

HI-ZEX MILLION™

HI-ZEX MILLION™ Ultra-High-Molecular-Weight Polyethylene

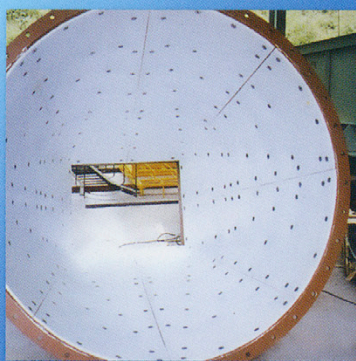


Mitsui Chemicals

High performance supp meets cutting-edge tec

HI-ZEX MILLION™ is Ultra-high Molecular Weight Polyethylene, Mitsui Chemicals originally developed. Because of the excellent properties, HI-ZEX MILLION™ is used in various fields ; an electronic material, industrial material, medical equipment, high performance fiber, separator, and food manufacturing, equipment, etc.

Why HI-ZEX MILLION™?



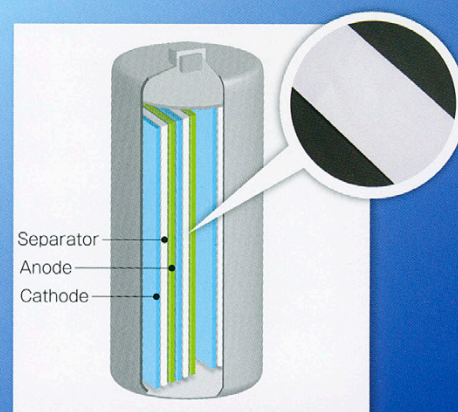
Hopper lining
/ slug



High-strength fiber



Artificial limb Materials

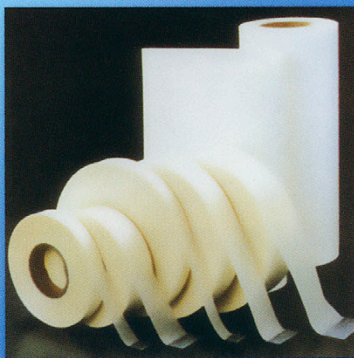


Battery separators

HI-ZEX M

ports your life and hnologies

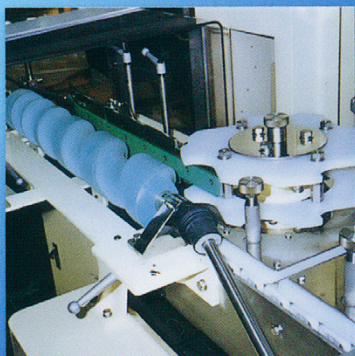
- The average molecular weight ranging from 0.5 million to 6 million.
- Excellent impact strength, abrasion resistance and self lubrication.
- Various grades meet various needs.
- Excellent chemical resistance and high stability against acids and alkalis.



Adhesive wear tapes



Snow Mobile Gear
/ Rails



Screw

MILLION™

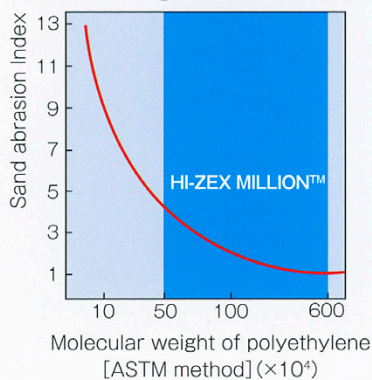
Compare the performance

Characteristics of HI-ZEX MILLION™

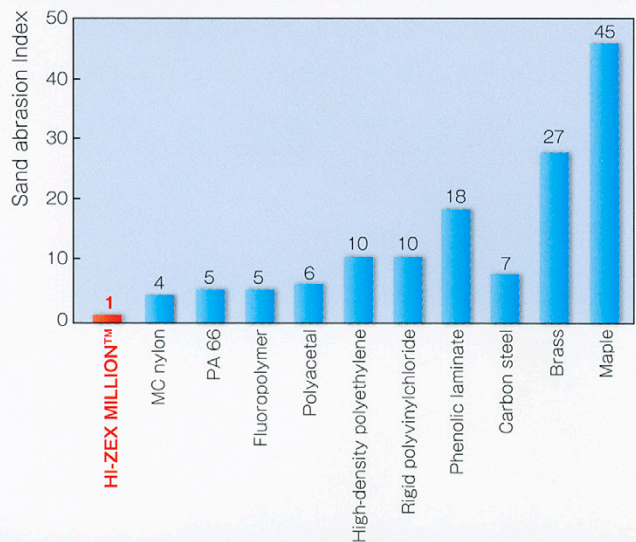
Abrasion resistance | More than ten times as high as that of ordinary high density polyethylene

HI-ZEX MILLION™'s abrasion resistance is higher than that of such metals as carbon steel and brass, and is several to more than ten times as high as that of ordinary high density polyethylene.

Relationship between polyethylene molecular weight and sand abrasion index



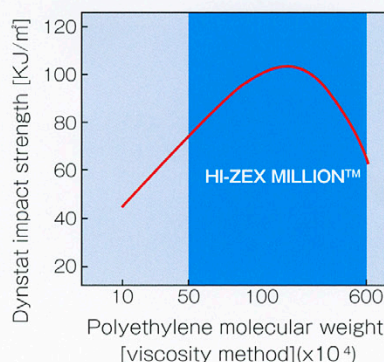
Sand abrasion Index of HI-ZEX MILLION™ Compared with Other materials



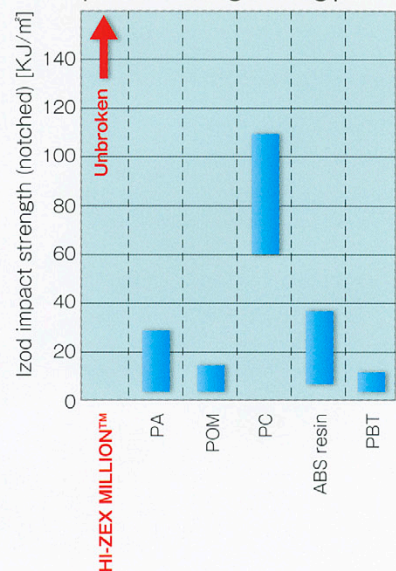
Impact resistance | Strength is maintained in extremely low temperature

The impact strength of polyethylene rises as its molecular weight increases. The impact strength of polyethylene reaches the highest level at the molecular weight of 2,000,000. HI-ZEX MILLION™'s impact resistance is higher than that of other resins and ordinary polyethylene, and it is maintained in extremely low temperature.

Molecular Weight Dependence of Impact Strength



Impact Strength of the HI-ZEX MILLION™ Compared with Engineering plastics



Allow to go to the next stage

Self-lubrication | Seizing will not occur

HI-ZEX MILLION™'s low coefficient of friction allows un-lubricated sliding of parts in contact with metal surfaces without frictional seizing. Furthermore, because of its hydrophobic nature, any water-containing slurry of metals will not deposit on HI-ZEX MILLION™.

Resin	Kinetic Friction (μ)	Threshold PV Value (MPa·m/s)
HI-ZEX MILLION™	0.10 ~ 0.22	0.29
Fluoropolymers	0.04 ~ 0.25	>0.5
Polyamide 66	0.15 ~ 0.40	0.1
Polyacetal	0.15 ~ 0.35	0.15

Chemical Resistance | Stable against acids, alkalis and organic solvents

HI-ZEX MILLION™ demonstrates excellent chemical resistance. This is due to its high crystallinity with no functional group and practically no side-chain, and the double bond in its molecular structure. Hence, it is highly stable in acid, alkali, and organic solvents (other than concentrated acid, concentrated hydrochloric acid, halogenated hydrocarbons, and aromatic hydrocarbons).

Low water absorption | Very little moisture absorption

There is no need for preliminary drying.

Lightweight properties | The weight of the product can be decreased

HI-ZEX MILLION™'s density of 0.935g/cm³, is one of the lowest in weight among engineering resins, a characteristic required for weight-reduction of molded parts.

Hygienic safety in food-contact uses | Conforming to the regulations in each country

HI-ZEX MILLION™ conforms to FDA specifications (Code of Federal Regulation, Title 21, Section 177, 1520 (c)2.2) and is safe for use in food-contact applications. HI-ZEX MILLION™ is also registered with the Polyolefins Hygienic Safety Association (PL) in Japan as a substance that meets the requirements set forth by the Association, and conforms to the specifications of hygienic safety-testing standards for plastic containers and packaging (1982 Notice of the Ministry of Health and Welfare).

Typical Applications

Application Areas	Typical Applications	Abrasion Resistance	Impact Strength	Self-Lubrication	Chemical Resistance	Advantages
Lining	Hoppers and silos for salt, sugar, fertilizer, etc.	○	○	○		Elimination of bridging
Food industry	Worm screws, guide rails, rolls, bottle conveyor guides, capping machine levers, etc.	○	○	○	○	Prevention of flawing and scratching bottles and cans, reduction of power consumption
Paper-marking machinery	Suction box covers, nozzles, gears, metallic parts, cocks, doctor knife, etc.	○		○	○	Prevention of paper from getting stuck, noise abatement
Construction and agricultural industries	Lining of trencher buckets, parts for snowplows, etc.	○	○	○		Prevention of sand and snow from sticking to buckets and snowplows
Chemical industry	Valves, gaskets, packings, etc.	○			○	
Textile industry	Pickers, metallic parts, connectors, etc.	○	○	○		Noise abatement, etc.
General machinery	Gears, stern tubes, rollers, etc.	○	○	○	○	Noise abatement, etc.
Sports & leisure goods	Snowmobile parts, go-cart parts, ski linings, kneepads, etc.	○	○	○	○	
Others	Artificial limbs, prostheses, medical equipment parts, neutron shielding material, battery separators, high-strength fiber, tubes, sheets, films, etc.	○	○	○	○	

Various Grades to Various Needs

Grade line up of HI-ZEX MILLION™

Available Grades of HI-ZEX MILLION™

Test Item	Unit	Test Method	Grade						
			030S	145M	240S	240M	320MU	340M	630M
Average molecular weight (Solution viscosity method)	x10 ⁴	MPC Method	50	115	200	240	320	340	590
Density	kg/m ³	ASTM D1505	950	940	940	935	935	935	930
Average particle size	μm	MPC Method	130	150	120	160	150	155	155
Bulk specific gravity		ASTM D1895	520	490	475	435	420	460	430
Dynstat impact	kJ/m ²	MPC Method	74	107	112	85	80	76	62
Kinetic coefficient of friction	—	MPC Method	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sand abrasion wear	mg	MPC Method	18	6	6	10	3	3	3

※Note: Figures shows here are typical values, not guaranteed specifications.

Physical Properties of HI-ZEX MILLION™ vs. Engineering polymers

Property	Unit	Test Method	HI-ZEX MILLION™		Other Engineering Resins				
			340M	630M	PA66	PC	POM (Homopolymer)	PTFE	
Physical Properties	Density	kg/m ³	ASTM D 1505	935	930	1100	1200	1400	2200
Mechanical Properties	Tensile strength at break	MPa	ASTM D 638	41	39	78	60	69	27~34
	Elongation at break	%	ASTM D 638	350	260	90~110	140	50	200~400
	Initial flexural modulus	MPa	ASTM D 790	590	390	2850	2260	2850	490
	Izod impact strength (with notch)	kJ/m ²	ASTM D 256	80	55	5	88	7~13	16
	Rockwell hardness	R scale	ASTM D 785	40	40	119	77	120	50~65
	Kinetic coefficient of friction(SUS304, 6S)	—	ASTM D 1894	0.2	0.2	0.4	—	0.4	0.2
Wearing Properties	Taber abrasion	mm ³	ASTM D 1044	<10	<10	175	280	210	250
	Sand abrasion(1600rpm, 3h)	mg	MPC Method	3	3	50	—	70	95
Thermal Properties	Melting point	°C	ASTM D3418	136	136	255	240	166	—
	Heat distortion temp. (0.45MPa)	°C	ASTM D 648	75	75	220	145	170	121
	Linear expansion coefficient	x10 ⁻⁴ /K	ASTM D 696	1.5	1.5	0.8~1.0	0.7	1.0	1.0
	Thermal conductivity	W/(m·k)	ASTM C 177	0.4	0.4	0.24	0.21	0.23	0.25
Electrical Properties	Volume resistivity	Ω·m	ASTM D 257	10 ¹⁵⁻¹⁶	10 ¹⁵⁻¹⁶	10 ¹⁵	10 ¹⁶	10 ¹⁵	>10 ¹⁶
	Dielectric breakdown voltage	kV/mm	ASTM D 149	50	50	18	30	20	30~35
	Dielectric constant	—	ASTM D 150	2.3	2.3	3.3	2.95	3.7	>2.1
	Dielectric loss tangent	x10 ⁻⁴	ASTM D 150	2~3	2~3	200	90	50	<1
Other Properties	Water absorption(23°C Surface tension, 24h)	%	ASTM D 570	<0.01	<0.01	1.2	0.20	0.25	<0.02

※Note: Figures shows here are typical values, not guaranteed specifications.

Molding Process

Normal plastic molding process can not be applied to HI-ZEX MILLION™

Press Molding

The press comprising male and female molds must have a depth more than 2.5 times the thickness of the parts to be molded because HI-ZEX MILLION™'s bulk specific gravity is as low as 0.45.

Extrusion Molding

HI-ZEX MILLION™ can be molded with Ram-Extruder. It can be extruded under certain selected conditions, using uniaxial extruder.

High Strength Fibers / Separators

HI-ZEX MILLION™'s high chemical resistance allow to use in high strength fiber and separators.

Family Products of HI-ZEX MILLION™

LUBMER™

A Special Polyolefin Resin with Superb Sliding Properties

Properties

Sliding properties, Self-lubrication / Abrasion resistance, Chemical resistance, Food Safety, Noiseless properties, Insulation properties

Applications

- Seat belt through anchors
- Weather strip
- Facsimile equipment parts
- Curtain-rail rings
- Keyboard plungers
- Gears

MIPELON™

Fine-Particle Ultra-high Molecular Weight Polyethylene Powder

Properties

Lubrication, Abrasion Resistance, Impact strength, Chemical resistance

Applications

- Resin and rubber modifiers
- Filters
- Self-lubricating parts
- Coatings
- Greases, lubricants, ink, pigments, and cosmetics

HI-ZEX MILLION™

The information contained in this brochure is, to the best of our knowledge, accurate and reliable, but all suggestions are made without warranty, either express or implied.

The values relevant to properties or the like of the product stated herein were obtained using laboratory test specimens prepared in Mitsui Chemicals, Inc. laboratories and are not to be used as product specifications, nor assumed to be identical to values obtained on the finished product manufactured by our customers.

Nothing herein shall be construed as permission or as recommendation for uses which infringe valid patents or as extending a license under valid patents.

Because the conditions and methods of use on the part of our customers are beyond our control, Mitsui Chemicals, Inc. disclaims any liability incurred in connection with the use of our products.



Head Office	Functional Polymeric Materials Business Sector / Performance Polymers Div. Shiodome City Center, 5-2, Higashi-Shimbashi 1-chome, Minato-ku, Tokyo 105-7117 TEL:+81-3-6253-3695 FAX:+81-3-6253-4220 http://jp.mitsuichem.com/
MITSUI CHEMICALS AMERICA, INC.	800 Westchester Avenue, Suite 607 Rye Brook, NY 10573, U.S.A. TEL:+1-914-253-0777 FAX:+1-914-253-0790 http://www.mitsuichemicals.com/
MITSUI CHEMICALS DO BRASIL COMÉRCIO LTDA	Rua Leoncio de Carvalho, 234-3º andar-Cjs. 31/32 CEP 04003-010-Paraiso-Sao Paulo-SP-Brasil TEL:+55-11-3266-5877 FAX:+55-11-3266-5909 http://www.mitsuichemicalsbrasil.com/
MITSUI CHEMICALS EUROPE GmbH	Oststrasse 10, 40211 Dusseldorf, GERMANY TEL:+49-211-173320 FAX:+49-211-323486 http://eu.mitsuichem.com/
TAIWAN MITSUI CHEMICALS, INC.	7F-2, No.4, Sec. 1, Jhongsiao W. Rd.,Taipei 10041,Taiwan,R.O.C. TEL:+886-2-2361-7887 FAX:+886-2-2361-6776
MITSUI CHEMICALS (SHANGHAI) CO., LTD.	Room 2309, Bank of China Tower 200 Yin Cheng Road Central, Pudong New Area, Shanghai 200120, CHINA TEL:+86-21-5888-6336 FAX:+86-21-5888-6337 http://cn.mitsuichem.com/
MITSUI CHEMICALS ASIA PACIFIC, LTD.	3 HarbourFront Place #10-01 HarbourFront Tower 2 Singapore 099254, SINGAPORE TEL:+65-6534-2611 FAX:+65-6535-5161 http://ap.mitsuichem.com/
MITSUI CHEMICALS INDIA, PVT. LTD.	Flat No. 301, 3rd Floor, D-2, Saket District Centre, Saket, New Delhi-110017 INDIA TEL:+91-11-4054-8823 FAX:+91-11-4054-8828