



## Mechanical Seal Analysis (MSA)

|                       |                    |                                     |                       |
|-----------------------|--------------------|-------------------------------------|-----------------------|
| <b>Date</b>           | 11/01/21           | <b>Pump Position</b>                | 802P2A                |
| <b>MSA #</b>          | 2021-049           | <b>Seal Manufacturer</b>            | FSI                   |
| <b>Inquiry #</b>      | I-21-0118          | <b>Seal Model</b>                   | MS6040HTC0046-2868    |
| <b>Customer</b>       | Anchor Seals       | <b>Shaft Size</b>                   | 2.875"                |
| <b>Customer Ref #</b> | -                  | <b>Drawing #</b>                    | FSI-2868              |
| <b>End User</b>       | USS Clairton Works | <b>Seal Serial #</b>                | 02530                 |
| <b>Pump House</b>     | TEC                | <b>Inboard Rotary Material</b>      | Silicon Carbide       |
| <b>Contact</b>        | Brandon Spithaler  | <b>Inboard Stationary Material</b>  | Tungsten Carbide      |
| <b>Phone</b>          | 412-865-2101       | <b>Outboard Rotary Material</b>     | -                     |
| <b>Salesperson</b>    | Brandon Spithaler  | <b>Outboard Stationary Material</b> | -                     |
|                       |                    | <b>Elastomers</b>                   | Graphoil/ Kalrez 6375 |

### General Seal Condition

The seal was removed assembled.



**Figure 1: Seal Assembly**

Both the drain port and the quench port were found clear of any obstructions.



**Figure 2: Drain Port, Figure 3: Quench Port**

## Seal Face Conditions

The Tungsten Carbide stationary face showed an even wear pattern.



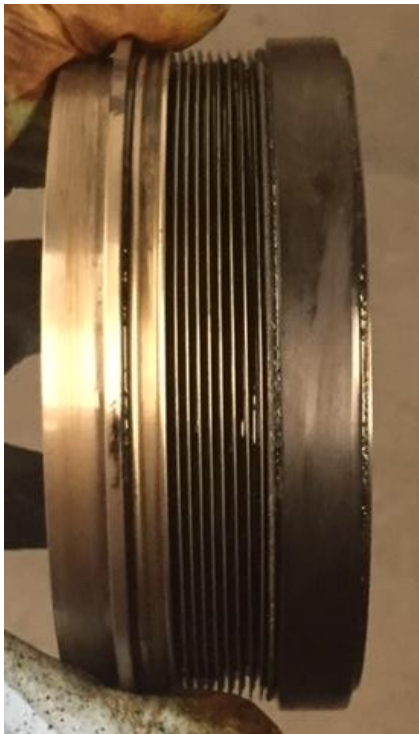
**Figure 4 & 5: Stationary Face**

The Silicon Carbide rotary face showed an even wear pattern. This face can be lapped and polished.



**Figure 6: Rotary Face**

The metal bellows capsule was pressure tested and showed no signs of leakage.



**Figure 7: Metal Bellows**

## Elastomers

All Graphoil gaskets and Kalrez O-ring were in good condition for sealing purposes.



**Figure 8: O-Rings/ Gaskets**

## Metal Components, Springs, Pins

All Metal Parts are in good working condition.



**Figure 9: Metal Components**

The segmented carbon bushing and springs are in good working condition.



**Figure 10: Metal Parts**

#### **Failure Explanation/Recommendation**

**Failure Explanation:** This seal did not leak or fail. This seal was on the outboard end of Pump 802P2A and that outboard bearing experienced high vibration. Both the bearing as well as the seal was changed out on the pump onsite at USS Clairton. This seal was brought in for repair and evaluation as a precaution due to the vibration that it endured during service.

**Recommendation:** Repair the seal and return it to service. Please ensure 3-5 psi of stream is constantly supplied to the quench port of the seal. It is also crucial that the seal drain piping be piped away from directly below the bearing housing. For the seal repair, we do recommend replacing the bellows capsule during each repair due to having no way to know the stresses that the welds and bellows leaflets have experienced during operation.

**Additional Note:** This outboard seal ran on this pump for 8 months prior to this high vibration being reported but was not removed due to a seal leak. The Inboard seal is still running on this pump and has been since 2/4/21.