GD ENERGY PRODUCTS

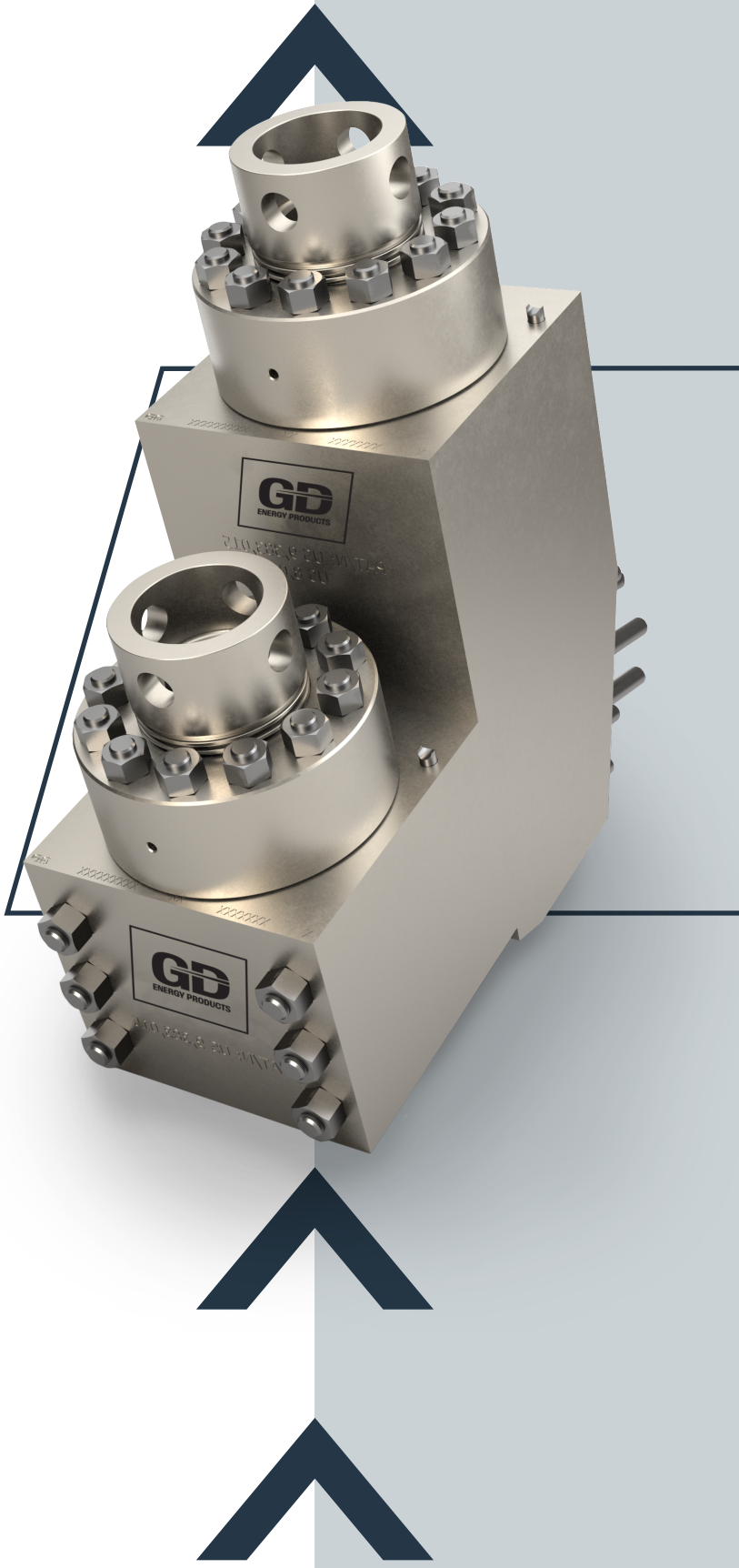
WE BUILD CONFIDENCE

OPTIMIZING MODULES FOR 10K PSI

The demand for greater performance and cost-effective operations continues to grow, pushing the boundaries of what drilling technology can achieve. Operators are now challenging drilling contractors to operate at unprecedented pressures, with 10,000 psi emerging as the new benchmark. This shift is driven by the need to extract resources from deeper wells and handle higher drilling pressures, placing immense stress on mud pumps and their critical components. These escalating requirements call for innovative fluid end designs capable of withstanding these extreme conditions.

GD Energy Products, working closely with leading drilling contractors, has developed groundbreaking fluid end modules to meet these challenges. Designed for exceptional durability and performance, these modules set a new standard for continuous-duty operations, capable of handling pressures that stretch traditional designs to their limits. The Y-Shaped module represents a revolutionary leap forward, offering resilience and efficiency at pressures up to 10,000 psi.

Modern high-pressure drilling operations also bring unique challenges to mud pump fluid end flow dynamics. Elevated pressures and flow velocities amplify issues like cavitation and operational wear. GD Energy Products has risen to the occasion by creating innovative, field-proven designs tailored to meet these rigorous challenges.



INNOVATING FLUID END DESIGN

For over five decades, fluid end modules have struggled to match the rapid progression of other drilling technologies. Legacy designs, such as the mono-block “valve-over-valve” module, gained popularity for their lightweight structure, compact footprint and straightforward maintenance. However, as the industry demanded higher performance, these designs were stretched far past their original capacities. By the 1980s, modular two-piece L-shaped fluid ends were introduced, bringing flexibility in replacing suction and discharge components independently. Yet, even these designs revealed inherent shortcomings, including restricted fluid flow and poor volumetric efficiency.

Recognizing these limitations, GD Energy Products engineered the Y-Shaped drilling module, specifically designed to excel in continuous operations at pressures reaching 10,000 psi. At its core lies a patented internal bore geometry that enhances fluid movement while preventing stress risers that lead to wear and fatigue. [cont.]

By eliminating sharp 90° angles and widening intersections to a radius of 120°, the Y-Shaped module reduces turbulence and stress concentrations better than its L-shaped predecessor.

Complementing this design is an API 7 standard valve assembly, integrated to deliver maximum performance by enabling smoother and faster fluid movement. To boost longevity and minimize wear, bore seal technology has been incorporated to safeguard critical module points, such as valve covers, seal carriers and wear plates.

The Y-Shaped module's two-piece configuration sets it apart by streamlining maintenance and minimizing downtime. Operators can now replace the suction module, the most common point of failure, without replacing the entire system. This results in reduced costs and extended service life for the discharge module, delivering exceptional operational value. The module's compact vertical dimensions also minimize un-swept, or "dead," volume, improving volumetric efficiency and maximizing consistency with each operational cycle.

Manufactured with high-quality, heat-treated forgings, the Y-Shaped module is built to endure the harshest conditions in high-pressure environments. Its ergonomic forward-leaning orientation allows for easier maintenance. It is also compatible with a range of standard GD Energy Products hardware that is readily available for replacing parts.

PREVENTING DAMAGE

Operating mud pumps at higher pressures and faster speeds amplifies fluid velocity, which can lead to turbulence, increased wear and risks like cavitation. Cavitation, caused by rapid pressure changes within drilling fluids, introduces damaging vapor-filled cavities into the pump. When these pockets collapse, they create intense shock waves capable of causing surface pitting and stress concentrations. Over time, this leads to serious issues like cracking or complete module washout.

Traditional fluid end designs, such as the L-shaped module, exacerbate these risks by forcing drilling fluid through sharp directional changes, creating additional stress risers and turbulence. Additionally, the taller design of these modules increases dead volume, further reducing flow efficiency and intensifying the strain on components.

The Y-Shaped module from GD Energy Products is meticulously engineered to combat these challenges. By optimizing the flow path through patented bore geometry, the module redirects drilling fluid smoothly from suction to discharge with minimal restriction or redirection. The expanded 120° radii at intersections significantly reduces stress, while bore seal technology ensures erosion resistance at key structural points. This innovative design minimizes wear and the risk of cavitation but also enhances volumetric and operational efficiency. Whether operating at 7,500 psi or reaching 10,000 psi, the Y-Shaped module remains reliable in the field.

CONCLUSION

The industry's shift to 10,000 psi operations demands new benchmarks for performance and durability. GD Energy Products' Y-Shaped drilling module provides the ideal solution, combining innovative engineering with practical maintenance benefits. By addressing the long-standing inefficiencies of legacy systems, it sets a new standard for fluid end design and ensures safer, more cost-effective performance in high-pressure drilling environments.

Engineered for the demands of the future, the Y-Shaped module reflects GD Energy Products' commitment to advancing drilling technology. It is not just a solution for today's challenges. Rather, it is a promise of enhanced efficiencies and reliable operations for years to come.

Figure 1. *Cavitation occurs when rapid changes of pressure in a liquid lead to the formation of small vapour-filled cavities (air bubbles) and can ultimately lead to cracking or module washout.*

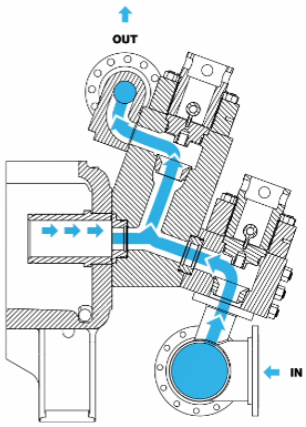


Figure 2. *This simple, uniform flow pattern reduces fluid turbulence, which decreases the internal stress placed on a module.*