



Mechanical Seal Analysis (MSA)

Date	09/03/21	Pump Position	P-103A
MSA #	2021-038	Seal Manufacturer	FSI
Inquiry #	I-21-0098	Seal Model	MS6040SP0028-2726
Customer	Anchor Seals	Shaft Size	1.75"
Customer Ref #	2202718	Drawing #	FSI-2726
End User	USS Clairton Works	Seal Serial #	02373
Pump House	TEC	Inboard Rotary Material	Silicon Carbide
Contact	Brandon Spithaler	Inboard Stationary Material	Tungsten Carbide
Phone	412-865-2101	Outboard Rotary Material	-
Salesperson	House	Outboard Stationary Material	-
		Elastomers	Kalrez 6375

General Seal Condition

Seal was returned assembled.



Figure 1: Seal Assembly

The quench port orifice was found to be clear.



Figure 2: Quench Port

The drain port was found to be mostly clogged with debris.



Figure 3: Drain Port

Seal Face Conditions

The tungsten carbide stationary face showed an even and concentric wear pattern.



Figure 4: Stationary Face

The Silicon carbide rotary face showed an even and concentric wear pattern, but did show a fair amount of wear.

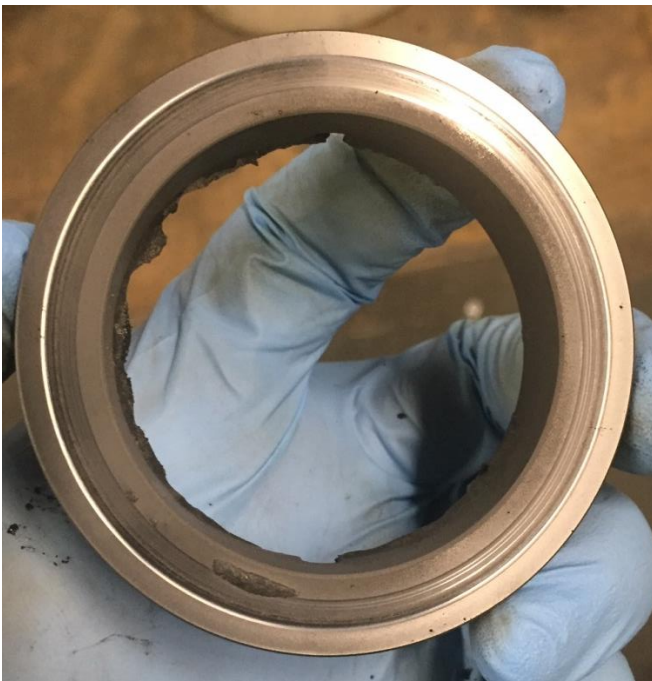


Figure 5: Rotary Face

Elastomers

All O-rings appeared to be in fair condition for sealing purposes. The stationary bellows capsule O-ring was fretted.



Figure 6 & 7: O-rings

Metal Components, Springs, Pins

Most metal parts are in good working order. The Baffle plate was damaged during disassembly.



Figure 8: Metal Components

After inspection, sandblasting and cleaning the bellows was pressure tested to determine that it did have a leak in the leaflets.



Figure 9: Bellows

Failure Explanation/Recommendation

Failure Explanation: It appears that the seal failure was caused by a leak in the metal bellows. The cause of the tearing the bellows is unknown but there is evidence of possible vibration/runout due to the fretting of the stationary o-ring shown in the above photos.

Recommendation: Repair the seal and return it to service. Please ensure that the 3-5 psi steam quench is maintained through operation. This will help to limit the amount of added torque the bellows sees at startup due to hardened product. As well as follow all FSI manufacturer specifications when installing the mechanical seal to the pump.

Additional Note: This seal was reported to have run 2 years and 8 months.