State of California
AIR RESOURCES BOARD

Small Off Road Engine Evaporative Emission System Components

C-U-07-007a
SABIC Innovative Plastics
Innovative Product

WHEREAS, Pursuant to California Health and Safety Code, sections 39600, 39601 and 43013, the California Air Resources Board (ARB) has established a certification process for evaporative emission system components designed to control gasoline emissions from small off-road engines, as described in title 13 California Code of Regulations (13 CCR), section 2767.1;

WHEREAS, Pursuant to California Health and Safety Code, section 43013, ARB has established criteria and test procedures for determining the compliance of evaporative emission system components with the design requirements in 13 CCR, section 2754;

WHEREAS, Pursuant to 13 CCR, section 2767.1, ARB Executive Officer may issue an Executive Order if she determines that the small off-road engine evaporative emission system component conforms to the applicable performance requirements set forth in 13 CCR, section 2754;

WHEREAS, Pursuant to Health and Safety Code, sections 39515 and 39516, ARB Executive Officer issued Executive Order G-05-008 delegating to the Chief of ARB Monitoring and Laboratory Division (MLD) the authority to certify small off-road engine evaporative system components; and

WHEREAS, On September 24, 2007, SABIC Innovative Plastics submitted an application for certification, #007-09-07, attached as Attachment A and incorporated herein, as an innovative product under 13 CCR, section 2767(c) for Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT material injection molded fuel tanks. This application was submitted as an update to the already existing Executive Order C-U-07-007 issued on April 25, 2007. This update has been made to reflect the change in company name from GE Plastics to SABIC Innovative Plastics. All other information within the Executive Order is unchanged.

NOW, THEREFORE, I, William V. Loscutoff, Chief of the MLD, find that the SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT material produced following the process and material specifications set out in Attachment A constitute an innovative fuel tank pursuant to 13 CCR, section 2767(c). Fuel tanks produced following SABIC Innovative Plastics process and material specifications are hereby deemed equivalent to those tanks listed in 13 CCR, section 2752(a)(5). This finding is based on SABIC Innovative Plastics demonstration that such tanks have a permeation rate substantially lower than 1.5 grams per square meter per day set forth in 13 CCR, section 2754 when tested at a constant temperature of 40 °C pursuant to TP-901 using an approved test fuel of California Phase II Certification Fuel.

IT IS ORDERED AND RESOLVED that no tank permeation data is required to be submitted in the certification process for equipment using the SABIC Innovative Plastics Xenoy® 6620U-1001GT or Xenoy® 6620-BK1066GT resin for an injection molded fuel tank.

IT IS ORDERED AND RESOLVED that all fuel tanks made from SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin with minimum average barrier thicknesses equal to or greater than the value listed in Table 1 attached hereto and incorporated

herein, and with minimum barrier thickness at any point 10 percent lower than Table 1 values due to molding tolerances, are certified for use in small off-road equipment.

Table 1
Specifications for SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT Fuel Tanks

Minimum Average Barrier Thickness (mm)
2.5

IT IS FURTHER ORDERED that equipment manufacturers utilizing SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin for fuel tanks shall provide a warranty. The warranty must conform to the requirements of 13 CCR, section 2760.

IT IS FURTHER ORDERED that the certified fuel tank made from SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin shall be installed in accordance with the manufacturer's installation and use instructions. A copy of this Executive Order and fuel tank installation and use instructions shall be provided to manufacturers purchasing SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin for fuel tanks for installation on small off-road engines and equipment introduced into commerce in California.

IT IS FURTHER ORDERED that fuel tanks listed in Table 1 shall be clearly identified by a permanent identification that allows ARB to identify manufacturer's name, executive order number, and model number.

IT IS FURTHER ORDERED that any modification of SABIC Innovative Plastics approved process and material specifications for producing a fuel tank made from Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin hereby are prohibited. Any alteration or modification of the process or material specifications set out in Attachment A of this Executive Order will require the manufacturer to apply for a new Executive Order.

IT IS FURTHER ORDERED that fuel tanks made from SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin shall be compatible with fuels in common use in California at the time of certification and any modifications to comply with future California fuel requirements shall be approved in writing by the Executive Officer or Executive Officer's delegate.

IT IS FURTHER ORDERED that the component certification obtained by testing fuel tanks made from Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin submitted by SABIC Innovative Plastics can be referenced in certification applications for small off-road engines and equipment that use small off-road engines unless the Executive Officer finds that fuel tanks made from SABIC Innovative Plastics Xenoy® 6620U-1001GT and Xenoy® 6620-BK1066GT resin no longer meets the performance requirements set forth in 13 CCR, section 2754 when tested pursuant to 13 CCR, section 2765.

Executed at Sacramento, California, this 12th day of October 2007.

William V. Loscutoff, Chief
Monitoring and Laboratory Division

Overall Material Specification:

Material Manufacturer:	GE Plastics
Material Composition / Description:	A Xenoy 6620U Single Homogeneous layer comprised of Polycarbonate (PC) + Polybutylene Terephthalate (PBT) un-reinforced impact modified thermoplastic alloy
Barrier Material:	N/A
Colors:	Natural (6620U-1001GT) & Black (6620-BK1066GT)

XENOY 6620 Datasheet

PROPERTY	Typical Value in SI Units		Typical Value in British Units		
	6620	Units	6620	Units	Test Method
MECHANICAL					
Tensile Stress, yield, Type I, 50 mm/min	43	MPa	6200	psi	ASTM D 638
Tensile Stress, break, Type I, 50 mm/min	40	MPa	5800	psi	ASTM D 638
Tensile Elongation, yield, Type I, 50 mm/min	4	%	4	%	ASTM D 638
Tensile Elongation, break, Type I, 50 mm/min	188	%	188	%	ASTM D 638
Tensile Modulus, Type I, 50 mm/min	1815	MPa	263000	psi	ASTM D 638
Flexural Modulus, 1.3 mm/min, 50 mm span	1720	MPa	249000	psi	ASTM D 790
Flexural Stress, @ Yield Strain, 1.3 mm/min, 50 mm span	64	MPa	9200	psi	ASTM D 790
IMPACT					
Izod Impact, notched @-20°C	850	J/M	15.9	ft-lb/in	ASTM D 256
Izod Impact, notched @-30°C	840	J/M	15.7	ft-lb/in	ASTM D 256
Instrumented Impact, total energy, -30° C	61	J	540	in-lb	ASTM D 3763
Instrumented Impact, total energy, -40° C	50	J	442	in-lb	ASTM D 3763
THERMAL					
HDT@0.455 MPa, unannealed, 3.2mm	98	°C	208	°F	ASTM D 648
HDT@1.82 MPa, unannealed, 3.2mm	60	°C	140	°F	ASTM D 648
PHYSICAL					
Specific Gravity	1.2	-	1.2	-	ASTM D 792
Melt Volume Rate, 265 °C, 5 kgf	17	cm3/10 min	17	cm3/10 min	ASTM D 1238

PROCESSING PARAMETERS	Typical Value in SI Units		Typical Value in British Units	
Injection Molding	6620	Units	6620	Units
Drying Temperature	105-115	°C	220-240	°F
Drying Time	2-4	hrs	2-4	hrs
Maximum Moisture Content	0.02	%	0.02	%
Melt Temperature	240-260	°C	460-500	°F
Mold Temperature	50-80	°C	120-180	°F
Nozzle Temperature	240-260	°C	460-500	°F

Manufacturing Method:	Injection molding process (a manufacturing technique for making parts from thermoplastic material). In essence, molten plastic is injected at high pressure into the cavity of a closed mold. The mold is made from metal, usually steel or aluminum and precision machined to form the features of the desired component. Within the application of this material, the component consists of two separate injection molded parts; the top half of the tank and the bottom half. The tank is assembled by attaching these two halves via a hot plate welding operation where the interface of the two halves are heated to the melting point of the plastic then pressed together and allowed to cool seamlessly incorporating the two halves.
Recommended Average Minimum Wall Thickness:	2.5 mm
Recommended Minimum Wall Thickness (at any point):	2.25 mm

THIS APPLICATION SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE APPROVAL OF THE APPLICANT
DO NOT REPRODUCE IN BLACK AND WHITE

Limits for Proper Functioning:

• Use moderate-slow screw speeds to keep melt temperature in suggested range. Suggested screw speed: 15 - 50 rpm. Actual rpm should be adjusted for desired output.

• Processing temperature must be measured with a hand-held probe as opposed to an internal-head probe.
• A reverse barrel profile may increase output while maintaining the melt temperature.

THESE PROPERTY VALUES ARE NOT INTENDED FOR SPECIFICATION PURPOSES.

(1) Typical values only. Variations within normal tolerances are possible for various colors. All values are measured after at least 48 hours storage at 23°C/50% relative humidity. All properties, except the melt volume and melt flow rates, are measured on injection molded samples. All samples tested under ISO test standards are prepared according to ISO 294.

(2) Only typical data for selection purposes. Not to be used for part or tool design.
(3) This rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.
(4) Internal measurements according to UL standards.

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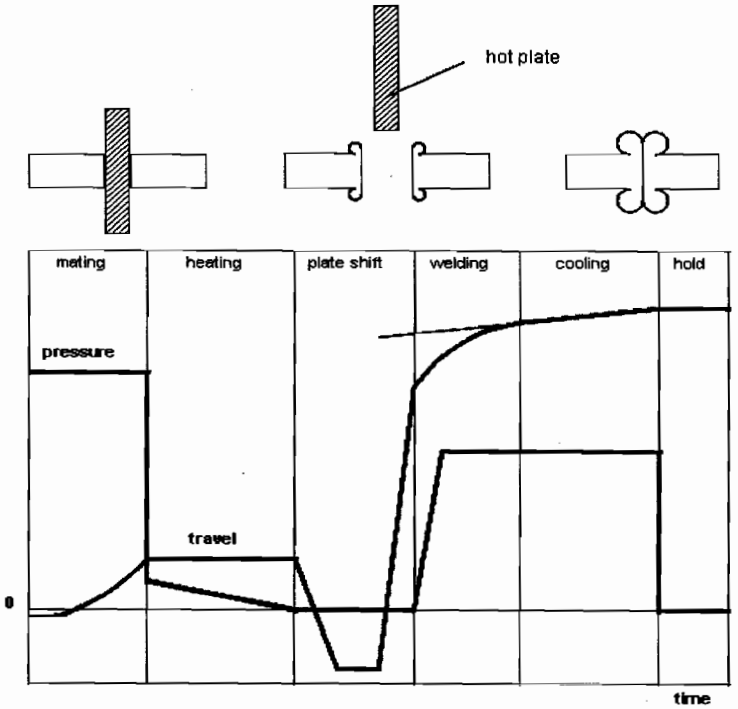
Hot Plate Welding Parameters:

Hot Plate Welding
The Hot Plate welding process offers a robust process for joining thermoplastic parts. Large, irregular surfaces can be welded and provide a strong hermetic seal. It has been used a lot in fuel tank applications.

Hot Plate Welding Xenoy 6620

Typical Key Welding Parameters for Xenoy 6620
- Temperature - 580 - 600F
- Melt Time - 12 - 20 seconds
- Hold Time - 12 -20 seconds

Other Welding Parameters:
- If plates are Teflon coated and can't handle the temperatures, you can change to a non-contact process, by raising the temperatures another 100F.
- Make sure parts are dry before welding.



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Certification Component Specification:

Manufacturer:	GE Plastics
Material Composition / Description:	A Xenoy 6620U Single Homogeneous layer comprised of Polycarbonate (PC) + Polybutylene Terephthalate (PBT) un-reinforced impact modified thermoplastic alloy
Color:	Natural (6620U-1001GT)
Minimum Wall Thickness at a single point:	*2.21-mm*
Maximum Wall Thickness at a single point:	*3.05-mm*
Nominal Wall Thickness:	*2.50-mm*
Barrier Material:	*N/A*
Minimum Barrier Thickness:	*N/A*
Manufacturing Method:	Injection molding process (a manufacturing technique for making parts from thermoplastic material). In essence, molten plastic is injected at high pressure into the cavity of a closed mold. The mold is made from metal, usually steel or aluminum and precision machined to form the features of the desired component. Within the application of this material, the component consists of two separate injection molded parts; the top half of the tank and the bottom half. The tank is assembled by attaching these two halves via a hot plate welding operation where the interface of the two halves are heated to the melting point of the plastic then pressed together and allowed to cool seamlessly incorporating the two halves.
Method to determine Nominal Wall Thickness:	A device called a Magna-Mic (name brand). This device uses a small metal ball (internally) and an external instrument (externally) which can determine the change in the magnetic field between the two which can be correlated to the wall thickness. 300-locations were measured on a sample tank.

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