

TechTalk

Advanced MOGAS metallurgically bonded overlay extends equipment operability

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ML-381 Metallurgically Bonded Overlay

In valve trials in the harshest of environments, MOGAS' new metallurgically bonded weld overlay shows improvement over previous coatings by tripling ball and seat life, promising extended service to equipment, reducing repair costs and increasing profitability.

The Pressures of Acid Leaching

Pressure leaching is a niche hydrometallurgical application that liberates valuable metals making them more susceptible to leaching. The application utilizes exotic materials of construction that withstand the severe service conditions of high temperature, high pressure, and acidity in an abrasive slurry with high solids content. The operational sequencing of the slurry media being treated also has a pronounced impact on the performance, expected life and condition of the valve. This is especially true for autoclave slurry discharge isolation valves in pressure leach circuits—one of the harshest environments. There is a strong drive in the industry to extend the operating campaign duration between shut downs, thereby not only maximizing production, but also utilizing assets to the fullest potential.

During service, cycling the valve results in wear on the lapped surfaces of the ball and seats. This can lead to a leak path after extended use, causing the valve to lose isolation integrity. Prolonged isolation with a leaking valve ultimately leads to erosion of the base metal. This results in a more expensive repair since it becomes improbable to weld repair, and highly probable to scrap and replace the internals when servicing the valve. Operating for an extended period with a leaking valve can also affect safety as erosion wears through the body or end connection. Finally, there is the loss of production if the pressure leach facility needs to undergo an unplanned shutdown.

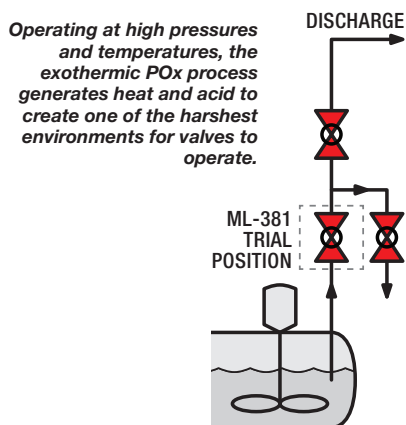
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An analysis of global installations indicates that MOGAS severe service ball valves in the slurry discharge location were historically removed on average every nine to twelve months. MOGAS valves are strongly preferred for slurry service discharge applications because of MOGAS':

- robust proprietary coating and continuous coating research, supported by advanced valve designs
- capability of expediting valve repairs, supported by their dedicated inventory
- strong relationships with end users as their 'partners' by continuously looking for opportunities to achieve the best product cost versus performance combination during the installed valve life

ML-381 Trial

MOGAS had undertaken a mandate in February 2012 to develop a process that would provide a two-fold benefit to its end users. First, to allow end users to achieve longer operating campaigns, and second, to drive down repair costs on the valves returned for service. After extensive research and development MOGAS supplied the first metallurgically bonded overlay to a POx autoclave site for trial in the slurry discharge location.






ML-381 parts manufactured for 10-inch, ASME 600 Class valve.

A 10-inch, ASME 600 Class ML-381 trial valve was installed in the primary (inboard) discharge location at the site in November 2016. The autoclave was operated at 419° F (215° C), 450 psig (3100 kPag), with free acid levels of 35 to 40 g/L H₂SO₄ over the course of the trial. MOGAS inspected the valve during two opportunities (April and August 2017), and during both inspections the valve condition was satisfactory to be reinstalled in service again.

The trial period ended when the autoclave shut down for planned major service in August 2018. At this time the valve was still functioning normally, but was replaced as part of the planned service. The valve accumulated a total installed service life of 21 months. At the time, the autoclave site planned shutdowns occurred every nine months.

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ML-381 Trial

	Inspection 1	Inspection 2	End of Trial
Installation Duration	4 months	9 months	21 months
Cummulative Strokes	25	66	125
Ball Condition			

The ML-381 trial ran from November 2016 to August 2018.

The ML-381 metallurgically bonded weld overlay resulted in tripling ball and seat life.

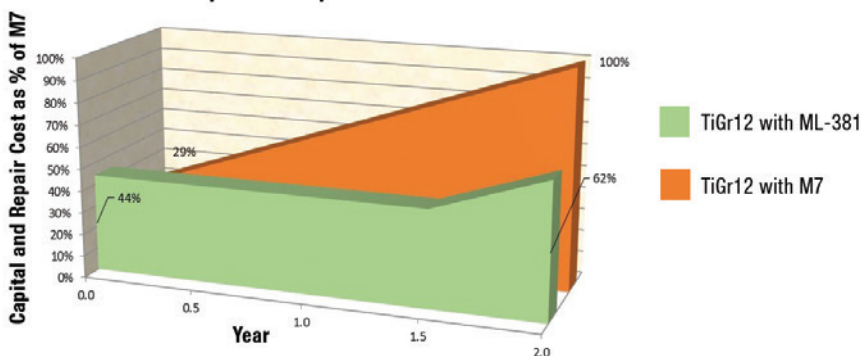
The M7 coating historically supplied in the discharge service ranged in condition, but typically had to be either scrapped or stripped and recoated at the seven-month interval. In comparison, the ML-381 metallurgically bonded weld overlay resulted in tripling ball and seat life. Even after an extended duration of the ML-381 trial valve, 98% of the ball surface was sufficient to undergo a kiss lap. It was also evident that any initial wear or erosion to the ML-381 hard phase had spread at a significantly slower rate compared to M7. The superior performance over thermally sprayed M7 is a result of the bonding mechanism differences between the two; M7 is a coating with a mechanical bond strength of 10,000+ psi, and ML-381 is a metallurgically bonded overlay with a bond strength of 40,000+ psi. Additionally, the valve internals were in better condition when compared to valves with M7 coating.

Wear and erosion to the ML-381 hard phase was significantly lower compared to M7.

The trial was extremely successful, and the potential benefits and opportunities for pressure leach sites globally are even more exciting, such as:

- potentially extending operating campaigns between shutdowns, thereby maximizing annual production potential
- the scope for applying ML-381 on other pieces of titanium equipment in the pressure leach circuit that are experiencing significant wear, such as agitator blades and discharge strainers
- the valve's internal rate of wear is significantly lower than that of the M7 coating previously supplied, despite the longer time in service. This implies approximately 38% lower ownership costs compared to that of M7.

Ownership Cost Comparison: ML-381 vs M7



ML-381 outperformed existing valve coatings, promising a reduced cost of ownership.

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Testimonials

“ML-381 trial results were impressive given our standard ceramic-coated severe service slurry valves typically survive 150 cycles, by which stage coating delamination is almost certain. This failure mode has historically been a constraint on our autoclave operating campaigns, requiring depressurisation to rectify after approximately six months of service. It may now potentially be eliminated, not just on the discharge, but also on the feed valves. Well done MOGAS!”

*Senior Reliability Engineer
International Mining Company*

“It is these types of breakthroughs that will make POX /HPAL even more cost effective and indeed safer.”

*Head of Metallurgy
International Mining Company*

Conclusion

Following the successful trial of ML-381, the trial site implemented a plan for replacing all discharge valves over time. Similar large-scale implementations have also been initiated in both POx and HPAL sites worldwide—such as Papua New Guinea, Dominican Republic, Madagascar and along the Western Pacific region—for titanium feed and discharge valves, as well as agitator blades.

MOGAS believes ML-381 metallurgically bonded overlay is the next step in revolutionizing severe service isolation slurry applications in the autoclave industry, and continually supports the implementation of ML-381 through its global Authorized Repair Centers.



MOGAS' innovation to expand their proprietary coatings and overlays is evidenced by this 18,000 sq ft dedicated surface technology facility in Houston.