T01-88**	**BV 9031G01-92**	**BV 9031G01-114 UVF***	**BV 9031D01-101**	**BV 9031D01-114**
105	90	105	75	75	75	75
90A	89A	88A	92A	89C	51D	64D
1.51	1.51	1.50	1.57	1.61	1.60	1.64
15.2	16.1	15.9	14.8	17.2	16.5	19.9
260	205	305	250	190	230	130
-13	-17	-18	-19	-2	-11	-6
32	33	32	48	52	47	49

Vinyl Manufacturing Sites

About Teknor Apex

The Teknor Apex Company, a privately-owned company founded in 1924, is one of the world's leading customer-specific plastic compounders. Teknor Apex produces flexible and rigid vinyl, thermoplastic elastomers, polyamides, specialty compounds, color masterbatches, chemicals and garden hoses.

The company is based in Pawtucket, RI, USA. It operates fourteen production plants worldwide: in the United States, Belgium, Germany, China and Singapore.

Industries Served

BUILDING & CONSTRUCTION

CONSUMER PRODUCTS

ELECTRICAL & ELECTRONICS

INDUSTRIAL

MEDICAL

PACKAGING

TRANSPORTATION

Contact Teknor Apex to begin customizing your solution today.

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