

# OMEGASLATE SUPERSEAL SYSTEMS LIMITED

## ROTARY VALVE UPGRADE CASE HISTORY QUARRY APPLICATION No.9

**HISTORY:** A quarrying customer operated a proprietary 300 mm NB heavy duty rotary valve, fitted with ni-hard bore and endplate liners, hardened steel shaft liners and 6 mm thick hardened steel blades. The valve was used to feed abrasive stone dust into a pneumatic conveying system.

OmeGaslate upgraded this customer's 300 mm NB Ni-hard rotary valve, using a diamond ground 95% alumina ceramic lining system. The following comparative results were achieved:

| <b>CRITICAL ROTOR CLEARANCES AT VALVE INSTALLATION AND AT FAILURE</b> |                                       |                                       |
|---|---------------------------------------|---------------------------------------|
|   | <b>NI-HARD LINED<br/>VALVE<br/>mm</b> | <b>CERAMIC LINED<br/>VALVE<br/>mm</b> |
| Rotor radial clearance at valve INSTALLATION                          | <b>0.22</b>                           | <b>0.20</b>                           |
| Rotor axial clearance/end at valve INSTALLATION                       | <b>0.23</b>                           | <b>0.23</b>                           |
| Rotor radial clearance at FAILURE                                     | <b>1.5 to 3.9</b>                     | <b>0.55 to 2.93</b>                   |
| Max rotor axial clearance/rotor end at FAILURE                        | <b>10.00</b>                          | <b>0.71</b>                           |
| OPERATIONAL LIFE ACHIEVED TO FAILURE                                  | <b>8 WEEKS</b>                        | <b>96 WEEKS</b>                       |

The Ni-hard valve failed because all the Ni-hard components had completely worn out within 8 weeks of operation. The ceramic lined valve failed because the ceramic shaft protection failed. If it had not been for the ceramic shaft protection failure, the ceramic lined rotary valve would have been operational for significantly longer than 96 weeks. However, the reason for the ceramic shaft protection failure was over tightening of the steel stuffing box compression rings, which caused the adhesive joints, between the 38 mm rotor shafts and the 50 mm outside diameter ceramic shaft liners, to shear. The 38 mm diameter rotor shafts, running through the stuffing boxes, were deemed too weak for this application as they were prone to bending and flexing.

The customer, although being very pleased with the 96 week life, realised that the operating life of the ceramic lined valve could be increased still further if design and engineering improvements were to be made.

**THE BRIEF:** To provide a rotary valve with increased reliability and operating life, and to improve rotor shaft sealing through endplates.

### IMPLEMENTING THE BRIEF:

To fulfil the requirements of the brief, it was decided to proceed as follows :

1. To use an existing proprietary cast iron valve body and fit new 10 mm thick, diamond ground, 99.7% alumina ceramic lining system (see figure1).

2. To use a heavy duty rotor with a minimum 50 mm diameter steel shaft and 75 mm alumina ceramic shaft protection through stuffing boxes (**almost a 75% increase in steel shaft sectional area and 66% increase in shaft sealing area**). The ceramic shaft protection is to be bonded to the rotor shaft and mechanically locked in position with castellated steel rings welded to the rotor shaft. Ceramic blades will be as used on the previous ceramic lined valve (see figures 2 & 3).

3. To manufacture new fabricated and machined steel endplates with larger stuffing boxes to house 12 mm square PTFE square section packing (**a 125% increase in sectional area, over the previous 8 mm square section packing**) and heavy duty circular, 3 bolt, steel packing compression clamping rings (see figures 4, 5 & 6).

The photographs on page 3 are of the latest ceramic upgrade; page 4 show the ni-hard lined valve, prior to the first ceramic upgrade, after 8 weeks in operation; page 5 shows the first ceramic upgrade after 96 weeks in operation.



**300 mm NB CERAMIC LINED ROTARY VALVE**



Figure 1



Figure 2



Figure 3



Figure 4

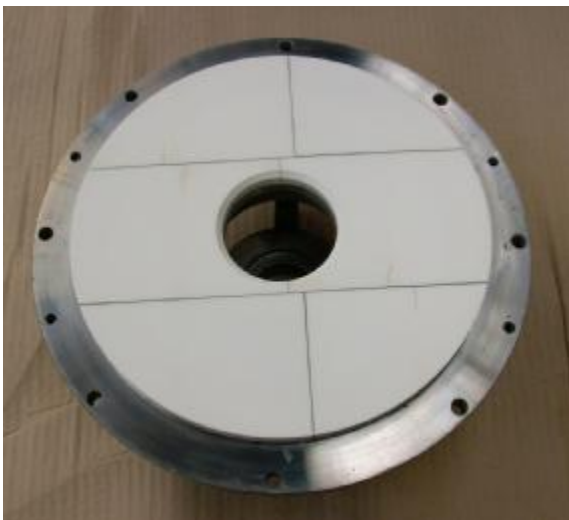
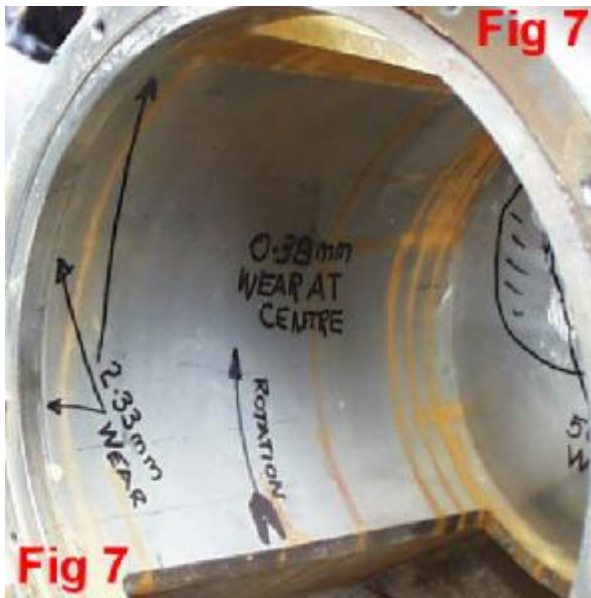


Figure 5



Figure 6





**Fig 7**  
NI-HARD LINED BORE



**Fig 5**  
NI-HARD LINED DRIVE ENDPLATE



**Fig 6**  
NI-HARD LINED NON-DRIVE  
ENDPLATE



**Fig 3**  
ROTOR VANE END WEAR



HARDENED STEEL SHAFT LINER



**Fig 2**  
HARDENED STEEL SHAFT LINER

