Reliable Valve Performance in Severe Service

The MOPPET® Valve

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Performing Well in Severe Service

Flare gas, dirty natural gas, hydrogen, polypropylene

- Severe service conditions require **rugged valve construction** to ensure **reliability**
- To meet **efficiency** expectations, valves need geometries engineered to **maximize flow area**
- Valve designs using multiple sealing elements **disperse liquids and debris** more efficiently than a single sealing element would

Performing Well in Severe Service
MOPPET® valve

- Patented MOPPET valve introduced in 1999
  - Now **a world standard** for reliability in severe service and field service capability

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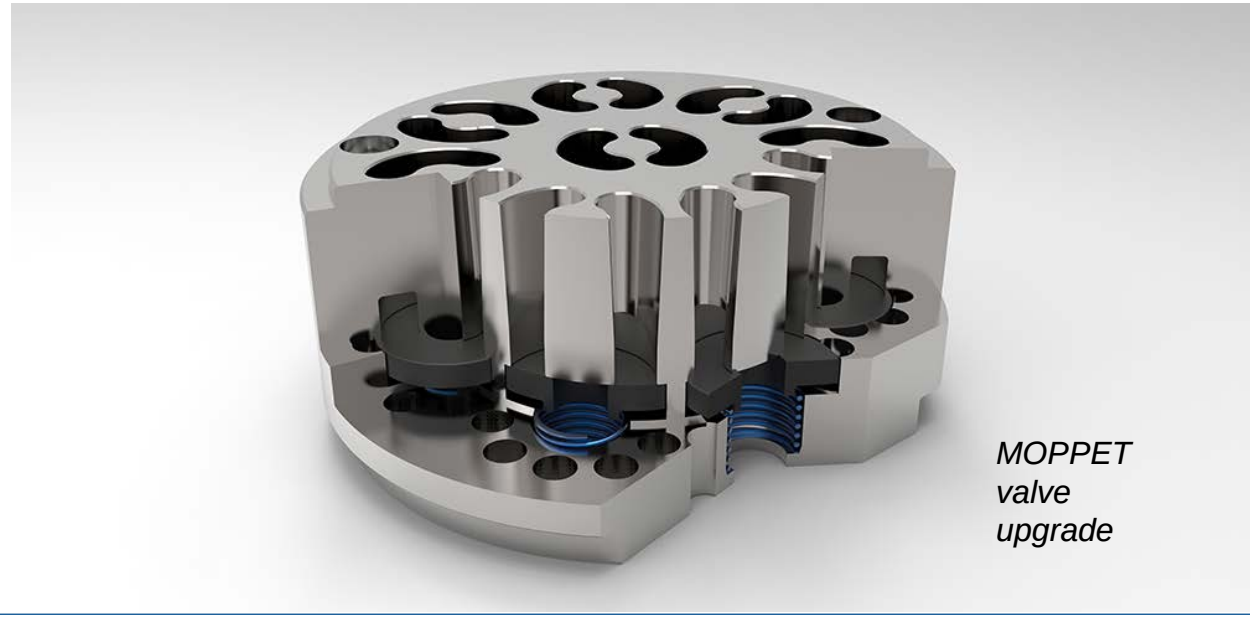
- MOPPET valve upgrade project
  - Builds on the positive features of successful product
  - Response to customer needs

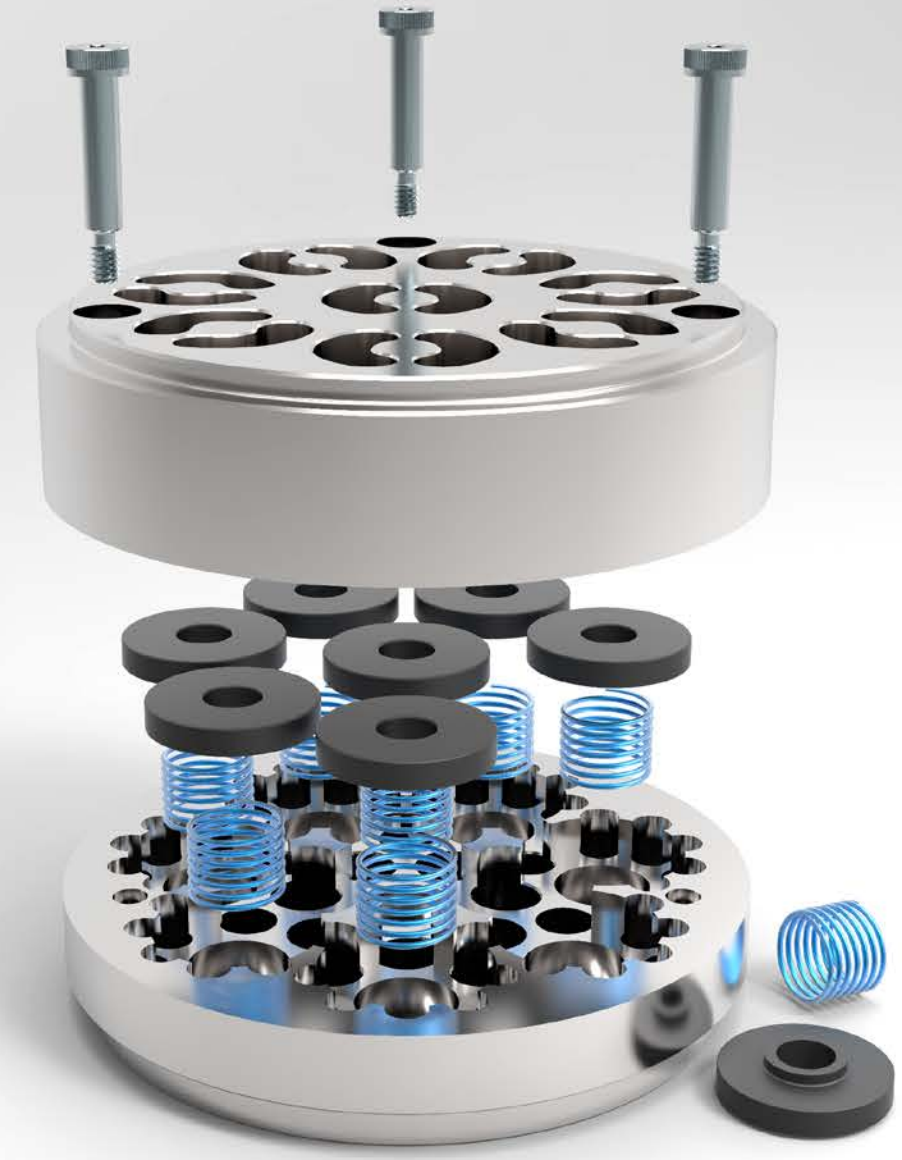
Original MOPPET valve



MOPPET valve upgrade

MOPPET® Valve Upgrade

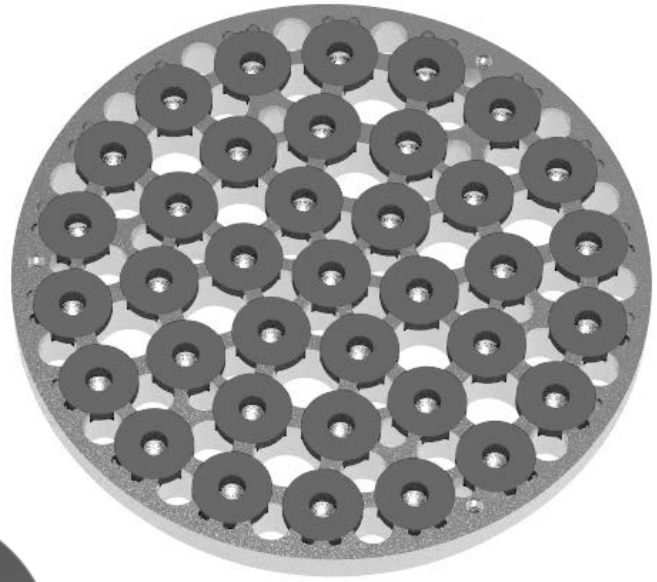
- Patented design
- Improved flow efficiency
- Improved clearance volumes
- Improved operating ranges
- Improved range of physical sizes
- Maintains high reliability

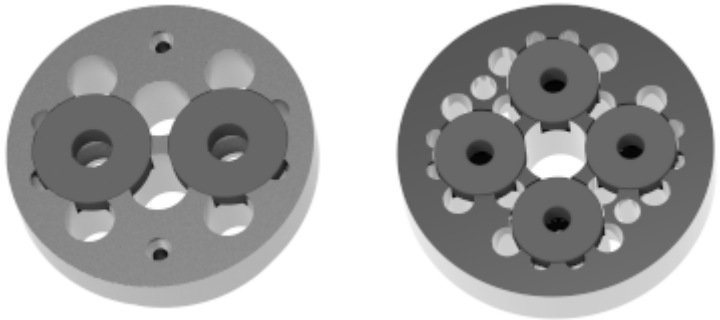


The MOPPET valve upgrade combines key design features of the traditional MOPPET valve with new features developed based on application experience and customer feedback.

Sealing with a Series of Identical MOPPET® Discs

- As valve diameter changes, the quantity of discs changes
- For smaller diameter valves a **new** smaller MOPPET disc element offers more options for configuration
- Discs are interchangeable from valve to valve for each size
  - Retains inventory advantages

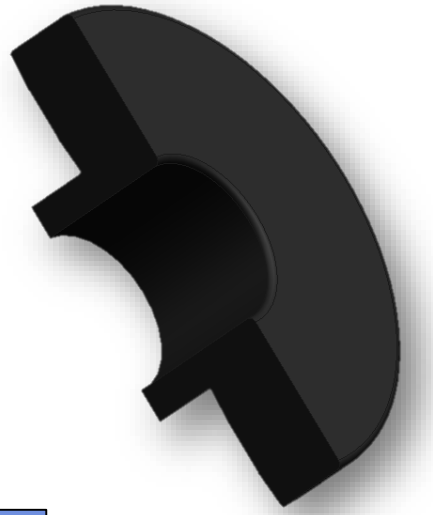


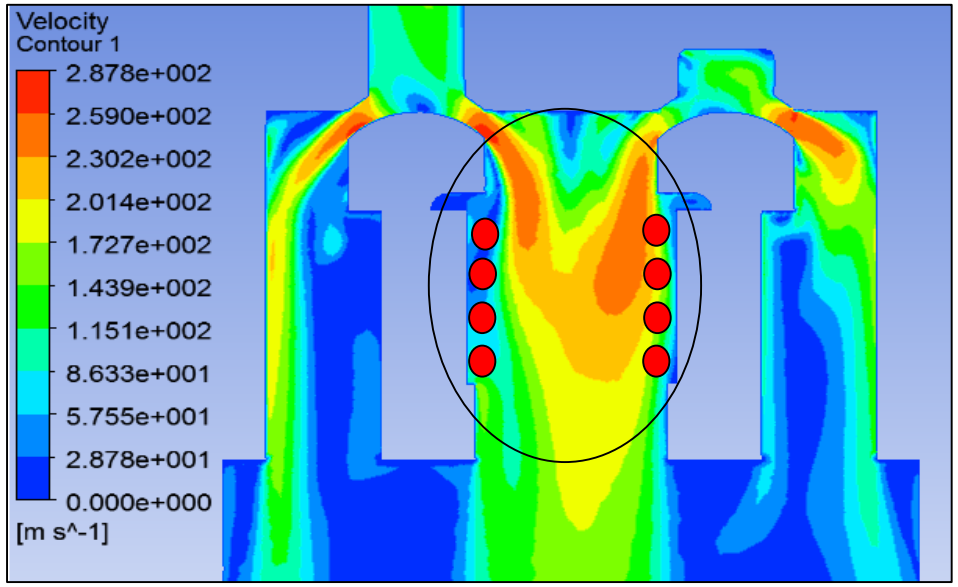


The small-radius, lightweight thermoplastic discs operate independently of each other and have the strength and stiffness to withstand high impact forces.

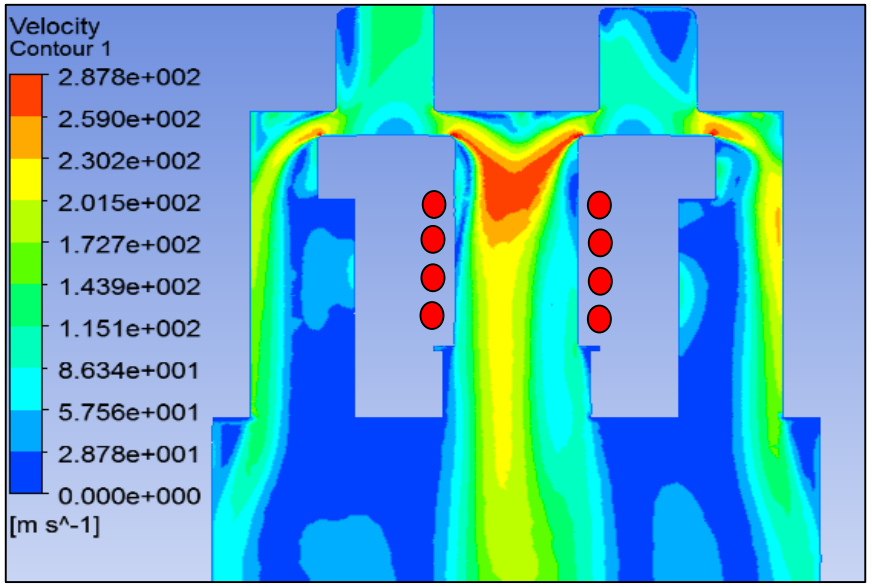
Redesigned for Greater Efficiency

- **New** patented disc design optimizes central disc flow
- **New** smaller disc element improves flow area in smaller diameter valves
- CFD analysis of seat, disc and guard flow paths has further improved efficiency

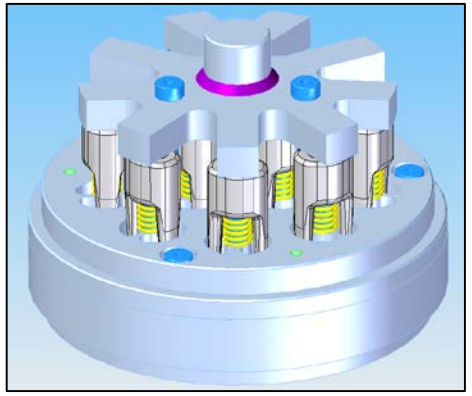




Central disc flow of the original

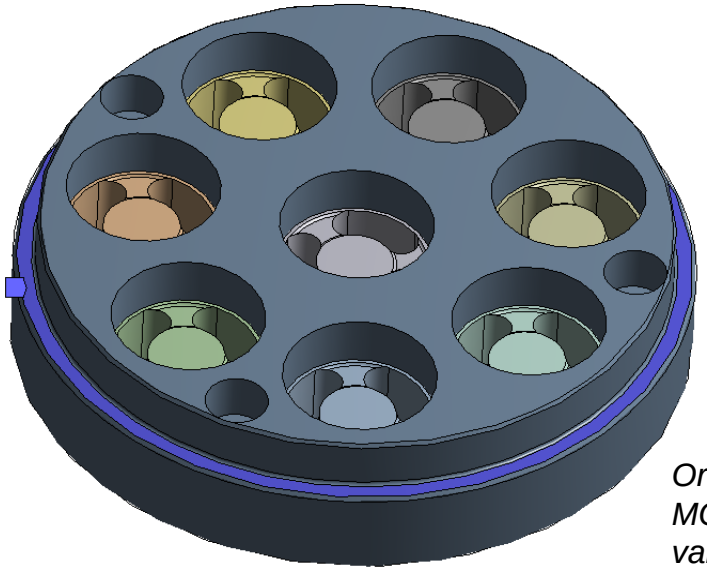


Central disc flow of the redesign

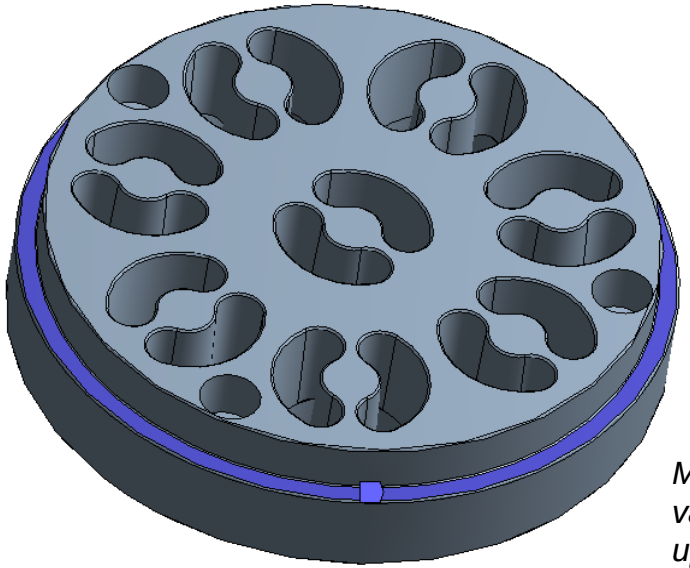


Redesigned for Greater Efficiency

- Milled seat design allows optimization of flow area
- Removal of cartridge design optimizes clearance volume
- Seat structural strength has been increased
- Optimized guard design further increases efficiency



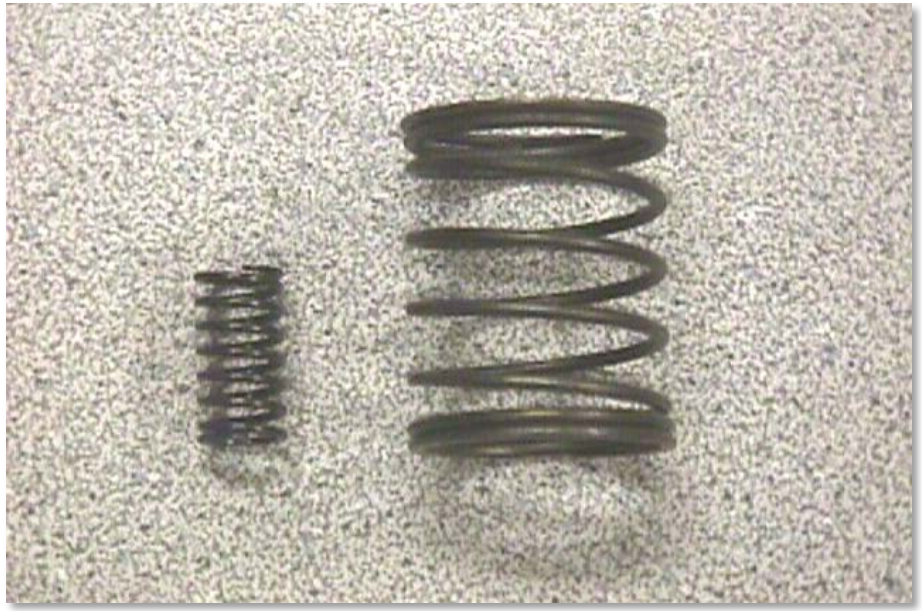
Original MOPPET valve



MOPPET valve upgrade

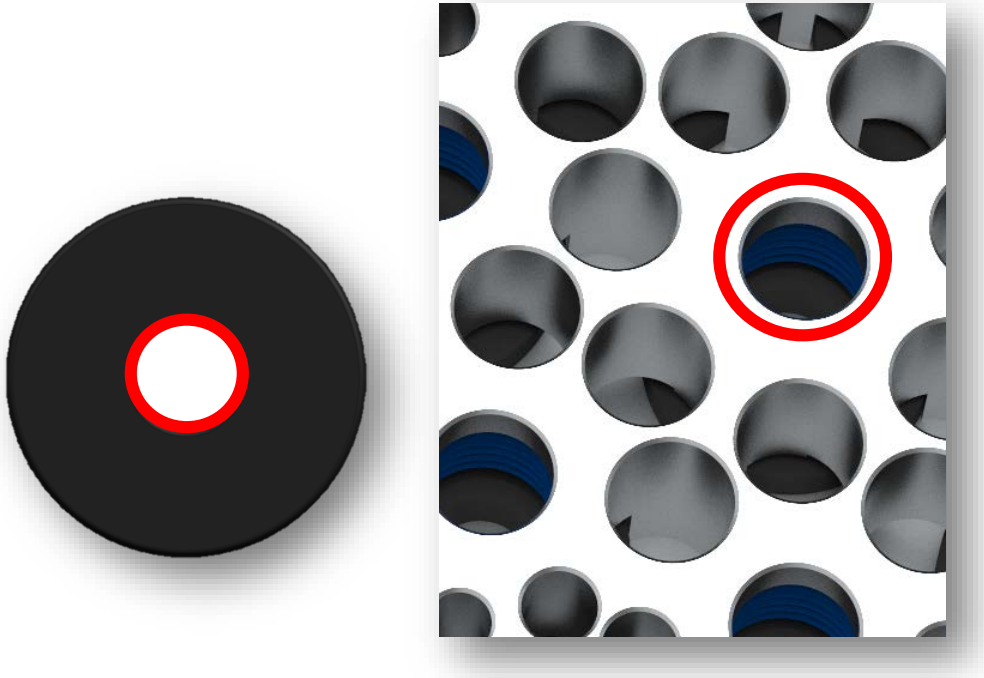
Retains Benefits of Legacy MOPPET Valve

- Large spring design
- Larger spring wire diameters allow lower stress designs
- Larger size allows increased coil clearances



Comparison of a MOPPET valve spring (right) and conventional valve spring (left)

- Centre disc flow adds lift area
- Large spring pocket diameters prevent debris build-up in pocket
- Centre flow cleans spring pocket



Proven Benefit – Extensive Testing

At 900 rpm, the MOPPET® valve upgrade provided up to 13% more flow while consuming nearly 5% less power.

- Comparison testing completed in house
  - Proved out flow and efficiency
- Several customer test sites
  - Over 8,000 hours run time (in several locations)
  - Sites chosen to test reliability in a variety of difficult service applications
  - Performance analysis shows reliable sealing and consistent, efficient flow performance over time

900 RPM				
Ø8.75 x 5.5	Data Collection	Existing Design	New Design	% Improvement
Flow (SCFM)	Flowmeter	1610	1815	12.7%
IHP/MMSCFD	Measured	47.16	42.36	-10.2%
Motor kW	Measured	103	98.4	-4.5%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