DuPont™ Vespel® solutions for oil & gas

Engineered materials to help you hit your reliability, efficiency & compliance targets

Your trusted provider of high-performance materials for oil & gas

Long recognized as a premier solution for mission-critical applications requiring reliability under extreme conditions, DuPont™ Vespel® materials provide proven performance in demanding environments where conventional plastics, composites, and even metals fall short. Backed by decades of innovation as DuPont advanced its technology to address aerospace and high-tech demands, machinable Vespel® Parts and Shapes are tailor-made for the demanding needs of oil and gas operations. Our specialized Vespel® product families include material options engineered for specific performance needs, including:

- **Vespel® polyimide materials** for outstanding thermal stability, mechanical strength, dimensional stability, and low friction
- **Vespel® CR carbon-fiber-reinforced fluoropolymer composites** for exceptional chemical resistance; very low compressive creep; and high dimensional stability, toughness, and wear resistance

Supported by DuPont's engineering knowledge and proven real-world performance, we collaborate with customers to provide technical expertise, design support, and deep application knowledge. Our network of engineers and scientists across Asia, Europe, the Middle East, and the Americas helps optimize component performance, reduce life-cycle costs, and ensure long-term reliability.

Why specify DuPont™ Vespel® materials?

As an engineer, you're balancing efficiency gains with reliability in pumps, compressors, and valves – often under aggressive chemistries and broad temperature windows. The Vespel® portfolio was built for those conditions, with documented results in API 610 pumps and gas compression equipment, plus validation work in hydrogen and supercritical CO_2. With Vespel® materials, you can expect tight-tolerance machinability, low coefficient of thermal expansion (CTE) for clearance control, creep resistance under load, and consistent sealing without reliance on lubricants.

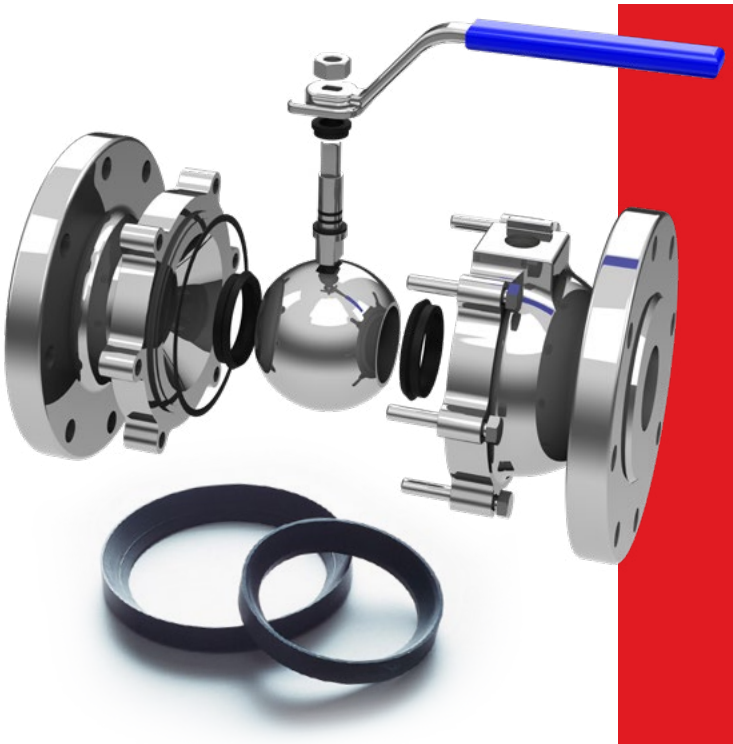
Proven field impact – setting the standard in nonmetallic pump wear components

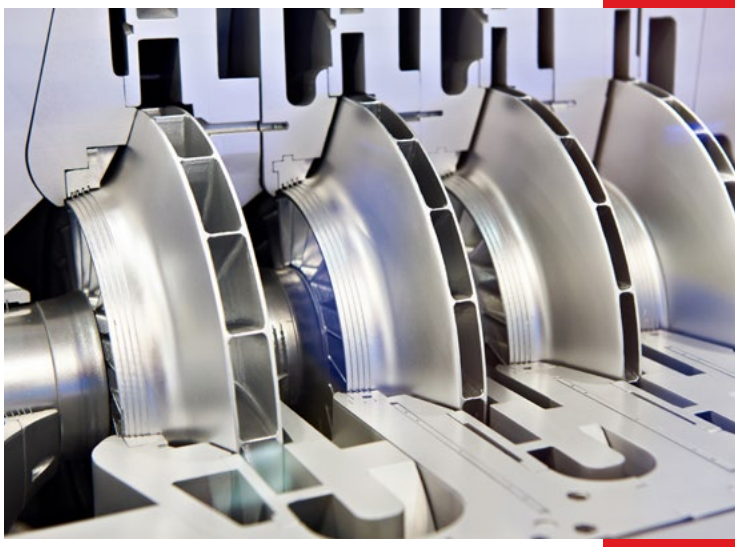
Engineers have replaced metal wear parts with Vespel® CR-6100 Parts and Shapes to run a single boiler feed pump at full capacity (rather than two), cutting annual operating costs by approximately $100,000 and eliminating seizure events for multiple years – all while dropping power draw by around 5%. That's design margin you can measure.

Vespel® CR-6100 has become the industry's leading nonmetallic wear component material for API 610 pumps by combining best-in-class run-dry survivability, reduced seizure risk, high chemical and thermal resistance, and the ability to safely reduce pump clearances for major efficiency gains. The material's documented success across thousands of pumps throughout decades of field use, along with its formal recognition in API 610 standards, solidifies its reputation as the gold-standard composite for critical pump reliability.

DuPont™ Vespel® materials for oil & gas

Product & key differentiator	Benefits
Vespel® CR-6100 Chemically resistant PFA composite	• Composite material engineered for hostile chemical environments • Meets API 610/ISO 13709 requirements for stationary pump components • Low coefficient of thermal expansion (CTE) from directional carbon-fiber reinforcement for tight clearances • Operates from -46°C to 230°C while maintaining dimensional stability
Vespel® CR-6120 Enhanced-mechanical-strength composite	• Composite material for hostile chemical environments; based on the Vespel® CR grade • Enhanced mechanical capability to support higher-pressure sealing applications
Vespel® SP-1 Unfilled base resin	• High strength with ability to conform to mating surfaces • Low creep for long-term sealing stability • Electrically insulating, high-purity material • Wide temperature capability, from cryogenic to 350°C
Vespel® SP-21 Contains graphite	• Graphite-filled polyimide for enhanced wear resistance and low friction • Self-lubricating material that reduces friction, wear, and required actuation force • Low creep for stable sealing and bearing performance over time
Vespel® SCP-5000 High-strength unfilled base resin	• High strength and rigidity for excellent dimensional stability under load • Low creep with consistent elongation to maintain sealing performance at pressure • Strong electrical insulation for demanding mechanical environments • Higher thermal-oxidative stability for sustained performance at elevated temperatures
Vespel® SCP-50094 High strength; contains graphite	• Exceptional wear resistance and low friction for extreme service conditions • High compressive strength and excellent creep resistance for load-bearing seals • Designed for high-pressure velocity (PV) applications
Vespel® SVT-600 Higher-toughness unfilled base resin	• High toughness and elevated elongation to accommodate press-fit and dynamically loaded components • Excellent impact resistance and fatigue resistance • High compressive strength with low creep to maintain tight tolerances over time





DuPont™ Vespel® product recommendations at a glance

		Vespel® CR-6100	Vespel® CR-6120	Vespel® SP-1	Vespel® SP-21	Vespel® SCP-5000	Vespel® SCP-50094	Vespel® SVT-600
Pumps	Bearings	✔						✔
	Wear rings	✔						
Compressors	Piston rings				✔		✔	
	Seal rings				✔		✔	
	Labyrinth seals		✔					
Valves	Valve seats			✔	✔	✔	✔	✔
	Valve stem packing	✔						
Downhole tools	Electrical insulators			✔		✔		
General	Bearings				✔		✔	✔
	Seal rings				✔			
	Thrust washers				✔		✔	
	Bushings							✔
	Thrust plugs			✔	✔			
	Aluminum wear & friction				✔			

DuPont™ Vespel® product recommendations by application benefit

Application	Benefits	Recommended products
Bushings/bearings	Low wear and excellent friction performance in demanding environments; high pressure-velocity (PV) rating supports reliable operation under elevated pressure and velocity conditions; self-lubricating nature eliminates the need for external lubricants; mechanical consistency across temperature ranges allows for tighter tolerances and broader service coverage to reduce design complexity and part variation	*Base recommendation:* Vespel® SP-21 *For higher temperatures and pressures:* Vespel® SCP-50094
Downhole tools	Consistent mechanical and electrical insulation performance across a wide temperature range; electrical properties remain stable, even at elevated temperatures, making recommended products ideal for insulating components in high-heat, high-pressure downhole environments	*Base recommendation:* Vespel® SP-1 *For higher temperatures and pressures:* Vespel® SCP-5000 *For significantly improved elongation:* Vespel® SVT-600
Pumps/compressors	Enhance pump and compressor reliability by resisting galling and seizing, even under dry-run or upset conditions; low CTE and low creep help maintain tight clearances and dimensional stability across temperature swings; improve efficiency, reduce vibration, and lower maintenance costs over time	Vespel® CR-6100 Vespel® CR-6120
Rod packing/piston rings	Support effective sealing in high-temperature, high-pressure compressor environments; self-lubricating properties reduce friction and wear; thermal stability ensures the material won't melt, simplifying replacement and maintenance; easy to machine, helping streamline production and reduce downtime	*Base recommendation:* Vespel® SP-21 *For higher temperatures and pressures:* Vespel® SCP-50094
Seal rings *(standard applications)*	Durable sealing performance in high-temperature environments; low creep and good dimensional stability help maintain seal integrity over time; high elongation and good modulus support reliable fit and long-term resilience	*Base recommendation:* Vespel® SP-1 *For higher temperatures and pressures:* Vespel® SCP-5000 *For significantly improved elongation:* Vespel® SVT-600
Seal rings *(high-speed applications)*	Dependable sealing in extreme environments; low creep and good modulus help maintain shape and sealing force over time; high elongation supports durability under pressure; low friction and self-lubricating properties eliminate the need for additional lubricants, even in high-temperature, high-pressure conditions	*Base recommendation:* Vespel® SP-21 *For higher temperatures and pressures:* Vespel® SCP-50094
Valve seats *(standard applications)*	Reliable sealing in high-temperature environments; low creep ensures dimensional stability over time, helping maintain tight seals and reduce leakage risk; flexibility allows material to conform to mating surfaces, simplifying machining and improving fit, especially in metal-to-polymer assemblies	*Base recommendation:* Vespel® SP-1 Vespel® SP-21 *For higher temperatures and pressures:* Vespel® SCP-5000 Vespel® SCP-50094 *For significantly improved elongation:* Vespel® SVT-600
Valve seats *(high-speed applications)*	Reliable sealing in high-temperature environments; low creep helps maintain shape and sealing force over time; lower friction reduces actuation force required to open and close valves; flexibility supports better sealing and easier machining for both metal and composite components for longer service life and consistent performance	*Base recommendation:* Vespel® SP-21 *For higher temperatures and pressures:* Vespel® SCP-50094
Valve-stem packing	Help prevent fugitive emissions and leaks by maintaining a tight seal under thermal and chemical stress; broad chemical resistance and dimensional stability for long-term sealing performance in aggressive oil and gas environments	Vespel® CR-6100 Vespel® CR-6120

When PEEK doesn't meet the challenge

PEEK is a high-performing thermoplastic, but its glass transition and melting characteristics can alter modulus, and creep behavior can shift abruptly near/above its transition temperature (Tg). DuPont™ Vespel® materials retain mechanical integrity across broader thermal excursions, offer lower H_2 permeability and lower friction in hydrogen, and do not melt – all key benefits when you're qualifying valve seats and packings for storage, transport or fueling duty.

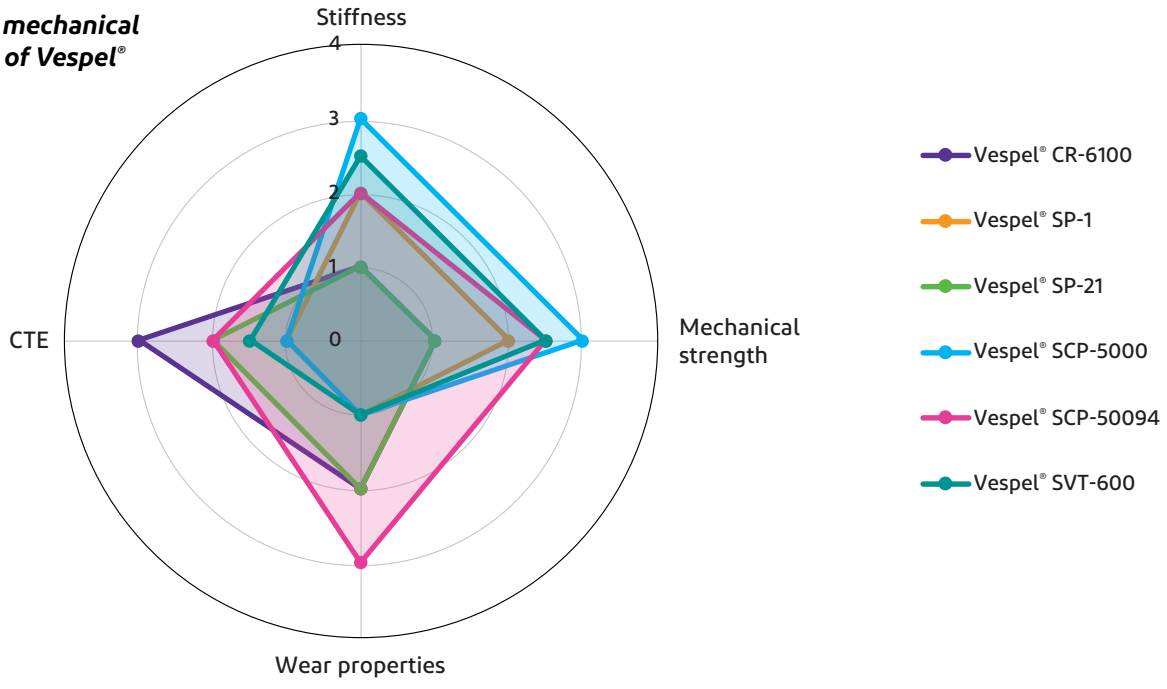
Switch to Vespel® when:

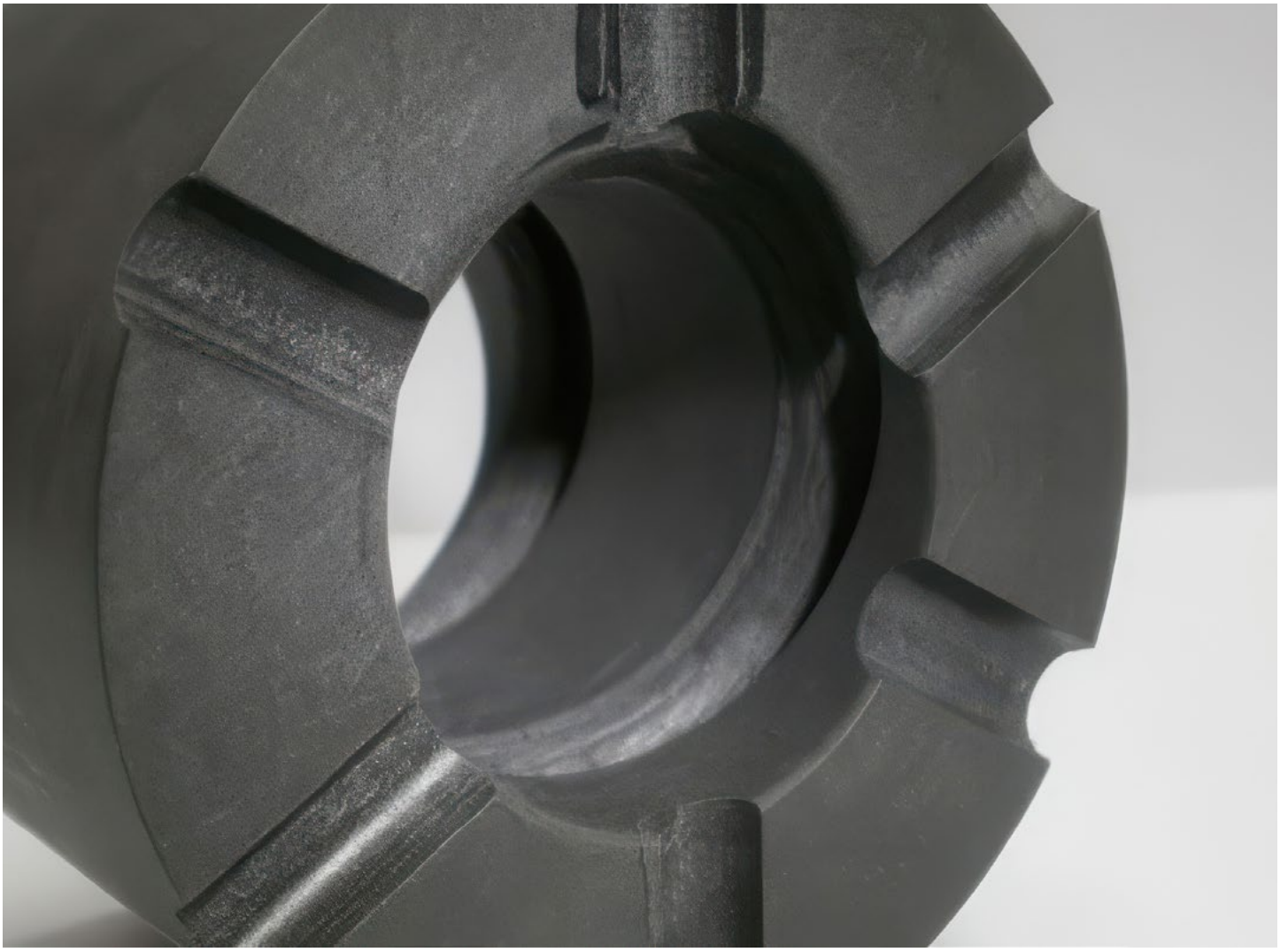
- Clearances or leakage allowances depend on low, stable CTE across thermal cycles
- Seizure risk exists during run-dry/ cavitation or upset conditions
- Sealing performance must persist under hydrogen permeation or amine/sour service
- Creep/set loss at temperature jeopardizes seating force or ring pre-load

Chemical resistance of DuPont™ Vespel® CR-6100 versus PEEK

Chemical	Vespel® CR-6100	PEEK
Acids		
Aqua regia	**Excellent**	Poor
Chromic acid >50%	**Excellent**	Testing suggested
Chlorosulfonic acid	**Excellent**	Testing suggested
Sulfuric acid 96%	**Excellent**	Testing suggested
Phosphoric acid 85%	**Excellent**	Good
Fluoroboric acid	**Excellent**	Testing suggested
Fluorosilicic acid	**Excellent**	Testing suggested
Nitric acid	**Excellent**	Testing suggested
Solvents		
Acetone	**Excellent**	Poor
Ketones	**Excellent**	Poor
Tetrahydrofuran	**Excellent**	N/A
Methyl acetone	**Excellent**	Poor
Methyl ethyl ketone	**Excellent**	Poor
Methyl isobutyl ketone	**Excellent**	Poor
Dimethyl sulfoxide	**Excellent**	N/A
Oleum	**Excellent**	Testing suggested
Other		
Bromine	**Excellent**	Poor
Sodium hydroxide	**Excellent**	Poor
Aq. zinc chloride 25%	**Excellent**	N/A
Caustic potash	**Excellent**	Poor
Chlorinated water	**Excellent**	Testing suggested
Oxygen	**Excellent**	Testing suggested
Steam	**Excellent**	Excellent
Iodine	**Excellent**	Testing suggested

Comparative mechanical performance of Vespel® materials





Fabricating for optimum performance

Vespel® Precision Parts – including both Vespel® CR products (plaques, rods, and tubes) and Vespel® polyimide products (rods, tubes, plaques, rings, discs, and bars) – are fabricated using methods tailored to a range of considerations, including end-use requirements, customer specifications, part geometry, and economics. These parts are relatively easy to machine because of their inherent mechanical strength, stiffness, and dimensional stability at machining temperatures. In addition, they can be machined with standard metalworking equipment to produce parts to tolerances once considered too close for plastic materials.

Isostatically molded (ISO) materials are ideal for thick, bulk shapes where near-isotropic properties are required.

Compression-molded "plaque" materials – especially the Vespel® CR series – are typically used for flat stock that is later machined, such as plates, plaques, and sheets. These offer excellent planar performance, with higher strength, stiffness, and wear resistance in the x-y plane.

Direct-formed polyimide shapes can, geometry permitting, offer more cost-effective higher-volume manufacturing; however, due to geometry-driven anisotropy, flow, and compaction, these materials may have localized orientation and density variations compared to the other grades.

For more information

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Visit vespel.com

Visit the DuPont™ Vespel® Resource Center

Learn more about DuPont™ Vespel® pump reliability technology

Contact us

Work with DuPont Technical Service to review fits, tolerances, and validation plans for your duty cycle and chemistry.

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