



ARE YOUR CYLINDERS OPTIMIZED?

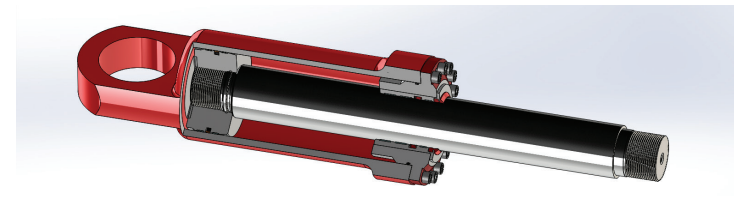
SYSTEM SEALS' NEW SOFTWARE TAKES THE GUESSWORK
OUT OF SEAL DESIGN AND CYLINDER OPTIMIZATION

Cylinder Optimization Process

SYSTEM SEALS CRACKS THE CODE ON SEAL DESIGN

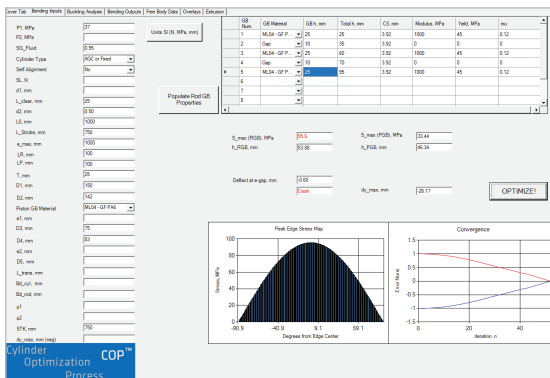
Most seal manufacturers make broad assumptions about cylinder properties, but they don't accurately understand elements such as sideload forces, friction, surface finish and fluid compatibility. In many cases, they aren't even close. So, after several years in the research lab, System Seals changed all that by eliminating assumptions.

System Seals has developed new tools that precisely measure a broad range of critical variables that affect seal performance. Knowing sideload forces, for instance, enables engineers to calculate changing friction levels and the true potential for extrusion. It's a process that enables the highest potential in seal design.



THE COP PROCESS ANALYZES KEY ELEMENTS IN CYLINDER PERFORMANCE:

- Side-load forces in three dimensions
- Guide band forces and nonlinear stress on guide bands
- The optimum number, size and material of each guide band
- Bending, deflection and clearance of the rod and piston
- Metal clearance analysis
- Extrusion analysis and seal selection
- Changing friction levels for seals and guide bands in action
- Chemical compatibility among fluids and seals
- Surface finish and its effects on friction



Specific operating values from each cylinder are entered into the calculator, which determines the precise side-load forces on the guide bands. Knowing these values, System Seals can accurately predict failures and design seals that significantly outperform standard parts.

01

SIDE LOAD

System Seals' side-load calculator measures precise forces and contact area of the guide bands during side loading. Knowing this information provides a significant benefit on a seal's design and performance. The new calculator is an integral part of System Seals' overall Cylinder Optimization Process.

02

EXTRUSION POTENTIAL

Knowing the true extrusion gap, or e-gap, derived from System Seals' side-load calculator, engineers can precisely calculate extrusion potential. The calculator is based on extensive inhouse testing, more than 300 FEA simulations and predictive modeling.

The calculator accounts for:

- Material composition
- Extrusion gap
- Pressure
- Temperature
- Safety factor

03

FRICTION ANALYSIS

Contrary to common belief, friction levels are rarely constant. They vary greatly based on material combinations and contact forces. System Seals has conducted extensive friction research on reciprocating, oscillating and linear motion models. The data enables friction-level prediction for any seal and guide-band combination, once extrusion and guidance analyses are complete.

04

CHEMICAL COMPATIBILITY

System Seals conducts extensive fluid compatibility tests, which last seven to 28 days. Although 90 days is an optimal time. Our research has revealed that shorter test times often create false-positive results. Problems typically present themselves after seven to 10 days and often longer. System Seals maintains a searchable database of hundreds of completed tests.

The test parameters include:

- Tensile properties
- Mass, density and volume swell
- Hardness
- Compression set
- Abrasion
- Changes in minimum service limits (Tg)

05

SURFACE FINISH

Surface finish is usually underrepresented by using only one variable, roughness average, or Ra.

System Seals calculates:

- **Ra** – the average roughness
- **Rz** – the microscopic differences in peaks and valleys of the grooves
- **Rt** – the total height of the roughness profile
- **Bearing Ratio** – the length of the bearing surface.

These parameters provide much greater insight into designing seals and wear bands for high performance and longevity.



Ultra-High-Performance Seals for Mission-Critical Applications

System Seals is the industry leader in ultra-reliable performance seals for global OEMs and service customers. System Seals is an engineering-based company with proprietary design tools that optimize seal performance for a wide range of applications worldwide. Some of the largest OEMs rely on System Seals for mission-critical designs.

Visit our [Technical Center](#) to learn more about how System Seals has changed the way seals are designed, while driving down the total cost of ownership.

systemseals.com

THE CYLINDER OPTIMIZATION PROCESS IS IDEAL FOR:

- ORIGINAL EQUIPMENT MANUFACTURERS
- MAINTENANCE AND REPAIR
- OIL AND GAS
- METAL PROCESSING
- WIND ENERGY
- MOBILE HYDRAULICS
- HYDRAULIC PRESSES
- INJECTION MOLDING

USA
800 465 8835

9505 Midwest Ave.
Cleveland, Ohio 44125

GERMANY
+49 (0) 40 228 175 85-0

Ossenpadd
25495 Kummerfeld