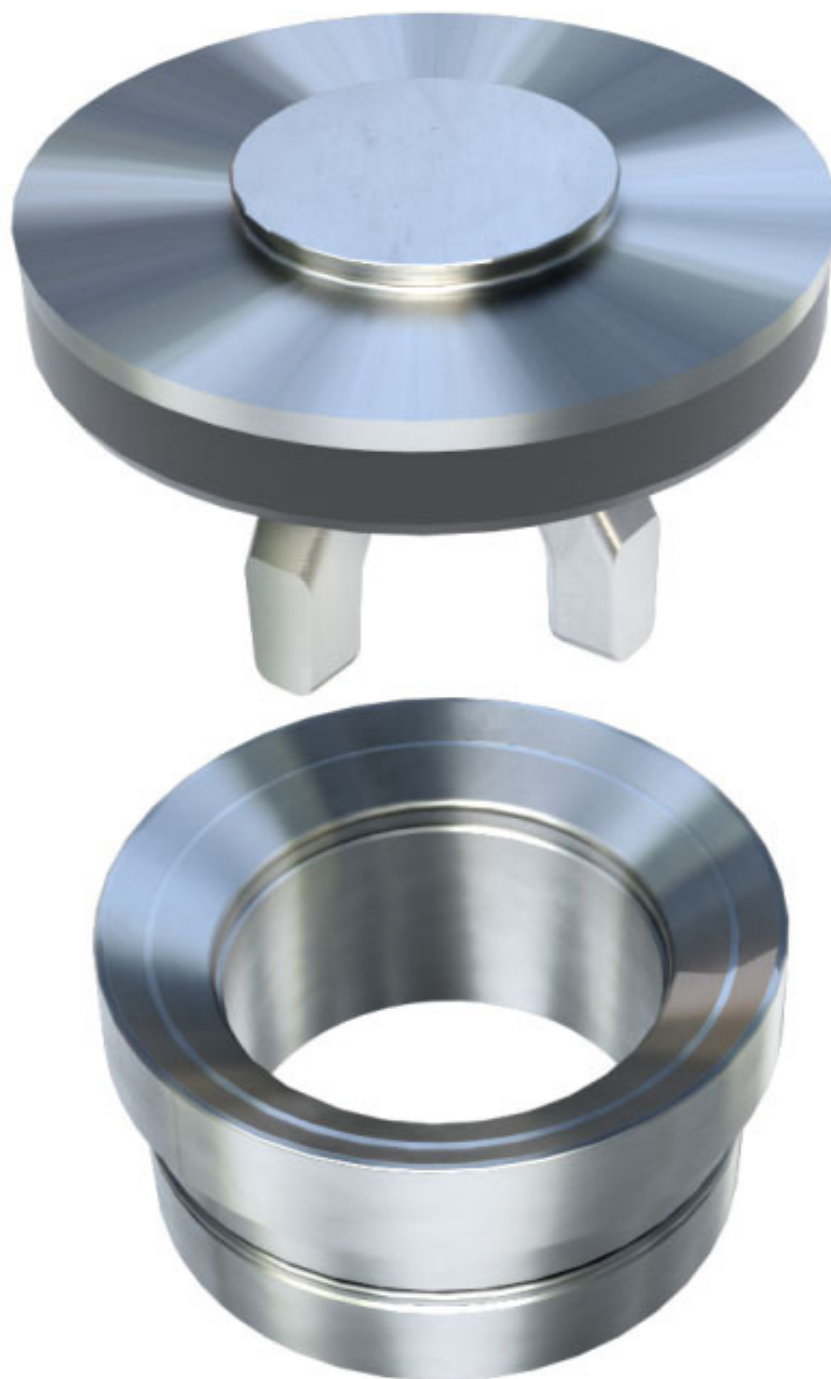


SPM™ Oil & Gas

A Caterpillar Company

SPM™ EdgeX

Valve and Carbide Seat



GAIN AN EDGE



OVER DOWNTIME.

Operators across the globe are pushing their frac fleets further than ever before. Rethinking processes. Integrating new technologies. Reducing nonproductive time. Optimizing equipment maintenance. They're continually looking for innovative, new ways to improve surface efficiency and reliability while prioritizing safety of their crews, assets, and the environment.

SPM Oil & Gas (SPM) is changing pressure pumping—starting with one of the largest maintenance expenses on the frac site.

Seats and Valves—Reimagined

The new SPM™ EdgeX Carbide Seat is the first valve and seat that combines the strength of tungsten carbide, proven durability of steel, and field serviceable with industry standard fluid end geometry. Its patented tungsten carbide insert technology enables the EdgeX Carbide Seat to outlast conventional steel seats by an average of six times*—even in the harshest conditions. With up to 760 hours of operating life, the EdgeX Carbide Seat dramatically reduces on-site risk, maintenance, and downtime.

The new SPM™ EdgeX Valve is designed to optimize its performance with the EdgeX Carbide Seat, allowing it to wear deeper and last twice as long as conventional valves. It features an industry-first steel and heat treatment combination with an innovative, new urethane material. The EdgeX Valve material balances hardness and toughness to maximize wear-resistance and reliability.

6X

longer average seat life*

2X

longer valve life

760+

hours of operating life—and counting

30°

standardized strike angle

* Comparison of 80-hour average life of steel seats to 611-hour average life of SPM™ EdgeX Carbide Seat

The Valve and Seat Experts

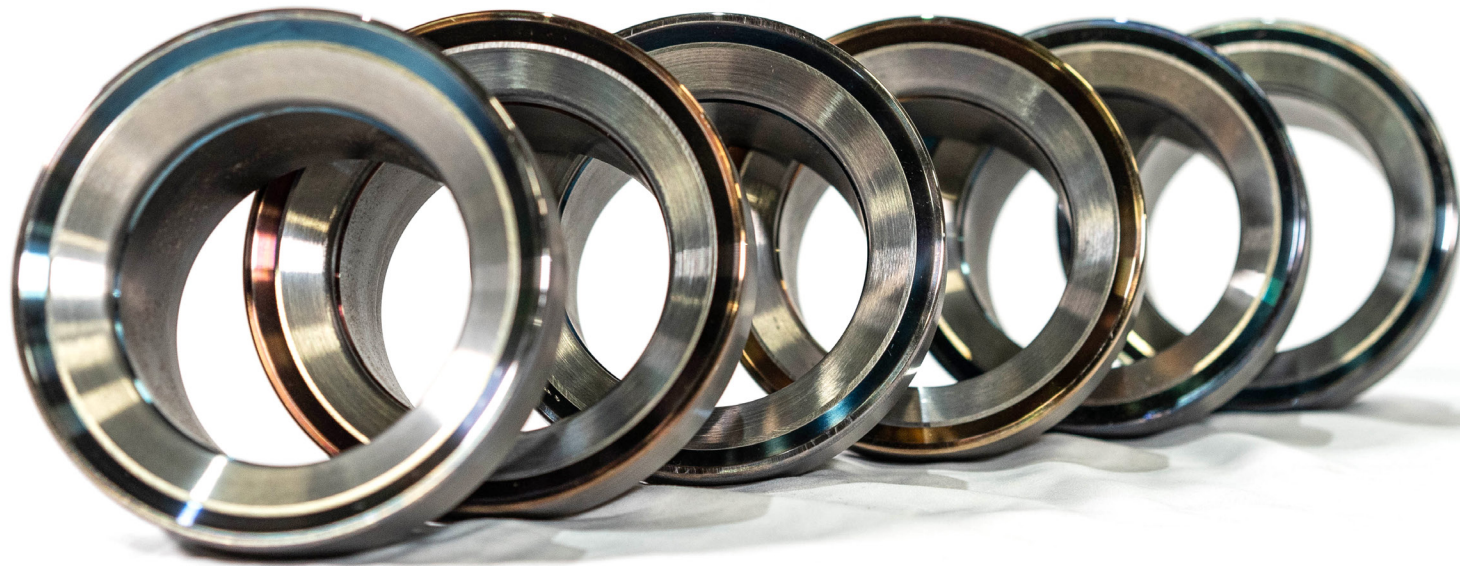
SPM has a long history of solving the industry's toughest challenges and pushing the boundaries of what is possible. From pioneering the first inertia-welded unibody design to developing the industry's safest, longest-lasting valves and seats, our innovations continually set new standards for the strength, life, and cost-efficiency of frac pump consumables.

Lab Tested, Durability Tested and Proven






From evaluating the optimal tungsten carbide alloy and designing an innovative insert technology to studying valve operation characteristics and failure modes, SPM engineered each element of the EdgeX Valve and Carbide Seat for maximum performance, life, and reliability. And it's backed up by rigorous testing—in the lab and the field.

The Strength of Carbide. The Durability of Steel.

With tungsten carbide strategically placed in the key wear area, the SPM™ EdgeX Carbide Seat delivers long life and unparalleled reliability—without the added risk of shattering and damaging the fluid end, or worse, causing a catastrophic pump failure. SPM™ EdgeX Carbide Seats resist severe impacts, wear, cracking, and washout. And that means less HSE risk, maintenance, unplanned downtime, and lost revenue.



Our Benefits

				
Up to six times longer seat life	Up to two times longer valve life	Longer maintenance intervals	Lower TCO compared with conventional valve seats	Reduced HSE risk

SPM™ EdgeX Carbide Seats

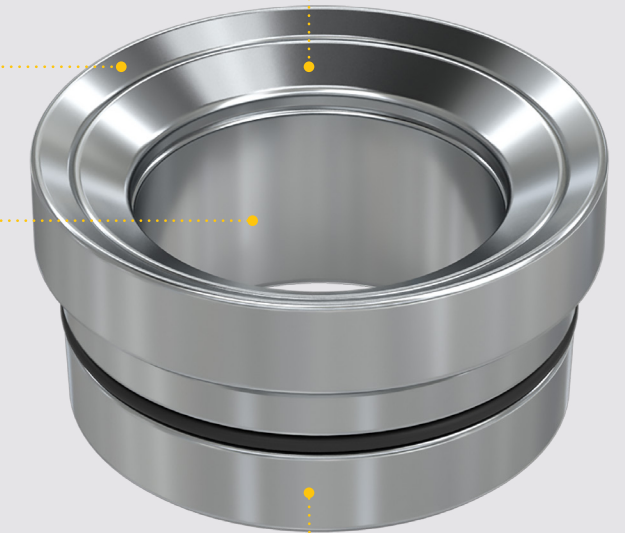
- Performed 1,000+ hours of finite element analysis (FEA) modeling to evaluate insert and steel stresses, design, and thermal impacts
- Prototyped 30 iterations of the seat and insert in the lab
- Tested 10 design iterations in the field
- Conducted extensive testing in SPM's custom cyclical sand tester (CST) using a vast range of known frac media to better understand abrasion resistance, durability, and toughness of designs and tungsten carbide grades
- Vetted and tested each seat design iteration in SPM's high-pressure loop at 15,000 psi
- Performed -170°F to 200°F (-112°C to 93°C) thermal shock testing to eradicate known temperature-dependent failure modes
- Ran extensive and diverse field testing ranging from 6,000 psi to 13,000 psi

Material

Engineered and proven tungsten carbide composite to handle the most demanding application conditions.

Reduce Stress

Patent protected tungsten carbide insert design minimizes surface and steel stresses, resulting in product longevity and functionality in all operating conditions.



Interchangeability

Standard 30° standardized strike angle for maximum interchangeability and use of standard seat puller.

Field Flexibility

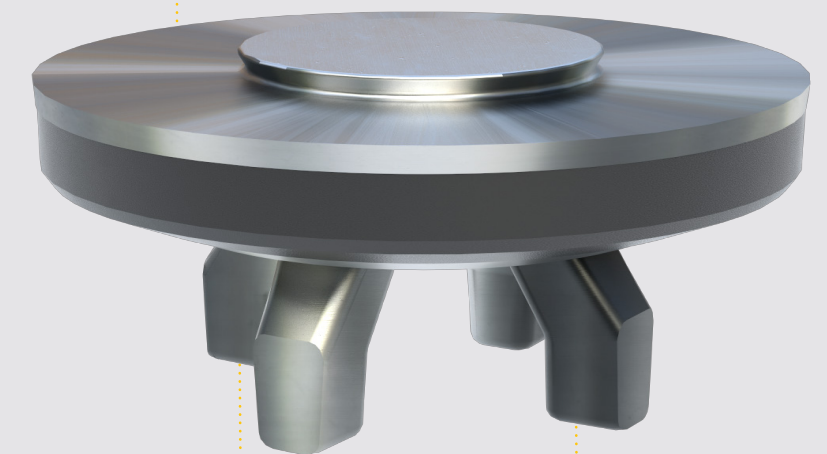
Robust design allows for field serviceability; can be removed and installed on site.

SPM™ EdgeX Valves

- Prototyped multiple iterations of valve design in the lab to maximize performance and reliability
- Ensured durability of the valve body and determined optimal urethane design through extensive FEA modeling
- Optimized fluid dynamics and performance with lab- and field-validated CFD analysis
- Evaluated and tested each design iteration in SPM's high-pressure loop at 15,000 psi
- Confirmed valve performance through diverse field testing ranging from 6,000 psi to 13,000 psi

Seal Design

Innovative seal design to prevent valve washout and maximize reliability.



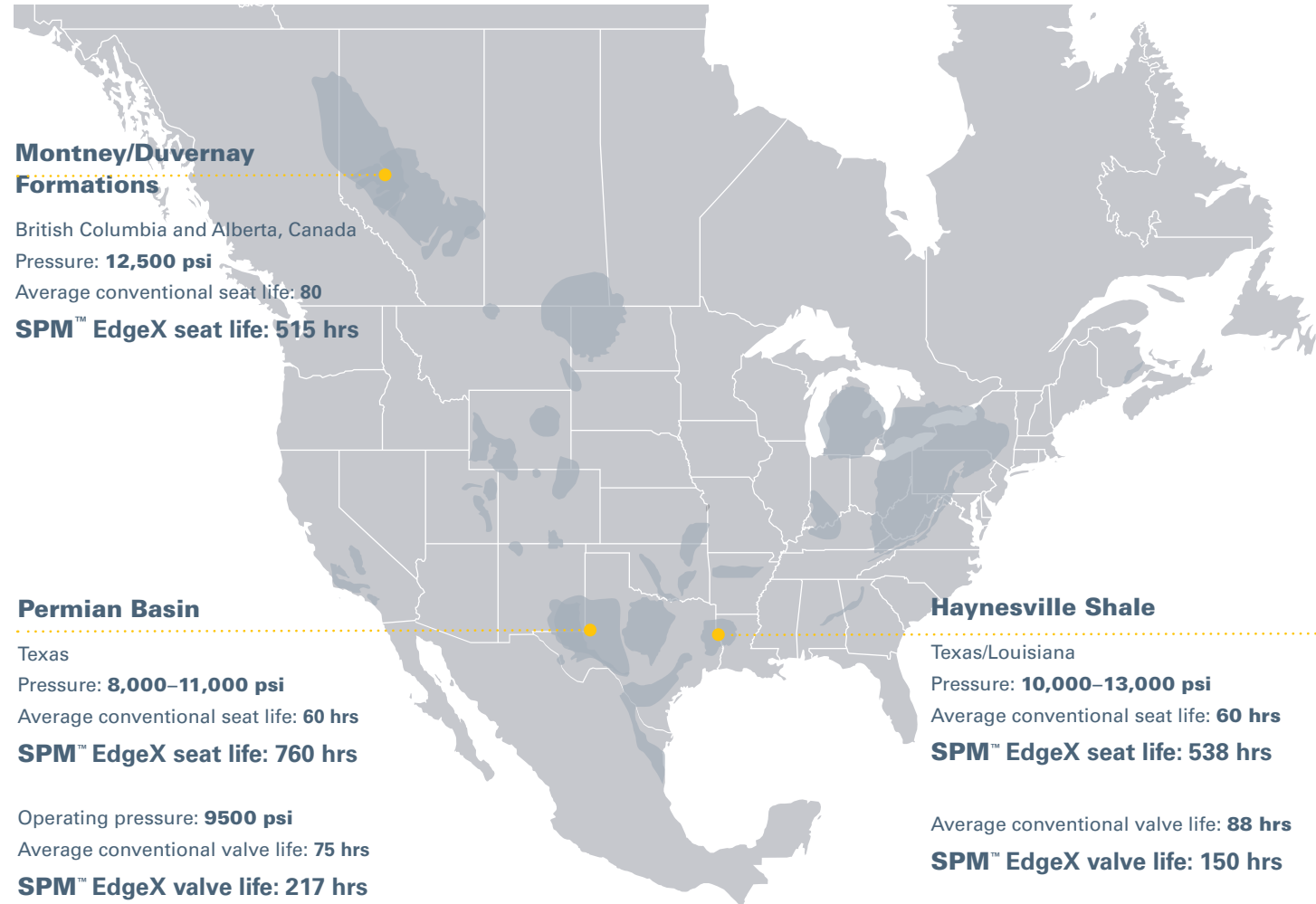
EdgeX Carbide Compatible

Designed to provide optimal performance when paired with the EdgeX Carbide seat.

Valve Body Design

Valve body designed to reduce fluid turbulence and erosion to increase valve life and performance.

Seats Across Shale Plays



Permian Basin	Montney/Duvernay Formations	Haynesville Shale
Avg. Treating Pressure: 8,000 to 11,000 psi	Avg. Treating Pressure: 12,500 psi	Avg. Treating Pressure: 10,000 to 13,000 psi
Avg. Conventional Seat Life: 60 hours	Proppant Mesh Size: 40/140, 51/204, 40/70, 50/140	Proppant Mesh Size: 40/140
Avg. EdgeX Seat Life: 760 hours	Sand Volume: 90,000 to 550,000 lb/stage	Sand Volume: 650,000 lb/stage
	Avg. Conventional Seat Life: 80 hours	Avg. Conventional Seat Life: 60 hours
	Avg. EdgeX Seat Life: 515 hours	Avg. EdgeX Seat Life: 538 hours
	Maintenance Interval: 80 hours	Maintenance Interval: 60 hours

24/7
Availability

10
Service centers

**SPM™
EDGE**
THE SERVICE ADVANTAGE

Our Success Stories

540%

540% Longer Seat Life in Canada

The Montney and Duvernay plays in Canada present unique challenges to valves and seats due to their frigid temperatures and total sand volume. With temperatures as low as -40°C (-40°F) and with up to 5,000 tons of sand pumped per well, the seats are subjected to much harsher conditions than a typical job. An operator recently piloted the new SPM™ EdgeX Carbide Seat with unprecedented success. The new seats ran for a record 515 hours—approximately 540% longer than the average hours of previous seats—and required eight times fewer changeouts.



760 HOURS

760 Hours of Seat Life in the Permian

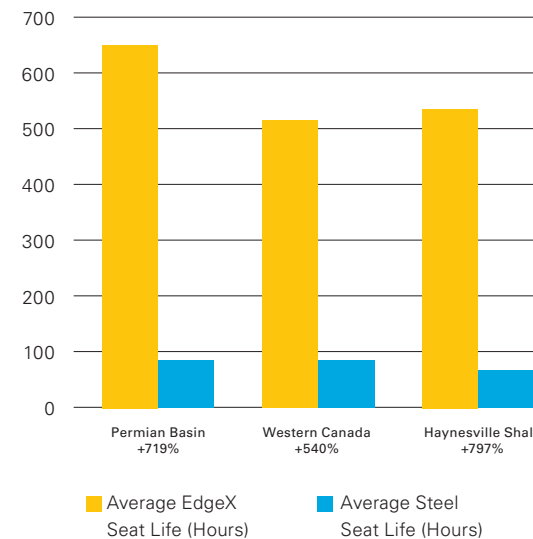
A Permian operator wanted to optimize the maintenance—and associated costs—of its frac equipment and consumables. SPM Oil & Gas proposed a field trial with SPM™ EdgeX Carbide Seats across three sites. The operator ran the engineered carbide seats an average of 655 hours—more than 8X longer than previous seats. One seat lasted 760 hours, setting a record for the longest life of an EdgeX Carbide Seat in North America.



8.9X

Haynesville Operator Increases Seat Life 8.9X

With treating pressures as high as 12,500 psi, the Haynesville Shale subjects frac equipment to some of the most extreme conditions of any play in North America. To complete its multiwell pads, a Haynesville operator pumped an average of 650,000 pounds of abrasive 40/140-mesh proppant per stage. Despite the challenging conditions, the SPM™ EdgeX Carbide Seat lasted an average of 538 hours—an increase of 797% compared with conventional steel seats.



Built to Last

The SPM™ EdgeX Carbide Seat is designed to minimize maintenance on the frac site. Seat life varies dramatically by play, treating pressure, proppant, and proppant volume. EdgeX Carbide Seats tested in the field have lasted between 515 and 760 hours—and counting. With an average maintenance cycle of 80 hours for steel seats, each EdgeX Carbide Seat can replace up to nine conventional seats and save hours of changeout time per bore.

Wherever You Are

SPM Oil & Gas' extensive North American network ensures you're never more than 3 hours away from our industry-leading repairs, parts, and support. With SPM™ Edge, we can deliver expendable equipment off the shelf, or set up an SPM™ EdgeX Delivered mobile trailer on site to keep critical parts and expertise right where you need them.

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