



thyssenkrupp Engineered Plastics

DuPont™ Authorized Distributor



DuPont™ Vespel® Parts and Shapes: Sealing Solutions

Properties

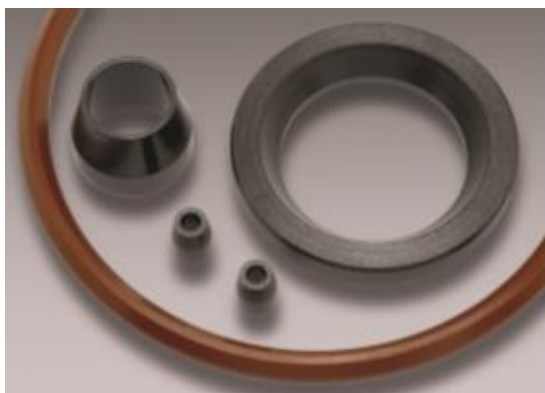
- Ability to withstand harsh environments
- High vacuum compatible
- Inherently clean
- Broad chemical compatibility
- Plasma and radiation resistant
- Self lubricating
- Oxygen service compatible

BENEFITS

- Reduce total cost of ownership versus metal-to-metal seals
- Thermal degradation resistance can reduce life cycle cost via longer component life

DuPont™ Vespel® Parts and Shapes: Sealing Solutions

Replacing metal-to-metal seals with Vespel® SP and SCP grades



Vespel® SP and SCP parts and shapes can be used for sealing components like valve seals, ferrules, and gaskets to achieve bubble-tight closure at high temperatures.

Challenges

- Metal-to-metal seals are expensive to fabricate requiring hard facing and multiple lapping steps in order to achieve low leak rates
- Increasingly demanding environments such as high temperature and pressure
- Most engineering plastics deteriorate quickly at high temperatures or cannot withstand thermal cycling
- Many engineering plastics do not have high temperature compression strength and creep resistance necessary for seal longevity at higher pressures

Solutions

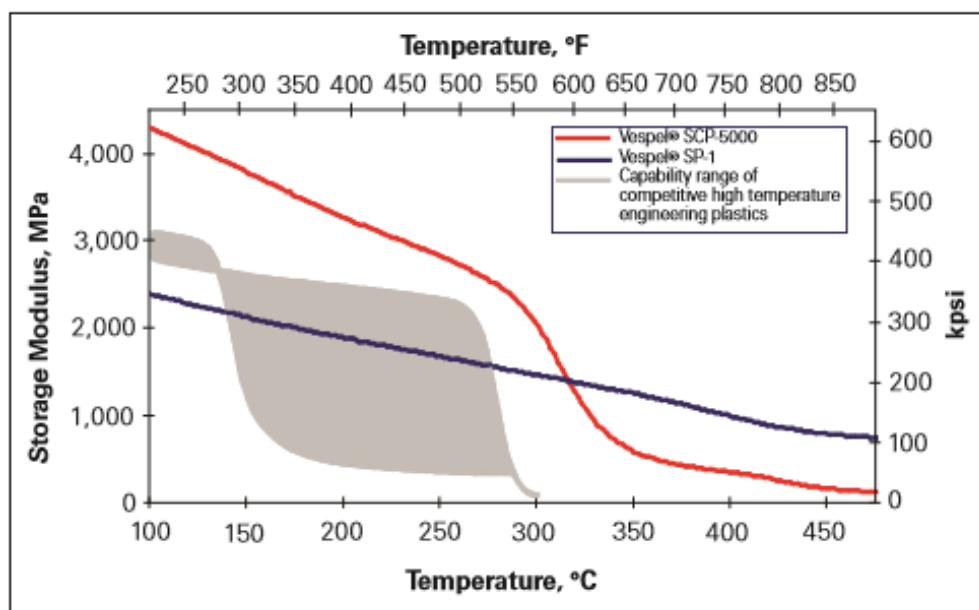
Sealing components made from the Vespel® SP and SCP families of products offer the combination of capabilities to meet demanding applications.

- Vespel® SP and SCP parts offer consistent properties maintaining tight seals across a wide range of temperatures
- High compressive strength and low creep rate enable higher operating pressures for long durations
- Low coefficient of friction and low wear rates between mating surfaces generate longer part life and clean environments (bearing grades)
- Vespel® SP and SCP parts and shapes can be machined to tight tolerances and sealing surface finishes using conventional machining techniques

The science of Vespel® parts and shapes help jet engines run efficiently; keeps transmissions shifting longer; helps snowmobiles run smoother; keeps tractors working longer; and helps parts endure extreme environments from reactor chambers to deep space.

Vespel® polyimide polymers are superb as material solutions for dynamic and static sealing applications. Vespel® polymers provide long life, sealing in extreme environments where other engineering plastics fail, and where metal-to-metal seals were previously considered the only option.

Flexural Stiffness by Dynamic Mechanical Analysis: DuPont™ Vespel® SP-1 and SCP-5000 versus Competitive High-Temperature Engineering Plastics Used for Seals



Benefits of Vespel® Parts and Shapes

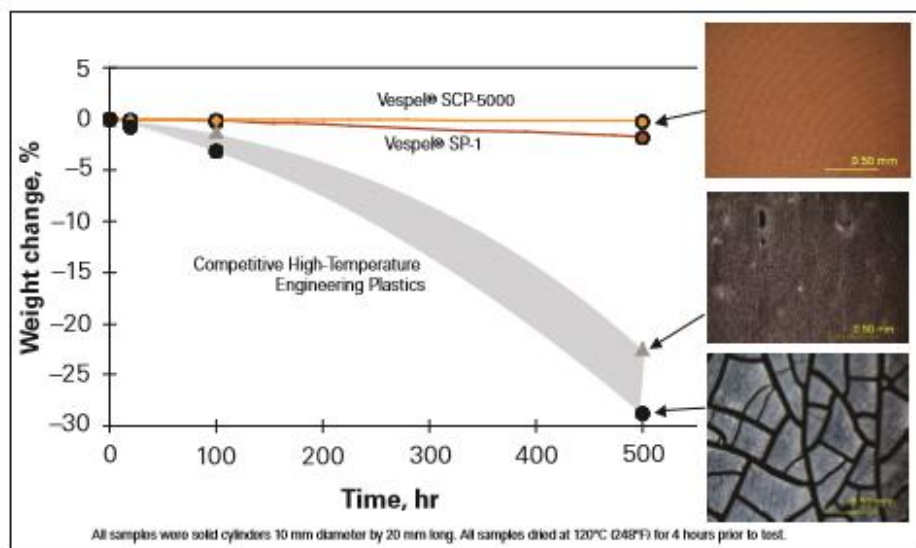
- Reduce total cost of ownership versus metal-to-metal seals
- Thermal degradation resistance can reduce life cycle cost via longer component life
- Lower coefficients of friction lead to smaller, lighter, and less expensive actuator components

Properties

Ability to withstand harsh environments.
Temperature up to 550°F for extended periods of time and excursions to 900°F.

- High vacuum compatible
- Inherently clean
- Broad chemical compatibility
- Plasma and radiation resistant
- Self lubricating
- Oxygen service compatible

Weight Loss Test Results — Exposure to Air at 662°F DuPont™ Vespel® Retains Its Weight and Shape.



Typical Properties — DuPont™ Vespel® Isostatic Shape Grades

	ASTM Test	Units	Vespel® SP					Vespel® SCP		
			SP-1 Unfilled	SP-21 15% graphite	SP-22 40% graphite	SP-211 15% graphite & 10% Teflon®	SP-3 Vacuum Bearing Grade	SCP-5000 Unfilled	SCP-50094 Graphite Bearing Grade	SCP-5050* Graphite Bearing Grade
Mechanical										
Tensile Strength, 73°F	D1708/D638	ksi	12.5	9.5	7.5	6.5	8.2	23.4	18.0	10.3
Tensile Strength, 500°F	D1708/D638	ksi	6.0	5.5	3.4	3.5		8.9	8.0	6.0
Elongation at Break, 73°F	D1708/D638	%	7.5	4.5	3.0	3.5	4.0	7.0	4.3	1.6
Elongation at Break, 500°F	D1708/D638	%	6.0	3.0	2.0	3.0		>20	13.0	3.0
Flex Modulus, 73°F	D790	ksi	450	550	700	450	475	840	923	1,093
Flex Modulus, 500°F	D790	ksi	250	370	400	200	270	440	514	700
Compressive Stress at 1% strain, 73°F	D695	ksi	3.6	4.2	4.6	3.0	5.0			
Compressive Stress at 10% strain, 73°F	D695	ksi	19.3	19.3	16.3	14.8	18.5	33.3	31.9	22.0
Compressive Stress at 0.1% offset	D695	ksi	7.4	6.6	6.0	5.4				
Deformation Under 2,000 psi Load	D621	%	0.14	0.10	0.08	0.13	0.12			
Friction										
Coeff. of Friction at PV = 25,000 psi-ft/min**			0.29	0.24	0.20	0.12	0.25	0.26	0.25	0.21
Coeff. of Friction at PV = 100,000 psi-ft/min**				0.12	0.09	0.08	0.17	0.15	0.06	0.09
Static Coeff. of Friction in Air**			0.35	0.30	0.27	0.20				
PV Limit (unlubricated)***		ksi ft/min		350	350	100			500	
Other Properties										
Coeff. of Thermal Expansion, 73–500°F	D696	10 ⁻⁶ /in/in/°F	30	27	21	30	29	26	24	
Hardness	D785	Rock E	45–60	25–45	5–25	1–20	40–55	95	91	
Water Absorption, 24 hr at 73°F, 100% RH	D570	%	0.24	0.19	0.14	0.21	0.23	0.08	0.06	0.06

* SCP-5050 in isostatic form is a developmental product. Properties shown are typical for the direct formed process.

** Versus carbon steel, steady state, unlubricated, in air, thrust bearing.

*** PV limits for any material vary with different combinations of pressure and velocity as well as other conditions.

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