INSPECTION REPORT

GRN No.	[redacted]	**Customer:**	[redacted]
Quote Refs.	[redacted]		
Your ref.			[redacted]

Seal Type	Burgmann MR1S5F Cartridge
Size	125mm
Material	WC/SiC/Vit/316/316-WC/SiC/Vit
Nash P/No.	BUR/MR1S5F/1250/UQVGG-UQV/OR3238/X
Cust. Ref.	Fabrik No. 07/7719
Equipment	Netzsch LMZ 150 Mill
Duty	Inks 460rpm 3.5barg Nitex Min Oil Barrier at 6 barg

NASH Mechanical Seal Services

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Part	Material	Description Of Condition	Replace	Reuse
IB SSR	Silicon Carbide	Deep circumferential scoring all round wear track. Edge chipping all round outside diameter of face. Coated with product. Measured 26.29mm on receipt. 25.84mm after grinding and lapping (Several small chips remain)	☒	☐
IB RSR	Tungsten Carbide	Light circumferential scoring all round wear track. Coated with product. Measured 16.13mm on receipt. 16.07mm after grinding and lapping	☐	☒
OB SSR	Silicon Carbide	Light circumferential scoring all round wear track. Light coating of product. Measured 26.16mm on receipt. 26.06mm after grinding and lapping	☐	☒
OB RSR	Tungsten Carbide	Light circumferential scoring all round wear track. Measured 16.15mm on receipt. 16.1mm after grinding and lapping	☐	☒
Shaft Sleeve	316ss	Generally good condition. Coated with product	☐	☒
Drive pin	316ss	Generally good condition	☐	☒
OB RSR Holder	316ss	Generally good condition	☐	☒
Drive pin	316ss	Generally good condition	☐	☒
Hex HD Cap Screw	A4-70	Generally good condition	☐	☒
IB Seal Plate	316ss	Generally good condition	☐	☒
IB SSR O Ring Back-up Ring	G/Filled Ptfe	Generally good condition. Coated with product. 2off	☒	☐
Housing	316ss	Generally good condition. Coated internally with product	☐	☒
Locating Pin	316ss	Generally good condition	☐	☒
Housing Insert	316ss	Generally good condition. Coated with product	☐	☒
IB Spring	316TI/316ss	Generally good condition. Coated with product	☐	☒
OB Spring	316TI/316ss	Generally good condition. Coated with product	☐	☒
IB Spring Plate	316ss	Generally good condition. Coated with product	☐	☒
IB SSR Pin	316ss	Generally good condition. Coated with product	☐	☒
OB Spring Plate	316ss	Generally good condition. Coated with product	☐	☒
OB SSR Pin	316ss	Generally good condition. Coated with product	☐	☒
OB Seal Plate	316ss	Generally good condition. Coated internally with product	☐	☒
OB SSR O Ring Back-up Ring	G/Filled Ptfe	Generally good condition. Coated with product	☒	☐
Lip Seal	Viton	Light wear in bore	☒	☐
Hex HD Cap Screw	A4-70	Generally good	☐	☒
Transit Pin	A4-70	Missing	☒	☐
Transit Pin Washers	Copper	Missing	☒	☐
Hex HD Cap Screw	A4-70	Missing	☒	☐
Shaft Sleeve O ring	Viton	Generally good condition	☒	☐
IB RSR O Ring	Viton	Generally good condition	☒	☐

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OB RSR O Ring	Viton	Generally good condition	☒	☐
IB SSR O Ring	Viton	Split in two. Small section missing. Severely nibbled and split for approximately 75mm. Nibbling and splitting starting to appear all round the inboard side of the O ring See Figs 1and 2.	☒	☐
Housing O Ring	Viton	Generally good condition	☒	☐
OB SSR O Ring	Viton	Generally good condition	☒	☐
OB Seal Plate O Ring	Viton	Generally good condition	☒	☐

Comments. **Repair Level** **1** ☐ **2** ☒ **3** ☐ **4** ☐

Background

This seal was fitted to a Netzsch LMZ150 Bead Mill operated by ********. ****** ********, Maintenance Manager at *****, confirmed the seal had only been in service for 3 months. He also said he believed the failure of the seal was caused by production staff forgetting to switch on the chillers that cool the cooling liquid circulating the mill chamber. This caused the mill to 'cook' - overheat. Shortly after the chillers were switched on, the seal lost fluid and pressure inboard and the seal support pressure switch tripped and stopped the mill.**

The seal support liquid is also cooled via a cooling coil in the seal pot. However, chilled water is automatically fed through the coil when the mill is started, thereby ensuring the sealing liquid will always be cooled when the mill is operational.

******** also confirmed that the mill chamber pressure switch is set to 3.5 bar g. The seal system pressure is set to operate at 6 bar g and the seal system pressure switch is set to trip the mill if seal system pressure drops below 5.5 bar g.**

Key Observations

1. The seal was generally in good condition.

2. The inboard stationary seal ring 'O' ring was severely damaged and extruded over a 4-5 cm length on receipt (Fig.1 & 2). When removed, closer examination under the microscope showed damage to the surface of the 'O' ring where exposed to product and beads. Beads became trapped between the 'O' ring and the product side groove wall, causing permanent crater like depressions in the 'O' ring surface (Fig.3). A clear deformation line also formed where the 'O' ring sits against the edge of the groove wall and the 'O' ring has broken down / peeled along this line (Fig.3). Beads were also embedded around the entire I/D of the 'O' ring (Fig.4).

Conclusions and recommendations

1. The primary cause of seal failure appears to be failure of the inboard stationary seal ring 'O' ring. Excessive temperature in the mill chamber has compromised the mechanical properties of the viton rubber and it has broken down in this area. The presence of metal beads (250 micron size) embedded in the 'O' ring would suggest that the impact of beads on the mechanically compromised surface of the 'O' ring due to elevated temperature also contributed to the break down of the 'O' ring surface. The 'O' ring eventually failed and was extruded by seal system pressure, causing rapid loss of seal system fluid and pressure.

We recommend a way be found that ensures the mill cannot be started without the mill chamber cooling system being in operation.

2. Under normal operating conditions, it should not be possible for beads to become trapped between the product side o-ring groove wall and the inboard stationary seal ring o-ring because seal system pressure, set in this case at a positive differential pressure of +2 bar g, will push and hold the o-ring against the o-ring groove wall, preventing bead ingress. It is possible beads only entered this area after the seal failed when seal pressure was lost. The only other explanation is that mill chamber pressure exceeded 6 bar g (seal system pressure) at some point, pushing the o-ring back in the opposite direction against the ptfe support rings and allowing beads to enter the gap created.

At the time of writing, it is unclear if pressures in excess of 6 bar g are ever applied to the mill chamber. There has been a suggestion that plant air (possibly in excess of 6 bar) may be applied at times (when the mill is stationary?) to 'clear' the mill of blockages of product/beads. This should be investigated and if confirmed, the practice must be stopped immediately. If this is not possible, another solution could be to permanently increase seal system pressure in order to maintain a positive pressure differential at all times. We would be happy to provide advice regarding the pressure capabilities of this mechanical seal if required.

Originator	[redacted]	**Date**	[redacted]

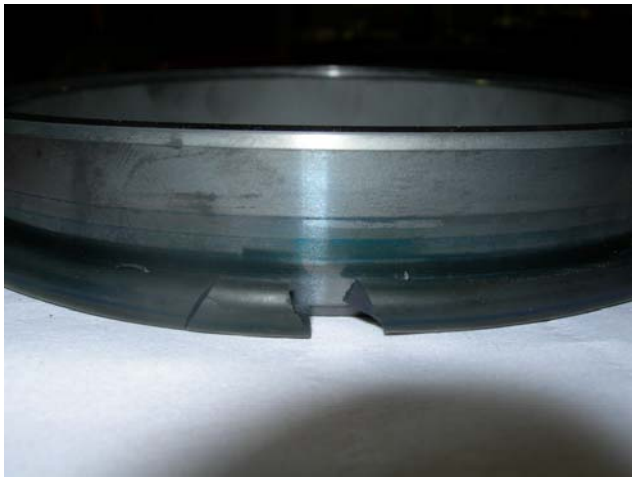

Fig.1 Inboard stationary seal ring O-ring showing section missing.

Fig.2 Inboard stationary seal ring O-ring showing nibbling and cracking

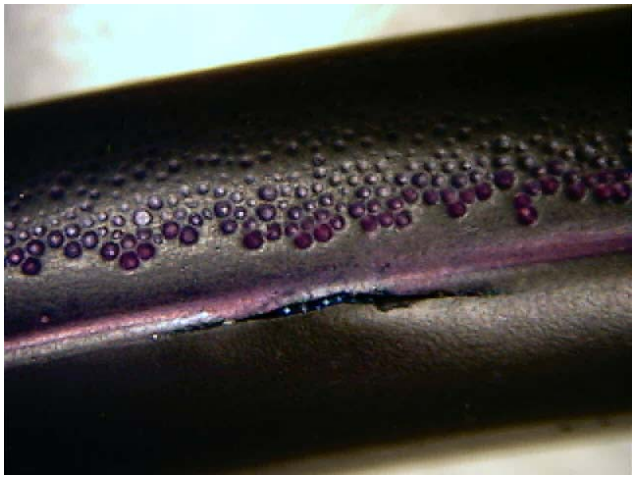

Fig.3 Inboard stationary seal ring O-ring showing indentations left by trapped beads and peeling due to softening at elevated temperature.

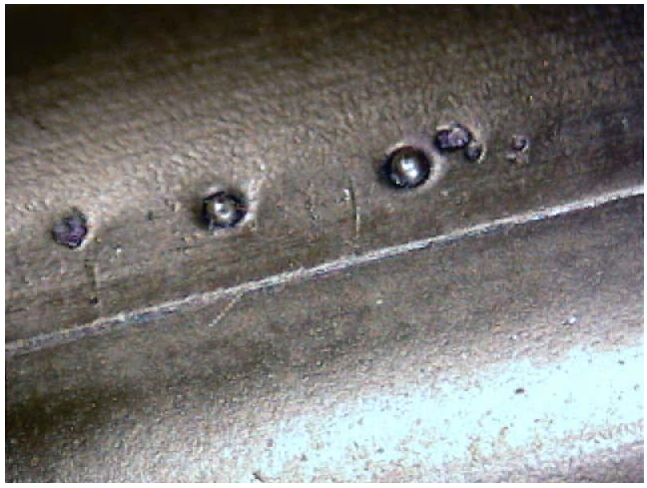

Fig.4 Inboard stationary seal ring O-ring showing beads embedded in the softened surface (ID /product side).