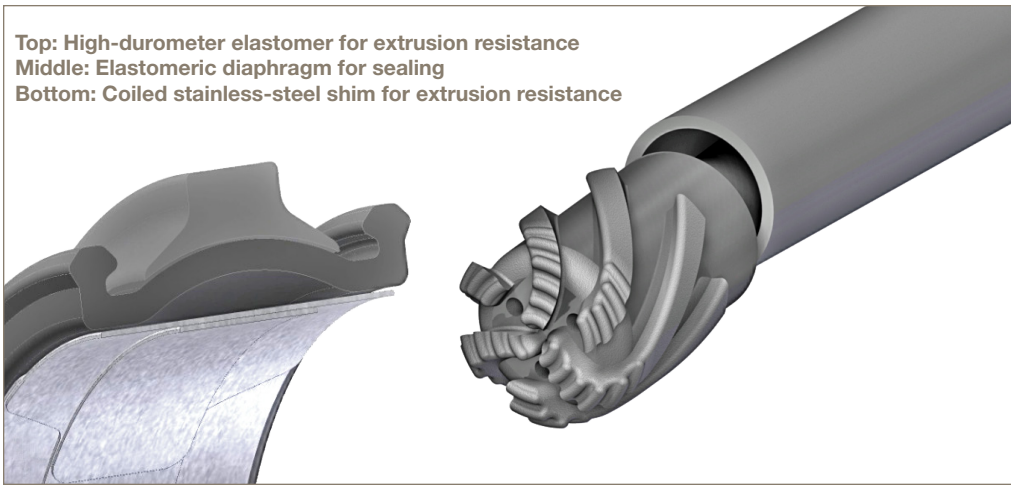
High-Pressure Steerable Drilling Diaphragm

Engineered Solutions
Issue 19

Problem:

Steerable drilling technology allows more efficient access to oil, but requires drill heads to articulate while drilling. This requires keeping high-pressure oil in the drill housing while keeping high-pressure debris out, and at the same time allow the housing to flex as the drill changes direction. The challenge of creating a seal which contains high internal pressure, maintains angular flexibility of the system, and resists high external pressure, is that a stiff material is required to prevent extrusion under pressure and this can limit flexibility. The previous sealing technology was a diaphragm reinforced with fiber for strength and a hard plastic ring to resist extrusion. This seal assembly was unable to sufficiently prevent extrusion from the outside or from the inside, resulting in premature failure.



Top: High-durometer elastomer for extrusion resistance
Middle: Elastomeric diaphragm for sealing
Bottom: Coiled stainless-steel shim for extrusion resistance

Solution:

Parker Engineered Seals Division utilized Finite Element Analysis (FEA) coupled with multiple experimental tests to create a solution meeting the needs of the steerable drilling technology. The solution consisted of a three-piece assembly working under extreme pressure conditions while maintaining the flexibility needed for articulation. The middle component is the sealing diaphragm, which is compressed on both ends and flexible in the middle. The outside component is a very hard elastomer and this piece acts as a solid backup against internal pressure, while preventing the flexible diaphragm from extruding out of the housing cavity. The inner component is a stainless-steel coiled shim. This patent-pending shim technology bridges multiple extrusion gaps on the inside of the seal. The coiled design is able to flex and change size to accommodate maximum articulation of the mating components.

Applications: Any drilling systems using housings that can tilt and flex and need to hold high pressure inside or outside can benefit from this high-pressure diaphragm technology. This solution, or one tailored for your unique system requirements, can be used where a combination of flexibility and pressure extrusion resistance is needed.

Contact Parker Engineered Seals Division and ask for a product engineer to review your application and see what opportunities are waiting to be discovered!

Parker Hannifin Corporation
Engineered Seals Division
501 South Sycamore Street
Syracuse, IN 46567

phone 574 528 9400
fax 574 528 9640

www.parker.com/esd

Parker

ENGINEERING YOUR SUCCESS.