ENHANCED LIGHTWEIGHT AND STRENGTH

STAMAX™ RESINS (LONG GLASS FIBER REINFORCED PP) FOR HIGH PERFORMANCE APPLICATIONS WITH POTENTIAL COST SAVINGS

CHEMISTRY THAT MATTERS™

ABOUT SABIC

SABIC is the third largest global diversified chemical company and market leader in the production of polyethylene, polypropylene and other advanced thermoplastics, glycols, methanol and fertilizers. Fostering innovation and a spirit of ingenuity, we have 21 dedicated Technology & Innovation facilities in Saudi Arabia, the USA, the Netherlands, Spain, Japan, India, China and South Korea.

With over 70 years of legacy of pioneering solutions in advanced engineering thermoplastics, and over three decades of experience in polypropylene and compounds, SABIC's PP compound business is positioned to help create new opportunities for our customer's growth and breakthrough applications around the world. We offer our customers our expertise in a variety of ways:

- Material solutions generated from our legacy of creating solutions for your needs
- Application, design, logistics and processing expertise to spark new ideas and improve efficiencies, supported by global sales and supply
- Unwavering commitment to drive performance for our customers, ensuring long-term reliability and building valuable relationships


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sabic

COST & PERFORMANCE BALANCE FOR STRUCTURAL APPLICATIONS

STAMAX™ resins are long glass fiber reinforced polypropylene (LGF PP) compounds offering potential benefits for innovation, production and cost/performance balance.

1 HIGH IMPACT STRENGTH AND STIFFNESS

2 LIGHT WEIGHT

3 HIGH DIMENSIONAL STABILITY AND GOOD PROCESSABILITY

STAMAX™ RESINS (LGF PP)

STAMAX™ resins are long glass fiber reinforced polypropylene (LGF PP) compounds offering outstanding balance of cost and performance for structural applications.

These products provide today's engineers with a unique balance of high stiffness, high thermal stability and performance, including:

- Good flow properties, thin wall and foam processability.
- Potential savings in terms of weight and secondary operations versus metal.
- Potential to reduce the production cost by lowering the molded part weight thus optimizing material cost and cycle times compared to some engineering thermoplastics.
- Potential to eliminate secondary operations such as painting, coating or assembly.

POTENTIAL BENEFITS

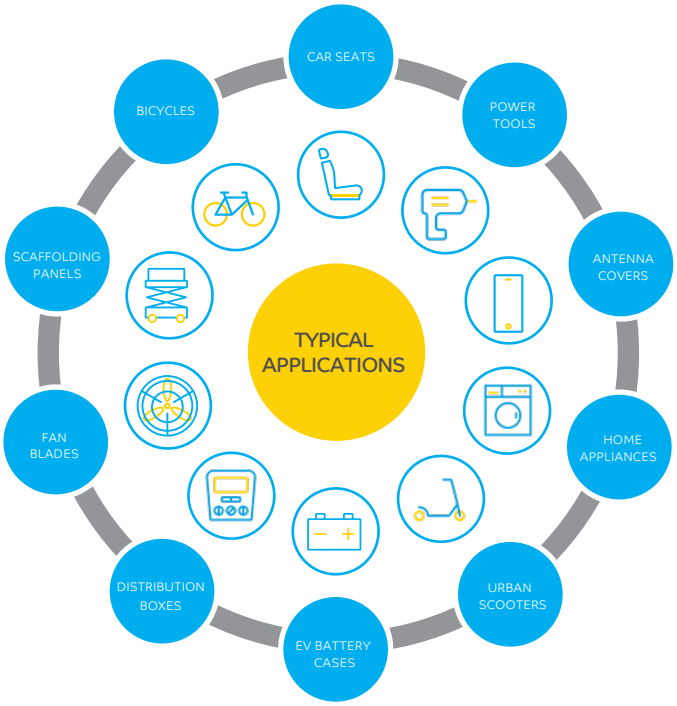
Widely utilized across automotive and other industries, STAMAX™ resins bring significant value to demanding applications requiring performance that are generally beyond the reach of short glass fiber reinforced PP (SGF PP) and other compounds.

These include:

- Higher stiffness and better creep performance compared to SGF PP, especially at elevated temperatures.
- Higher impact performance compared to SGF PP.
- Potential weight and cost savings compared to polyamide (PA) compounds.
- Less sensitivity and better performance in moisture environment compared to PA compounds.
- Recyclability compared to PA compounds.

TYPICAL APPLICATIONS

STAMAX™ resins find use in demanding applications, primarily in the automotive, industrial and recreational markets, and frequently replace die-cast metal.



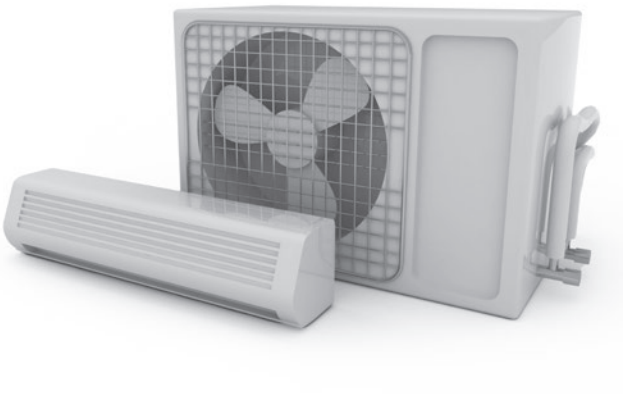
TYPICAL APPLICATION EXAMPLES

ENERGY STORAGE

Halogen-free flame retardant STAMAX™ resin grades have outstanding chemical resistance and fulfill the safety requirements, such as UL and IEC. Flame retardant STAMAX™ solutions can lead up to 50% in potential weight savings versus steel or aluminum, which can help lower overall battery weight for energy storage. Typical application areas include battery cells, structural parts for EV, charging infrastructure and power electronics.

FAN BLADES

Long glass fiber reinforced STAMAX™ resin is a cost efficient solution versus PA compound materials with good mechanical performance.



POWER TOOLS

STAMAX™ resin may offer high stiffness, low creep performance, low thermal expansion and chemical resistance for hand tool housings.

URBAN SCOOTER BODY

Urban scooters require the strength and the stiffness of glass fiber filled STAMAX™ grades may meet these requirements and may offer lightweight.

BABY CAR SEAT

High flow properties of STAMAX™ resin in combination with good impact and stiffness balance in baby car seats may reduce the carrying weight by 50%, while maintaining the high safety standards.

5G NETWORK BASE STATION ANTENNA COVER

30% glass filled STAMAX™ grades may be used to replace metal in antenna covers offering impact resistance at cold temperatures, long term heat- and UV stability, supporting manufacturing processes such as injection molding and extrusion. Next to that our product may offer low melt sagging property for extrusion and high stiffness; supporting design for recyclability.

SCAFFOLDING PANELS & BUILDING PROFILES

STAMAX™ resin is typically used in scaffolding and building applications offering up to 60% weight savings, next to the significant handling advantages compared to traditional solutions such as wood.

SOLAR ROOF PANELS

STAMAX™ resin used for the PV panel back sheet may offer high strength and stiffness, providing light weighting and continuous performance at elevated temperatures for solar panels. SABIC's material also enables that panels be recycled and potentially enable utilizing of post-consumer recycled content.

BUILDING & CONSTRUCTION

STAMAX™ resins are good candidates for structural parts, distribution boxes and stationary energy storage applications that combine lightweight with functional integration, deliver higher impact resistance, stiffness and improved dimensional stability. Corrosion-free and moisture resistant, long glass-fiber reinforced components have been shown to have a significantly longer life than wooden examples, offering a sustainable alternatives because of their favorable lifecycle. These products can commonly be used for scaffolding, frame works decking, fencing, floodwalls, jetties, and solar panel back sheet, among many others. Their lightweight help reduce installation time and costs.

WHY STAMAX™ RESIN
HIGH ADDED VALUE SOLUTION

LESS CREEP OVER TIME
THAN SHORT GLASS FIBER PP

STAMAX™ resin has better creep performance for load carrying parts due to long fiber content of the finished part. The advantage becomes bigger at elevated temperatures such as 80°C.

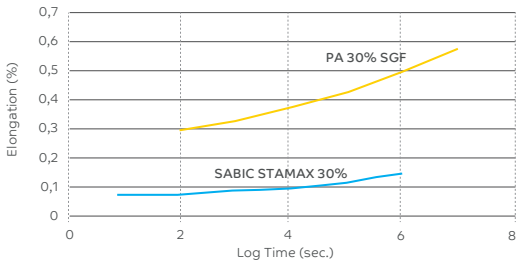


Figure 1:
Graphic is showing creep performance of 30% STAMAX™ resin versus 30% SGF PA material.

LESS PART WARPAGE
THAN SHORT GLASS FIBER PP

STAMAX™ resin's long glass fibers content result in less isotropic fiber alignment and less warpage. SABIC's experience in predictive engineering enables optimum tool design and gate locations to minimize the warpage.

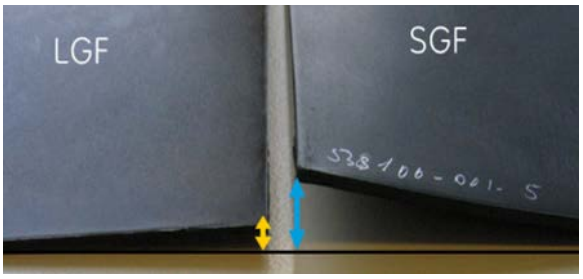


Figure 2:
Picture is showing difference in dimensional stability between injection molded plaques of 30% PP SGF and STAMAX™ resin.

HIGHER STRENGTH
THAN SHORT GLASS FIBER PP

Long glass fiber PP offer improved strength compared to SGF PP and the advantage increases at higher temperatures such as 80°C.

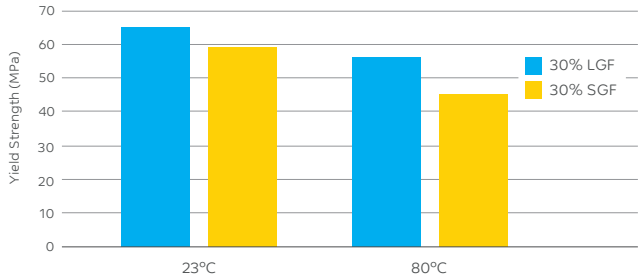


Figure 3:
Graphic is showing difference in yield stress between 30% PP SGF and STAMAX™ resin according to Multiaxial Impact test at 23°C and 80°C.

HIGHER IMPACT RESISTANCE
THAN SHORT GLASS FIBER PP

STAMAX™ resin has superior impact resistance compared to SGF PP based on the falling dart impact test done at 23°C.

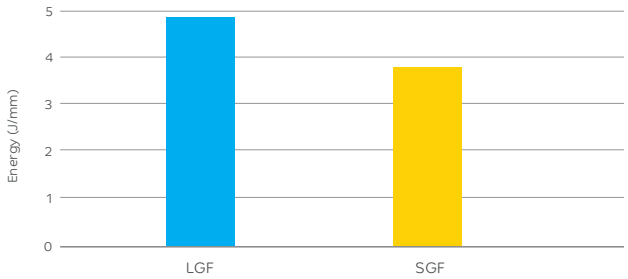


Figure 4:
Graphic is showing difference in impact resistance between 30% PP SGF and STAMAX™ resin according to Multiaxial Impact test at 23°C.

PART AND COST PERFORMANCE OPTIMIZATION

THROUGH SABIC SERVICES & KNOWHOW

With over 20 years of compounding innovation and application development experience, SABIC can offer expertise to its customers with:

- Material and application knowledge
- The application design for the optimal use
- Optimum part and tool design
- The computer aided simulations
- The processing parameters on machines

Extensive guidelines on design and processing for STAMAX™ resin is available on request.

SABIC also may offer an online tool to support its customer's engineering simulation activities. Known as the SABIC Simulation Portal (SSP 2.0), this platform gives designers, engineers and product developers 24/7 access to material engineering data that they need to run in their simulations and computer-aided engineering (CAE) activities. Benefits for customers may include reduced product development time and cost, and improved design optimization.

The data covers the full range of SABIC product portfolio and is validated and managed by SABIC's team of experts. The portal is available at **https://simulate.sabic.com**.

PRODUCT GUIDE

STAMAX™ resin injection molding portfolio is available globally from our production locations in EU, US and PAC regions. The materials are delivered in standard black color.

Additionally, on request we can offer:

- UV stabilized grades to prevent fading and color shift.
- Emission stabilized grades.
- Natural color for color-compounding or additional colors.
- Grades for foaming, extrusion, compressing molding and other processing techniques.

PRODUCT PROPERTY GUIDE

TYPICAL PROPERTY VALUES	UNITS	TEST METHODS	STAMAX™ RESIN GRADES						
			HIGH IMPACT		HIGH STRENGTH			HALOGEN FREE FR	
			20YK270	30YK270	20YM240	30YM240	40YM240	30YH515	30YH530
POLYMER PROPERTIES									
Density	kg/m³	ISO 1183	1040	1120	1040	1120	1220	1270	1235
Glass Fiber Content	%	ISO 3451	20	30	20	30	40	30	30
MECHANICAL PROPERTIES[1]									
Tensile Modulus									
at 23°C	N/mm²	ISO 527/1A	4500	6200	4600	6600	8200	7600	7200
at 80°C	N/mm²	ISO 527/1A	3250	4400	3400	4500	5400	4700	4500
Tensile Strength									
at 23°C	N/mm²	ISO 527/1A	75	100	80	105	110	95	90
at 80°C	N/mm²	ISO 527/1A	45	55	50	60	65	45	40
Tensile Elongation at Break									
at 23°C	%	ISO 527/1A	2,5	2,4	2,5	2,3	2,1	2,0	2,0
Flexural Modulus									
at 23°C	N/mm²	ISO 178	4000	6000	4600	6400	8200	7500	7000
at 80°C	N/mm²	ISO 178	3000	4000	3100	4600	6100	5000	4800
Flexural Strength									
at 23°C	N/mm²	ISO 178	115	150	130	160	180	135	130
at 80°C	N/mm²	ISO 178	60	75	75	95	105	65	60
Charpy Impact Notched									
at 23°C	kJ/m²	ISO 179/1eA	19	28	14	20	26	15	16
at -30°C	kJ/m²	ISO 179/1eA	18	28	15	27	25	14	15
Charpy Impact Unnotched									
at 23°C	kJ/m²	ISO 179/1eU	45	60	40	60	55	45	46
at -30°C	kJ/m²	ISO 179/1eU	55	75	20	40	50	44	45
THERMAL PROPERTIES									
Heat Deflection Temperature									
at 1.80 Mpa (HDT/A)	°C	ISO 75/A	156	158	156	158	158	155	155
Coeff. of Linear Thermal Expansion									
-30°C to 100°C	µm/mK	ASTM D696	50	40	52	44	40	40	42
FLAMABILITY PROPERTIES									
UL94 @1.5MM		UL94V	N/A	N/A	N/A	N/A	N/A	V0	N/A
UL94 @3MM		UL94V	N/A	N/A	N/A	N/A	N/A	V0	V0
CTI	V	IEC 60112	N/A	N/A	N/A	N/A	N/A	600	600
GWFI @1.6MM	°C	IEC 60695-2-12	N/A	N/A	N/A	N/A	N/A	960	960

1] All measurements based on injection molded samples
N/A
not applicable

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