BLACK HAWK SEALS®

HIGH-PERFORMANCE THERMOSET COMPOSITES SOLUTIONS

Product Performance. Affordability. Availability.

Composites Solutions	Product	Composites Structure
Machinery Application	Guide ring and wear parts	Phenolic resin+Cotton fabric
		Phenolic resin+Cotton fabric+Graphite
		Thermosetting resin+Polyester fabric+Graphite
		Thermosetting resin+Polyester fabric
		Thermosetting resin+Polyester fabric+PTFE
		Thermosetting resin+Polyester fabric+PTFE
		Thermosetting resin+Polyester fabric+PTFE
		Thermosetting resin+Polyester fabric+Self Lubricant
		Thermosetting resin+High temperature polyester fabric+MoS2
	Bearing composites	Resin+Fabric+Self Lubricant
Pneumatic Motor Applications	Rotor vane for air tool	Phenolic resin+Fine weave cotton fabric
		Phenolic resin+Fine weave cotton fabric+Self Lubricant
		Thermosetting resin+Polyester fabric
Vacuum Pump Applications	Rotor vane for vacuum pump	Phenolic resin+Middle weave cotton fabric
		Phenolic resin+Middle weave cotton fabric+Self Lubricant
		Thermosetting resin+Polyester fabric
Electric Power Applications	Composite Laminates	Thermosetting Composites Laminates
Marine Application	Composite spherical bearing	Thermosetting resin+Polyester fabric+Self Lubricant
		Thermosetting resin+Polyester fabric+Self Lubricant
	Typical marine application	Thermosetting resin+Polyester fabric+Self Lubricant
	Match cover pads	Thermosetting resin+Polyester fabric+Self Lubricant
Cryogenic Applications	Special cryogenic insulation	Epoxy resin+Glass fabric
		Epoxy resin+Glass fabric

HIGH-STRENGTH FABRIC-REINFORCED PHENOLIC RESIN

Material Description:

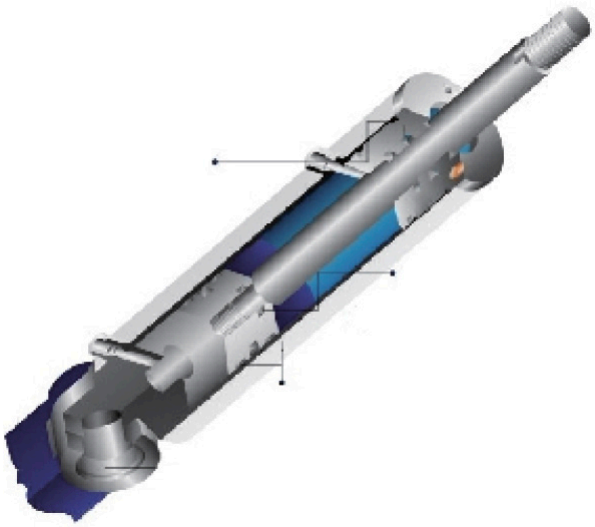
This material is made from high-strength cotton fabric as the reinforcing material, combined with thermosetting phenol resin as the base material.

Product Features:

Easy processing, good wear resistance, excellent dimensional stability, corrosion resistance.

Typical Applications:

- Light hydraulic cylinder guide ring, supporting ring, wear ring
- Bushings and thrust washers for swing bridge support of construction vehicles
- Hydraulic machinery, vertical column, conduit, etc.



TECHNICAL PARAMETERS

Color	Density g/cm^3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Light Yellow to Brown	1.2-1.4	50.5	298	98	108	0.12-0.18	0.05-0.12	-55 to +130

HIGH-STRENGTH FABRIC-REINFORCED PHENOLIC RESIN

Material Description:

This material is high strength cotton fabric as reinforcing material, thermosetting Phenol resin as base material, and adding self-lubricant micro-powder graphite.

Product Features:

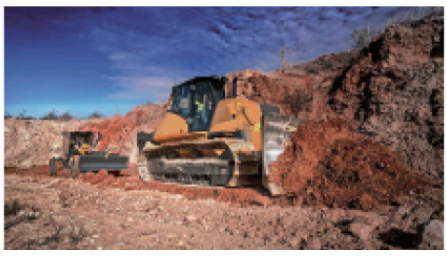
Reduced coefficient of friction and can operate with little or no oil, to meet different customer needs. With high mechanical strength, outstanding high temperature performance, can withstand semi-static strong vibration and light rotating load

Typical Applications:

- Hydraulic cylinder guide ring, support ring
- Forging machine tool pillar guide sleeve, swing bridge bushing, and thrust washer

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Grey	1.2-1.4	107	295	127	103	0.10-0.16	0.03-0.10	-55 to +130



HIGH-STRENGTH FABRIC-REINFORCED PHENOLIC RESIN

Material Description:

This material is high strength polyester fiber as reinforcing material, soluble modified Phenol resin as base material, and adding self-lubricant micro-powder graphite, high strength composite material synthesized by advanced technology.

Product Features:

Excellent friction and wear properties, can be in little or no oil applications. Good corrosion and high temperature resistance. With high mechanical strength, can withstand semi-static strong vibration and light rotating load.

Typical Applications:

- Hydraulic cylinder guide ring, supporting ring, wear ring water conservancy machinery bushing, shaft sleeve food machinery bearings

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Black	1.2-1.4	83	405	120	94	0.10-0.16	0.03-0.10	-55 to +130

HIGH-STRENGTH FABRIC-REINFORCED PHENOLIC RESIN

Support rings and guide rings

Material Description:

This material is high strength polyester fiber as reinforcing material, thermosetting Phenol resin and as base material, under certain temperatures and pressures through advanced technology synthesis of high strength composite material.

Product Features:

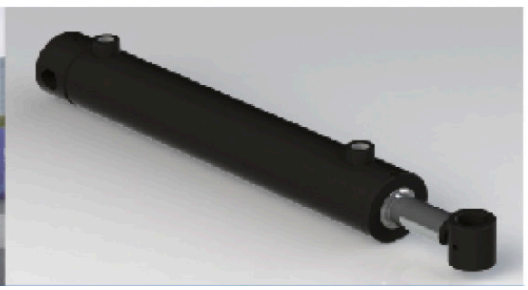
High load-bearing, temperature resistance, wear resistance and good dimensional stability. Flexibility and impact resistance. Easy to install and economic.

Typical Applications:

- Agricultural and construction hydraulic cylinders, sanitation vehicle hydraulic cylinders, automotive tail plates.

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Light Yellow to Brown	1.2-1.4	72.5	350	125	94	0.12-0.18	0.05-0.12	-55 to +130



HIGH-STRENGTH FABRIC-REINFORCED PHENOLIC RESIN

Support rings and guide rings

Material Description:

The material is high strength polymer fiber as reinforcing material, new thermosetting Phenol resin as base material, and adding self-lubricating PTFE, high strength composite material synthesized by advanced technology.

Product Features:

High mechanical strength, both hard and flexibile. Excellent wear resistance and impact resistance, self-lubrication, high load bearing. Little to no water absorption. It can work with little or no oil. Suitable for complex working conditions.

Typical Applications:

- Construction and railway machinery, hydraulic cylinder guide and support rings, chemical processing equipment, excavators, mining transport.

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Light Yellow to Brown	1.2-1.4	62.3	413	131	109	0.12-0.18	0.05-0.12	-55 to +130

SELF-LUBRICATING COMPOSITE MATERIAL

Support rings and guide rings

Material Description:

The material is high strength polymer fiber as reinforcing material, reinforced resin and base material, adding self-lubricant PTFE and high strength composite materials synthesized by advanced technology.

Product Features:

Excellent wear and impact resistance, with good chemical corrosion resistance. Both hardness and toughness with little to no water absorption, self-lubrication, low coefficient of friction, and high load.

Typical Applications:

- Hydraulic cylinder guide ring, support ring, wear ring, joint bearings, bushings, shaft sleeve, wear resistant sheet, construction machinery and hydroelectric power parts, lifting aerial work vehicles, etc.
- Marine engineering equipment spherical bearing and marine bearing materials.

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Blue to Green	1.2-1.4	60	355	115	98	0.12-0.18	0.05-0.12	-55 to +130

SELF-LUBRICATING COMPOSITE MATERIAL

Support rings and guide rings

Material Description:

The material is high strength polymer fiber as reinforcing material, reinforced resin as base material, and adding self-lubricant PTFE, with high strength compositie material synthesized by advanced technology.

Product Features:

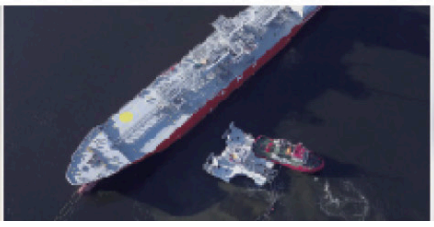
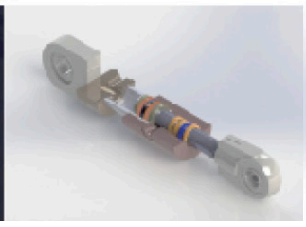
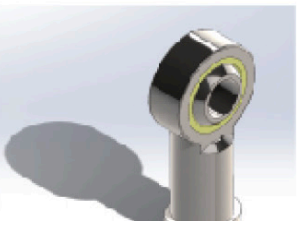
Excellent wear and impact resistance, with good chemical corrosion resistance. Hardness and tough, with little to no water absorption. Self-lubrication, low coefficient of friction and high load.

Typical Applications:

- Hydraulic cylinder guide ring, support ring, wear ring joint bearings, bushings, shaft sleeve, wear resist sheet construction machinery and hydroelectric power parts, lifting aerial work vehicles, etc.
- Marine engineering equipment spherical bearing and marine bearing materials.

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Blue to Green	1.2-1.4	103	551	152	112	0.12-0.18	0.05-0.12	-55 to +130

SELF-LUBRICATING COMPOSITE MATERIAL

Support rings and guide rings

Material Description:

This material is high strength special synthetic fiber as reinforcing material and reinforced polyester resin as a base material, with solid self-lubricant power, high strength composite material that has been synthesized by advanced technology.

Product Features:

Excellent dimensional stability and wear resisteance, excelling in applications requiring little to no oil. Excellent self-lubrication and high load. It has a very low coefficient of friction in dry state to reduce the wobble/creep, and is suitable for long-stroke oil cylinders.

Typical Applications:

- Hydraulic cylinder guide ring, supporting ring, wear ring tunnel construction shield machine water conservancy, hydropower system bearings construction machinery heavy-load hydraulic cylinder.

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
White	1.2-1.4	132.8	408.8	159.6	92	0.12-0.18	0.05-0.12	-55 to +130

HIGH-STRENGTH FABRIC-REINFORCED PHENOLIC RESIN

Support rings and guide rings

Material Description:

This material is high temperature resistant polymer fiber as reinforcing material, high temperature resistant modified Phenol resin as base material, and has self-lubricant MOS2, high strength composite material synthesized by advanced technology.

Product Features:

Compared with other phenolic products (cotton fiber, polyester fiver, etc.), it has excellent compressive properties and high tensile properties. High wear resistance and high load, flame retardant, high temperature stability. Can adapt to all kinds of working conditions requiring complex working environment. (especially suitable for the oil cylinder of medium and large excavators).

Typical Applications:

- Construction machinery hydraulic cylinder guide ring, support ring, wear ring mining, coal machinery equipment support ring ship marring machinery parts.
- Water and wind power equipment parts, heavy hydraulic props.

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Black	1.2-1.4	80	530	130	110	0.10-0.16	0.03-0.10	-55 to +200

COMPOSITES FOR BEARING AND WEAR APPLICATIONS

Material Description:

We manufacture bearing and wear composites, which are made from phenolic or polyester resin, reinforced with polyester fabric, aramid fabric, and self-lubricant. The composites are designed to operate without external lubrication.

Product Features:

100% Bearing material, no fiberglass. No calcium carbonate, no scratching mating surfaces. Self-lubricating, wet or dry running. Chemically resistant, low water swell. High bearing capacity, high impact resistance, good shock resistance.

Typical Applications of Bushings:

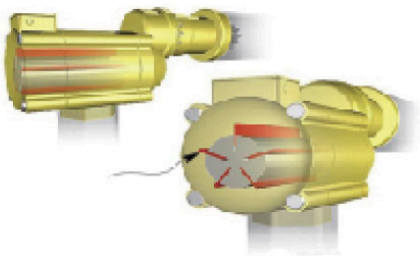
- Constructions machinery, agricultural machinery
- Heavy logistics transport machinery
- Hydraulic power plants, pump bearings, etc.
- Petrochemical industry, railway equipment etc.

Typical Applications of Rails:

- Center pivot liners
- Side bearing liners
- Friction damper bushings
- Hook guide plates

ROTOR VANE FOR AIR TOOL

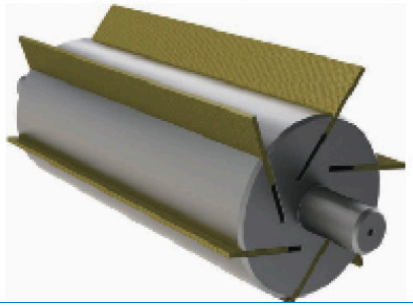
Photo	Introduction
	Made from a cotton fabric and phenolic resin laminate. This material is wear resistant, well bonded, and dimensionally stable under operating conditions. Standard rotor vanes material for an air tool, light duty a air motor, etc.
	Made from phenolic resin cotton fabric bonded with micro self-lubricant powder laminate, This material has good wear resistance and low friction self lubricant that is suitable for industrial grade air tools, air motors, etc.
	Made from a fine synthetic fabric and thermosetting resin laminate. It has excellent impact strength, excellent wear-resistance, extremely low humidity growth, works continuously in the 390°F condition, and when thermal decomposition temperature is above 930°F. This material was designed for highest grade air tools



ROTOR VANE FOR VACUUM PUMP

Photo	Introduction
	It is made from a middle-fine cotton fabric and phenolic resin laminate. It is wear resistant, well bonded, dimensionally stable under operating conditions, has good heat resistance, and is stable in 300°F conditions with intermittent 390°F conditions. Suitable for light duty air motors, vacuum pumps, compressors, etc.
	It is made from a middle fine cotton fabric and phenolic resin bonded with micro self-lubricant powder laminate. This material has good wear resistance, low friction coefficient, self lubricantion, is also with good heat resistance, can work stably in 300°F conditions, and intermittent 390°F conditions. Suitable for industrial air motors, vacuum pumps, compressors, etc.
	It is made from reinforced synthetic fabric and thermosetting resin laminate. It has excellent impact strength, excellent wear-resistance, and extremely low humidity growth, can continuously work in 390°F conditions and when thermal decomposition temperature is above 930°F. Designed for heavy duty applications such as industrial vacuum pumps, milking machine pumps, seage truck pumps, cement plant compressors, etc.

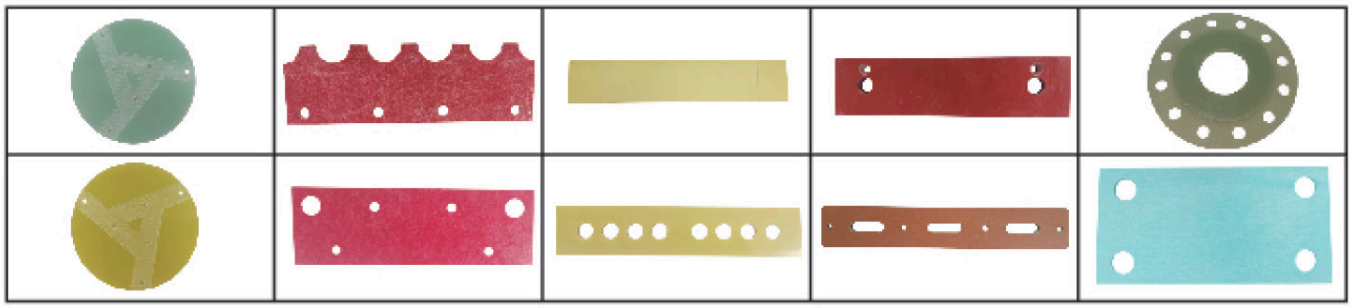
Best vane solution for industrial vacuum pump!



INSULATION PARTS

Equipped with state of the art machining facilities such as vacuum press, CNC, VMC, we can offer services such as sawing, milling, planning, grinding, drilling, tapping, punching, cutting and other machining. Parts used in various types of electrical equipment, such as high voltage frequency converters and transformers.

Tailored Insulation Parts



Composites Laminates

Polyester resin fiberglass laminated sheet
Standard for reference
NEMA:GPO-3
IEC:UPGM203

Epoxy (phenolic) glass cloth laminated sheets
Standard for reference
NEMA:FR4/FR%/G10/G11
IEC: EPGC 201/EPGC 202/EPGC203

Welding Gun Nozzles

This is a glass silicone laminate that offers excellent mechanical, electrical and thermal properties, works continuously under 240°C conditions. Used as high temperature electrical insulation or thermal insulation in critical applications such as arc-welding tips, impeder tubes, plasma-cutting insulators, electric arc furnaces, etc.

SELF-LUBRICATING COMPOSITE MATERIAL

Support rings and guide rings

Material Description:

It is made of composite materials such as phenolic or polyester. Spherical bearings are generally used for low-speed swing motion (angular motion) because the sliding surface is spherical. This material can also handle inclined motions, with the support shaft and shaft shell hole utilizing different degrees, to operate normally.

Product Features:

Little to no electrochemical corrosion with not rust. Large bearing capacity, good impact resistance. Wear resistance and self-aligning with good lubrication. 100% Bearing composite material, non-fiberglass. Harmful materials such as calcium carbonate do not harm the dual surfaces.

Typical Applications:

- Construction machinery
- Hydraulic machinery
- Self-lubricating, maintenance-free equipment
- Bearings for marine platforms
- Automation equipment, etc.

TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Blue to Green	1.2-1.4	60	355	115	98	0.12-0.18	0.05-0.12	-55 to +130
Black	1.2-1.4	60	350	110	96	0.10-0.18	0.04-0.08	-55 to +130

SELF-LUBRICATING COMPOSITE MATERIAL

Material Description:

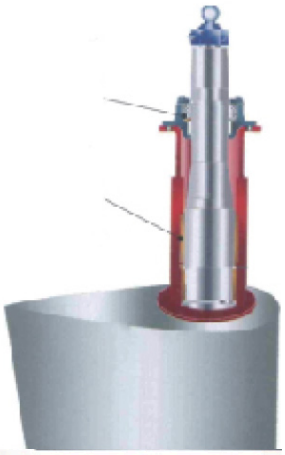
This material is used for water lubricated stern bearing, water lubricated rudder bearing. The material is composed of special synthetic fiber, reinforced polyester resin, solid lubricant and other agents.

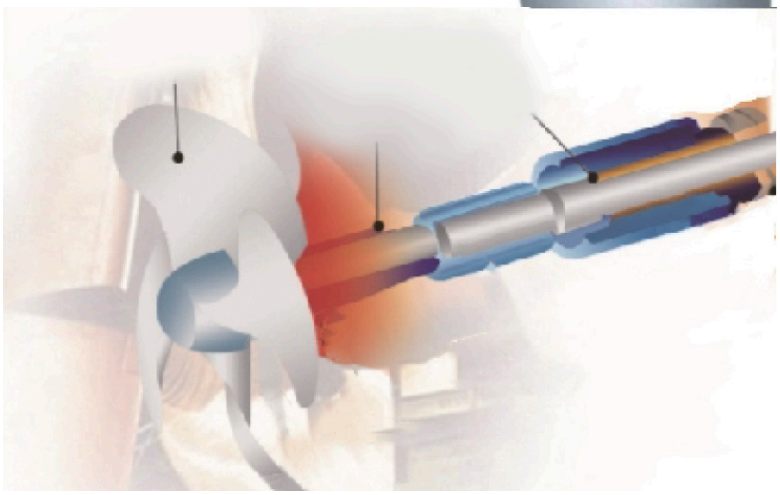
Product Features:

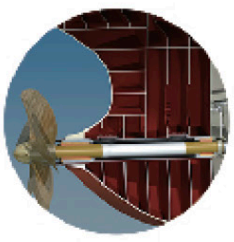
Material wear resistance means long service life. Little water expansion for excellent dimensional stability. Operating using only internal lubrication ensures excellent performance. Proper flexibility can mitigate shock and impact during operation.

Typical Applications:

- Rudder bearing
- Stern tube bearing
- Guide bearing for pump
- Marine propulsion system, swing system, etc.







Typical Marine Application

SELF-LUBRICATING COMPOSITE

Hatch cover pads

Material Description:

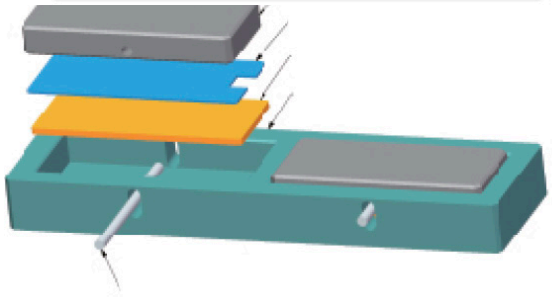
This material is known as hatch resisting pad, this material is made of thermosetting resin and polymer fiber composite.

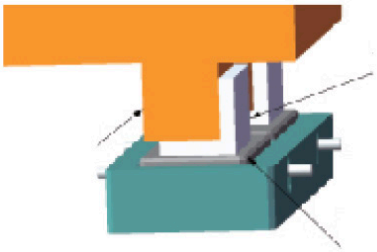
Product Features:

Excellent corrosion resistance, long service life. Light weight, high strength, good electrical insulation and other advantages. Low coefficient of friction, high mechanical properties, good dimensional stability. Long service life.

Typical Applications:

- Deck machinery bearings
- Lath and hatch bearings
- Marine platform bearings
- Container ships and bridge support
- Pump parts, hydraulic power generation parts





TECHNICAL PARAMETERS

Color	Density g/cm3	Tensile Strength MPa	Ultimate Compressive Strength MPa	Bending strength MPa	Rockwell Hardness HRM	Coeficient Friction		Temperature °C
						Dry	Oil	
Black	1.2-1.4	95	421	153	89	0.11-0.20	0.08-0.14	-55 to +200

SPECIAL CRYOGENIC INSULATION COMPOSITE

Material Description:

These composites are impregnated with epoxy resin with glass fiber cloth, which have high mechanical strength, good thermal insulation, and are applicable to air separation equipment, refrigeration equipment, low-temperature tank car, liquid nitrogen tank, liquid helium tank and other cryogenic equipment.

TECHNICAL PARAMETERS

TEST ITEM	UNIT	Option 1		Option 2		Option 3	
		Normal temperature	-196℃	Normal temperature	-196℃	Normal temperature	-196℃
Density	g/cm^3	1.75	/	1.9	/	1.9	/
Compressive Strength (Laminar Direction)	Mpa	201	248	273	486	296	497
Compressive Strength (Vertical Direction)	Mpa	445	484	520	644	543	724
Tensile Strength	Mpa	348	456	438	467	529	556
Impact Strength (Vertical Direction)	J/cm^3	12	17	30	42	38	46
Shear Strength (Laminar Direction)	Mpa	68	100	71	180	85	197
Shear Strength (Vertical Direction)	Mpa	139	146	157	257	169	263
Bending Strength (Vertical Direction)	Mpa	447	512	385	495	427	518

Cryogenic Tubes & Supports

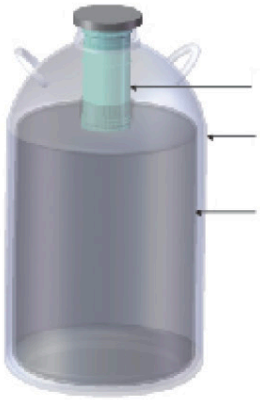
Material Description:

We manufacture special epoxy glass fabric composites for cryogenic applications such as customized neck tubes for liquid nitrogen and liquid helium tanks, bottom tank supports and horizontal tank supports for LNG transportation and storage, etc.

Product Features:

Very low thermal conductivity and very low hygroscoplicity. Very low outgassing rate and very high strength. Has a very low leakage rate under high vacuum conditions. Excellent dimensional stability, no shrinkage.

Composites for cryogenic



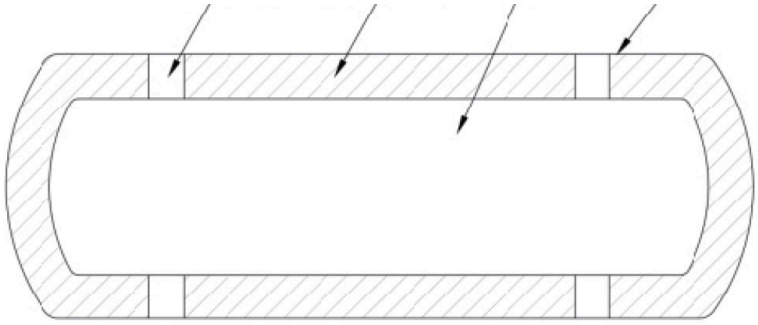
CRYOGENIC INNER TANK SUPPORTS

Material Description:

This material is made of special epoxy and high strength glass fibers, which are compounded at high temperatures. The inner tank supports are widely used in low temperature insulated tank boxes and tank cars, etc.

Product Features:

Our material has super high shear strength, super high heat resistance and super low thermal conductivity and hygroscopicity.



Since 2013, Black Hawk Seals has been creating a better solution for distributors in the fluid power industry. We remain dedicated to providing the latest industrial sealing technology through superior engineering knowledge, innovative technical design, materials and manufacturing expertise.

Our mission is to be competitively superior in all we do.

3702 Vanguard Drive | Fort Wayne, IN 46809 | USA | (260) 436-5628 | service@PSPseals.com | PSPseals.com