Fluid Sealing International
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Mechanical Seal Analysis (MSA)

Date	06/24/20	**Pump Position**	805P7A
MSA #	2020-028	**Seal Manufacturer**	FSI
Inquiry #	I-20-0067	**Seal Model**	MS2080NSP0030-2330
Customer	Anchor Seals	**Shaft Size**	1.875”
Customer Ref #	2191848	**Drawing #**	FSI-2330
End User	USS Clairton Works	**Seal Serial #**	01897
Pump House	TEC	**Inboard Rotary Material**	Silicon Carbide
Contact	Jason DiBiase	**Inboard Stationary Material**	Tungsten Carbide
Phone	412-299-6900	**Outboard Rotary Material**	Silicon Carbide
Salesperson	House	**Outboard Stationary Material**	Tungsten Carbide
		Elastomers	Kalrez 6375

General Seal Condition

Seal was returned assembled cover in product.

Figure 1: Seal Assembly

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The Barrier Outlet port was found clogged with hardened product.

Figure 2: Barrier Outlet Port

The Barrier Inlet port was found clogged with hardened product.

Figure 3: Barrier Inlet Port

Seal Face Conditions

Inboard Tungsten carbide stationary face was coated in product. Once cleaned it showed a concentric wear pattern including scratches on the sealing face.

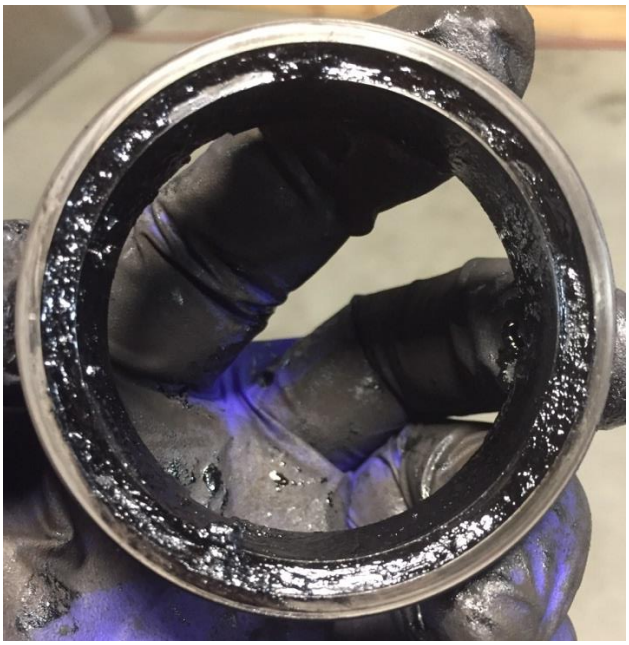

Figure 4: Inboard Stationary Face

Inboard silicon carbide rotary face was coated in product, cracked in multiple locations. The main break appeared to have started near one of the drive pins.

Figure 5 & 6: Inboard Rotary Face

Outboard Tungsten carbide stationary face was covered in product. Once cleaned it showed a concentric wear pattern including scratches on the sealing face.

Figure 7: Outboard Stationary Face

Outboard silicon carbide rotary face was coated in product. Once cleaned it was cracked and broken in multiple locations. It should be noted that the wear on the seal face was considerable.

Figure 8: Outboard Rotary Face

Elastomers

The Outboard stationary O-ring was cooked and almost no existent.

Figure 9: Outboard Stationary O-ring

The Inboard stationary was found to be swollen, fretted and "gummy" possibly from such long expose to the product.

Figure 10 & 11: Inboard Stationary O-ring

Metal Components, Springs, Pins

Gland Plate, Inboard Gland, Sleeve, Thrust Discs, Back Up Rings, Seat Carrier and Drive Collar were found covered in product.

Figure 12: Metal Components

Both the inboard and outboard springs were coated with product. The inboard springs flexed freely upon removal. The outboard springs were stuck in the gland with baked on hardened product. Most were bent during removal.

Figure 13: Inboard Springs, Figure 14: Outboard Springs

Failure Explanation/Recommendation

Failure Explanation: After such a long run life and with such a wide range of damage to the seal it is hard to determine the root cause of the seal failure. The outboard shows evidence of running dry with no barrier fluid. The inboard shows both a damaged stationary O-ring as well as a heavily cracked rotary face originating at the anti-rotation pins of the rotary holder. All of which could have been the result of their own failure mode.

Recommendation: It is recommended to replace this seal our new 2080D double balanced, double seal specified for this application. Also to be installed with the barrier fluid in the seal pot at the recommended level and pressurized 15-25 psi above the maximum stuffing box pressure. This practice will help maintain the proper pressure differential between the process fluid and barrier fluid. Also in order to prevent the loss of the seal in the event of the loss of barrier fluid we suggest installing a low level alarm and/or a pressure switch.

Additional Note: This seal was installed on 3/19/2014 per our seal tracking program.