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ENGINEERING SERVICES

[How to reduce hydraulic cylinder repair costs](#)

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As a product group, cylinders are almost as common as pumps and motors combined. So if you operate a lot of hydraulic equipment, it's likely that cylinder repair expenses are a significant portion of your total maintenance costs.

It is often stated that up to 25% of mechanical equipment failures are failures of design. If we extrapolate this to hydraulic cylinders, as many as one in four hydraulic cylinders are not adequately designed for the application they are operating in. This doesn't mean that the cylinder won't do the job asked of it, it will - but not with an acceptable service life. If you have a particular cylinder that requires frequent repair, you may need to address one or more of these design-related problems:

Bent Rods

Bent rods are a common cause of rod seal failure. Bending of cylinder rods can be caused by insufficient rod diameter or material strength, improper cylinder mounting arrangement or a combination of all three. Once the rod bends, excessive load is placed on the rod seal resulting in premature failure of the seal. The permissible rod loading for a cylinder in an existing application can be checked using the Euler formula. A detailed explanation of how to do this is contained in [Industrial Hydraulic Control](#).

Ballooned Tubes

Ballooning of the cylinder tube is usually caused by insufficient wall thickness and/or material strength for the cylinder's operating pressure. Once the tube balloons, the correct tolerance between the piston seal and tube wall is lost and high-pressure fluid bypasses the seal. This high velocity fluid can erode the seal and localized heating caused by the pressure drop across the piston reduces seal life.

Insufficient Bearing Area

If the internal bearing areas in the gland and at the piston are insufficient to carry the torsional load transferred to the cylinder, excessive load is placed on the rod and piston seals. This results in deformation and ultimately premature failure of the seals.

Rod Finish

The surface finish of the cylinder rod can have a dramatic effect on the life of the rod seal. If the surface roughness is too low seal life can be reduced through inadequate lubrication. If the surface roughness is too high,

contaminant ingress is increased and an unacceptable level of leakage can result.

In the context of extending cylinder service life, consider the surface of the cylinder rod as a lubricated wear surface and treat it accordingly. In some applications, the use of an alternative rod surface treatment with superior mechanical properties to conventional hard chrome plating, such as [black nitride](#) or High Velocity Oxygen Fuel (HVOF) metal spraying, can increase the service life of the rod and its seals. The installation of a [shroud to protect the rod surface and seals](#) from impact damage and contaminants can afford similar life extension benefits.

Repair or Redesign?

Not all hydraulic cylinders are made equal. So if you have hydraulic cylinders that suffer recurring failure, it's likely that modifications to the cylinder are required to break the vicious circle of failure and repair.

ABOUT THE AUTHOR: Brendan Casey has more than 25 years experience in the maintenance, repair and overhaul of mobile and industrial hydraulic equipment. For more information on reducing the operating cost and increasing the up-time of your hydraulic equipment, visit his web site:
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