I'M GREEN™ POLYETHYLENE

INNOVATION AND DIFFERENTIATION FOR YOUR PRODUCT

Braskem

be **green**
and be **innovative**

™

I'm green™ Polyethylene:

biopolymer that offers versatility and a favorable carbon footprint

By using Green Polyethylene, Braskem's partners can offer unique products made from renewable resources that make a significant contribution to reducing the level of greenhouse gas emissions throughout the chain. Green Polyethylene is a renewable alternative to polyethylene, a thermoplastic resin largely used for packaging in consumer goods industries, such as food and beverage, cleaning and personal care products, as well as toys and plastic bags. At the end of its lifespan, Green Polyethylene can be recycled in the same chains already developed for conventional polyethylene.

The I'm green seal can be applied to finished packaging and products that have Green Polyethylene in their composition.

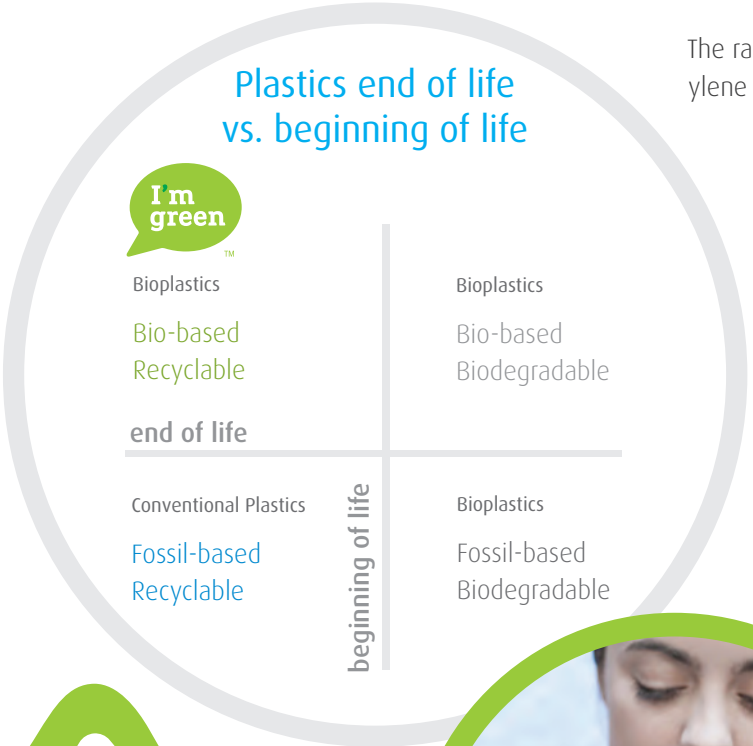
Different source, same properties

Green Polyethylene is a drop-in biopolymer. Substituting conventional polyethylene with Green Polyethylene does not require investments in new plastics manufacturing machinery.

The Green Polyethylene portfolio features approximately 30 grades in the HDPE, LLDPE and LDPE families that cover a wide range of applications. The material's renewable content varies from 80% to 100%, depending on specific grades and its constitution. It is verified based on the standard ASTMD6866.

There are a number of recognized certifiers in Europe, the USA and Asia that offer labels for the renewable content of a material or products based on ASTMD6866.

The raw material used to make Braskem's Green Polyethylene is sugarcane ethanol.



be **green** and be **recyclable**

Life Cycle Analysis

To address the challenges of today's modern world and society's growing demands for more sustainable solutions, "Life Cycle Thinking" is one of the major challenges faced by industries and governments when designing their products and proposing new regulations.

To learn more about the impacts associated with the production of Green Polyethylene, Braskem conducted Life Cycle Analysis, Water Footprint and Land Use studies of the product. These studies were concluded in December 2013, with the effort drawing on the participation of specialists in the sugarcane industry, ethanol suppliers and specialized consulting firms.

The LCA was conducted in accordance with the standard ISO 14040 and a panel of specialists was charged with reviewing the work. Six categories of impacts were covered representing the entire process, from the cultivation of sugarcane to the product's arrival at Braskem's factory gate: Global warming potential, Fossil energy demand, Ozone layer depletion, Eutrophication, Acidification, Photochemical ozone potential.The data used was in large part obtained from primary sources in the production processes of both Braskem and ethanol suppliers.

To gain a better understanding of the differences in the impacts between fossil-based and bio-based plastics, the results of conventional polyethylene and Green Polyethylene were compared for all six categories.

Responsibility in the chain

Braskem's relationship with the ethanol supply chain is based on the Supplier Code of Conduct, which was drafted in 2010 with the support of ProForest, a sustainability management consulting firm with expertise in natural resources.

The social and environmental practices established in the code aim seek continuous improvement in sugarcane

and ethanol production and, most importantly, respect for Brazilian laws and regulations. For this, the code drew on the models of good practices described in the UN Global Compact, the São Paulo State Agricultural and Environmental Protocol, Brazil's Sugarcane Agroecological Zoning and the National Commitment to Improve Labor Conditions for Sugarcane Workers.

Braskem conducts regular audits of its suppliers to ensure compliance with the practices outlined in the code of conduct and works jointly with them to draft action plans to correct any gaps.

Brazil's sugarcane industry

Brazil is the world's largest sugarcane producer and second-largest ethanol producer.

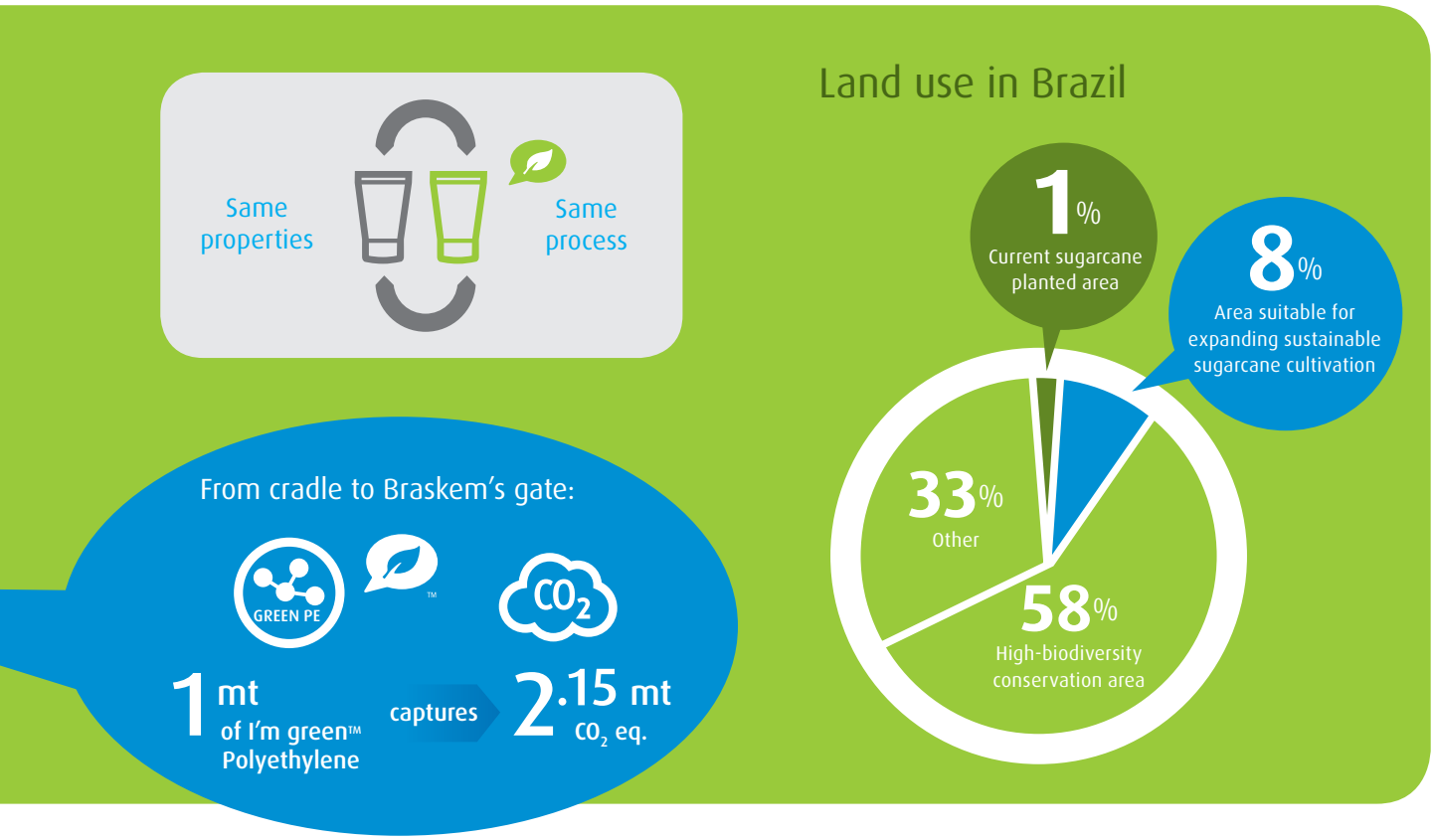
Approximately 50% of the sugarcane produced is used to make sugar, with Brazil a leading player in world sugar trade, with the remaining 50% used to make ethanol. The sugarcane industry also makes an important contribution to Brazil's energy matrix: 16% of the energy consumed in Brazil comes from renewable resources derived from sugarcane, both from the use of bagasse as a fuel for sugar mills and for electricity generation exported to Brazilian grid and from ethanol used mostly as fuel for vehicles.

Land use in Brazil

Ninety percent of Brazil's sugarcane cultivation is concentrated in the country's Center-South region. The expansion in sugarcane planted area is regulated by the Sugarcane Agroecological Zoning Policy, which is a regulatory framework implemented by the federal government in 2009 that prohibits the expansion of sugarcane cultivation into high-biodiversity areas, such as the Amazon Rainforest and the Pantanal Wetlands. Sugarcane cultivation currently occupies 8 million hectares of Brazil's land mass and there are still 65 million hectares identified as suitable for this activity. Brazil currently has 358 hectares of arable land available for agricultural activities.

The Sugarcane Agroecological Zoning Policy identifies the best use of the areas available for agriculture in Brazil and for sustainable expansion, which puts into context any aspects related to food security and use of water.

Genetically modified (GMO) sugarcane is currently not commercially cultivated in Brazil.



be **green**
and be **versatile**

BI-CO N

technical films

MULTI-LAYER

T-s

heavy-du

Product portfolio

The broad product portfolio enables Green Polyethylene to be used in rigid and flexible applications that are already well consolidated in the market as well as in growth applications.

Braskem's technical teams provide support for the development of new products and ensure shorter approval times for Clients and the achievement of high renewable-content levels in final products.

The technical information on the grades that meet the needs of Blow Film and Cast Film Extrusion, Fiber Extrusion, Injection Molding, Blow Molding and Tubing processes can be found in this catalogue.

See some of the segments that are produced using I'm green™ Polyethylene:

be **green**
and be a Braskem **partner**

Braskem is a world leader in terms of biopolymer production capacity through its Green Polyethylene, which it has marketed since 2010.

Around the world, Braskem has a dedicated team to serve, provide technical assistance and build solid relationships with its Clients.

I'm green seal: transparent communication and guarantee of origin

The I'm green seal can be applied to finished products that use Green Polyethylene in their composition.

The seal can be used by Clients at their discretion. However its use must be accompanied by communication of the renewable content of the product or packaging verified based on C14 analysis in accordance with standard ASTMD6866.

Braskem is the largest producer of thermoplastic resins in the Americas

With 36 industrial plants in Brazil, the United States and Germany, the company produces over 35 billion pounds of thermoplastic resins and other petrochemicals per year. Braskem is the world's leading biopolymers producer, with annual production capacity of 200 kton of polyethylene made from sugarcane ethanol.

Pillars of sustainable development

- More sustainable resources and operations
- More sustainable product portfolio
- Solutions for a more sustainable life

Braskem in numbers

Base year 2013

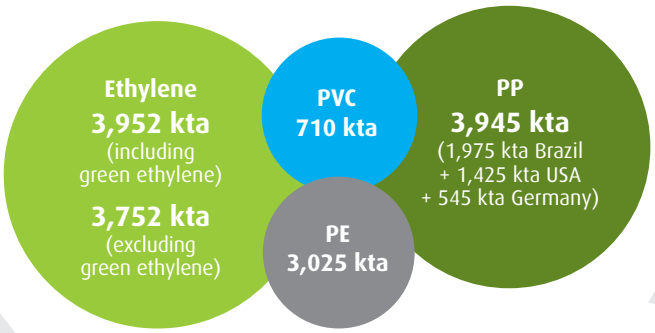
8 pilot plants

36 industrial plants

US$ **8.1** billion in export sales

16 Over million tons/year in resin and petrochemical production capacity

Capacity of main products



650 patents filed in Brazil and abroad

Exports to more than 70 countries

US$ **92** million invested in innovation

Braskem is a component of the Dow Jones Sustainability Index Emerging Markets, the Carbon Efficient Index (ICo2) and the Corporate Sustainability Index of the BM&FBovespa – Securities, Commodities and Futures Exchange. Braskem is a member of the United Nations' platform for more sustainable industries and its sustainability annual report is rated level A+. Fast Company ranks Braskem among its world's top 50 most innovative companies for using renewable sources to take the oil out of plastic.

Braskem

One of the most innovative companies in the world

FAST COMPANY THE WORLD'S 50 MOST INNOVATIVE COMPANIES 2014

Green PE

Braskem

Injection Molding

Typical Properties		Melt Flow Rate (190°C / 2.16 kg)	Melt Flow Rate (190°C / 21.6 Kg)	Density	Tensile Strength at Yield [a]	Tensile Strength at Break [a]	Flexural Modulus (1% secant) [a]	Shore D Hardness [a]	Notched Izod Impact Strength [a]	Environmental Stress cracking resistance (10% Igepal) [a,b]	Environmental Stress cracking resistance (100% Igepal) [a,b]	Vicat Softening Temperature [a]	Deflection Temperature Under load (0.45MPa) [a]	Minimum bio-based content
ASTM Methods		D 1238	D 1238	D 1505/D 792	D 638	D 638	D 790	D 2240	D 256	D 1693	D 1693	D 1525	D 648	D 6866
Unit		g/10 min	g/10 min	g/cm³	MPa	MPa	MPa	-	J/m	h/F50	h/F50	°C	°C	%
HDPE	SHA7260	20	-	0.955	29	-	1,350	64	25	-	<4	124	74	94
		Pails & basins, Caps & Closures, Toys, Lids, Thin-walled parts and Housewares.												
	SHC7260	7.2	-	0.959	30	-	1,350	64	35	-	<4	126	76	94
		Industrial containers, Safety Helmets, Toilet seats, Housewares, Toys, Lids, Caps & Closures, Pallets and Boxes for beverages bottles.												
	SHC7260LSL	7.2	-	0.959	30	-	1,350	64	35	-	<4	126	76	94
		Industrial containers, Safety Helmets, Toilet seats, Housewares, Toys, Lids, Caps & Closures, Pallets and Boxes for beverages bottles.												
	SHD7255LSL	4.5	-	0.954	27	-	1,270	63	45	-	<5	127	74	94
		Bins; Boxes for fish and groceries; Boxes for general purpose.												
	SGE7252	2.0	85.0	0.952	26	14	1,200	55	50	40	-	125	72	96
		Caps and closures for beverages.												
	SGE7252XP	2.0	85.0	0.952	26	14	1,200	55	50	-	-	125	72	94
		Caps and closures for high carbonated beverages.												
LDPE	SPB208	22	-	0.923	10	6	700	42	-	-	-	87	-	95
		Masterbatches. Injection of large flat area parts.												
	SPB608	30	-	0.915	8	8	450	39	-	-	-	79	-	95
		Masterbatches. Injection of large flat area parts.												

Blow Molding and Tubing

Typical Properties		Melt Flow Rate (190°C / 2.16 kg)	Melt Flow Rate (190°C / 21.6 Kg)	Density	Tensile Strength at Yield [a]	Tensile Strength at Break [a]	Flexural Modulus (1% secant) [a]	Shore D Hardness [a]	Notched Izod Impact Strength [a]	Environmental Stress cracking resistance (10% Igepal) [a,b]	Environmental Stress cracking resistance (100% Igepal) [a,b]	Vicat Softening Temperature [a]	Deflection Temperature Under load [a] (0.45MPa) [a]	Minimum bio-based content
ASTM Methods		D 1238	D 1238	D 1505/D 792	D 638	D 638	D 790	D 2240	D 256	D 1693	D 1693	D 1525	D 648	D 6866
Unit		g/10 min	g/10 min	g/cm³	MPa	MPa	MPa	-	J/m	h/F50	h/F50	°C	°C	%
HDPE	SGF4950	0.34	28	0.956	30	30	1,350	63	150	40	70	129	75	96
		Bottles for household cleaning products and health and care products; Bottles for food products; Bottles for food products; Rigid containers for cosmetics and pharmaceutical applications (complies with USP 33).												
	SGF4950HS*	0.21	20	0.951	-	35	1,100	-	175	150	1,000	-	70	95
		Canisters from 2 to 20L for chemical products; Flasks for concentrated detergent; Reservoir for wind shield wiper and air ducts.												
	SGF4960	0.34	28	0.961	30	35	1,400	64	225	-	25	129	79	96
		Bottles for household cleaning products and health and care products; Bottles for food products; Bottles for food products; Rigid containers for cosmetics and pharmaceutical applications (complies with USP 33).												
	SGD4960	0.70	50	0.961	32	22	1,600	64	89	19	24	128	79	96
		Bottles for food applications such as dairy products and beverages; Containers for non-food applications such as alcohol, cosmetics and lubricant oils.												

Fiber extrusion

Typical Properties		Melt Flow Rate (190°C / 2.16 kg)	Melt Flow Rate (190°C / 21.6 Kg)	Density	Tensile Strength at Yield [a]	Tensile Strength at Break [a]	Flexural Modulus (1% secant) [a]	Shore D Hardness [a]	Notched Izod Impact Strength [a]	Environmental Stress cracking resistance (10% Igepal) [a,b]	Environmental Stress cracking resistance (100% Igepal) [a,b]	Vicat Softening Temperature [a]	Deflection Temperature Under load (0.45MPa) [a]	Minimum bio-based content
ASTM Methods		D 1238	D 1238	D 1505/D 792	D 638	D 638	D 790	D 2240	D 256	D 1693	D 1693	D 1525	D 648	D 6866
Units		g/10 min	g/10 min	g/cm³	MPa	MPa	MPa	-	J/m	h/F50	h/F50	°C	°C	%
HDPE	SHA7260	20	-	0.955	29	-	1,350	64	25	-	<4	124	74	94
		Bi-co nonwoven, fibers in general.												
	SHE150	1.0	-	0.948	28	40	1,280	62	-	-	-	128	76	94
		Raschel; Shading and protecting nets; Ropes.												

a) Test specimens prepared from compression molded sheet, according to ASTM D 4703.
b) Compression molded 2mm notched-plaques, 50°C.
* Developmental grade.

Blow and Cast Film Extrusion

Typical Properties		Melt Flow Rate (190°C / 2.16 kg)	Melt Flow Rate (190°C / 5Kg)	Melt Flow Rate (190°C / 21.6 kg)	Density	Film Thickness	Tensile Strength at break (MD/TD)	Elongation at break (MD/TD)	Tensile Modulus (1% secant) (MD/TD)	Dart Drop impact [a]	Elmendorf tear strength (MD/TD)	Haze	Gloss 60°	Minimum bio-based content	Additives
ASTM Methods		D 1238	D 1238	D 1238	D 1505/D 792		D 882	D 882	D 882	D 1709	D 1922	D 1003	D 2457	D 6866	-
Unit		g/10 min	g/10 min	g/10 min	g/cm³	µµ	MPa	%	MPa	g/F50	gF	%	-	%	-
HDPE	SGM9450F	-	0.33	9.3	0.952	12.5	85/45	590/740	750/870	245	58/51	-	-	96	PPA
		Bags in general (T-shirt bags, Handle Bags, Star Bags, others); Geomembrane.													
	SHE150	1.0	-	-	0.948	-	-	-	-	-	-	-	-	94	PPA
		Blend with LLDPE to improve blown film stiffness. Film for cereal liners.													
LLDPE	SLL118	1.0	-	-	0.916	38	50/40	1,130/1,430	180/200	120	-/370	-	-	87	-
		Stretch films; liners; LDPE and HDPE blends and packages for general use. Others applications: blends for irrigation pipes.													
	SLL118/21	1.0	-	-	0.919	38	40/30	1,070/1,340	210/230	130	180/400	-	-	87	AB, S
		Automatic Packaging (FFS); liners; general purpose; HDPE and LDPE blends.													
	SLL5405S	1.0	-	-	0.919	38	40/30	1,070/1,340	210/230	130	180/400	-	-	87	AB, S
		LLDPE and HDPE blends, films with low thickness for general use, bags for waste, special bags for water and protection of clothes.													
	SLL218	2.3	-	-	0.918	38	40/30	1,310/1,560	200/230	100	150/190	-	-	87	-
		Stretch films; liners; LDPE and HDPE blends and packages for general use.													
	SLL218/21	2.0	-	-	0.917	38	30/30	1,140/1,440	200/220	100	140/340	-	-	87	AB, S
		Liners; LDPE and HDPE blends; general use packages; technical films for automatic packaging.													
	SLL318	2.7	-	-	0.918	38	30/30	1,220/1,440	180/200	90	120/340	-	-	87	-
		Stretch films; liners; LDPE and HDPE blends and packages for general use. Others applications: blends for irrigation pipes; insulation for low and medium tension XLPE wire and cable.													
	SLH118	1.0	-	-	0.916	38	40/40	1,080/1,360	200/210	150	300/510	-	-	84	-
		Stretch films; liners; LDPE and HDPE blends and packages for general use. Others applications: blends for irrigation pipes.													
	SLH218	2.3	-	-	0.916	38	40/40	1,170/1,500	210/240	110	240/520	-	-	84	-
		Stretch films; Liners; LDPE and HDPE blends; packages for general use; Others applications: insulation for low and medium tension XLPE wire and cable; blends for irrigation pipes.													
	SLH0820/30AF	0.8	-	-	0.92	25	50/40	950/1,180	170/180	170	270/500	-	-	84	AB, PPA
		Lamination; Heavy-duty bags; Blends with LDPE and HDPE.													
LDPE	SBF0323HC	0.32	-	-	0.923	38	40/30	390/1,040	-	100	-/90	10	72	95	-
		Heavy-duty bags. Agriculture, co-extruded and shrink films.													
	SBF0323/12HC	0.32	-	-	0.923	38	40/30	390/1,040	-	100	-/90	10	72	95	AB, S
		Automatic packaging of solid and liquid products; shrink films for pallets.													
	STN7006	0.6	-	-	0.924	50	25/20	350/700	140/170*	170	310/250	9	86	95	-
		High-clarity films for coextruded food packaging, such as: cheese, meat, sausages, sliced ham, etc. Cast films for table cloth, curtains and laminated tissues. Flexible bottles for solids, liquids or pasties products for hygiene and cleanness.													
	STS7006	0.6	-	-	0.924	50	25/20	350/700	140/170*	170	310/250	9	86	95	AB, S
		High-clarity films for coextruded food packaging, such as: cheese, meat, sausages, sliced ham, etc.													
	SEB853	2.7	-	-	0.923	38	30/20	270/1,040	-	70	-/100	5	113	95	-
		Typical blown film applications include films for diapers and other general purposes as well as LLDPE and HDPE blends.													
	SEB853/72	2.7	-	-	0.923	38	30/20	270/1,040	-	70	-/100	5	112	95	AB, S
		Lamination film; general purpose; automatic packaging of solid products (FFS).													
	SBC818	8.1	-	-	0.918	25	25/20	380/870	-	64	-	8	76	95	-
		Extrusion coating. Injection of general parts and carrier for masterbatches.													
	SBC818R50	8.1	-	-	0.918	25	25/20	380/870	-	64	-	8	76	45	-
		Extrusion coating. Injection of general parts and carrier for masterbatches.													
	SPB681	3.8	-	-	0.922	38	30/20	370/1,070		60	-/100	4	120	95	-
		Blown and Cast Film Extrusion. Injection molding.													
	SPB681/59	3.8	-	-	0.922	38	30/20	340/1,050	-	60	-/100	5	112	95	AB, S
		Films for lamination and general purpose.													

MD = Machine Direction; TD = Transversal Direction. Additives: AB = antiblocking agent, S = slip agent, PPA = polymer processing agent. *Tensile Modulus - 2% secant (MD/TD). For more details, please see product data sheet.


I'm green™
Plastic
>X% Biobased
Verfied by ASTM D6866

may/2014 keenwork

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