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NOVEL CORROSION-RESISTANT AND EROSION-RESISTANT COATING QUALIFIED FOR USE IN PRESSURE OXIDATION SEVERE SERVICE

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ABSTRACT

Metals and non-metals, which are normally non-flammable in air, can burn very rapidly in an oxygen-enriched environment such as Pressure Oxidation severe service. Accordingly, oxygen systems present unique risk and safety concerns wherein materials selection of equipment used in oxygen systems is critical in mitigating the risk of damage to equipment and injury to personnel due to fire or explosion.

Equipment used in POx is also subject to erosive and corrosive conditions. While titanium is commonly used in hydrometallurgical severe service equipment because of its mechanical strength and corrosion resistance, its use in POx is limited by its high propensity for ignitability and flammability.

Conventional materials that are resistant to ignition or slow to combust include copper and its alloys, nickel-copper alloys, carbon steel and the 300 series of stainless steels. However, these materials often do not have sufficient mechanical properties or corrosion-resistance to be used in POx service where severe service conditions present in the form of high temperature, high pressure, and acidic environment, and also comply with industry guidelines and international standards governing the use of oxygen.

In response to a POx client's problem of high levels of corrosion and erosion on auxiliary discharge equipment to the autoclave, Callidus developed an innovative dual coating BM-1600 that is a corrosion and erosion-resistant system for severe service equipment in POx and HPAL applications.

BM-1600 is fully dense, metallurgically bonded to the surface with a low coefficient of friction ideal for application on isolation equipment such as metal-seated ball valves (MSBVs). BM-1600 was further qualified for use in oxygen-enriched environments following ASTM G124 for temperatures up to 230ºC and pressure up to 3,300kPag in a 100% gaseous oxygen environment. ASTM G124 is an internationally recognized test method that determines the minimum gas pressure and temperature that supports self-sustained burning.

The introduction of this novel coating applied on valve trim extended the life and reliability of the MSBV from less than one month to over a year. Common failure modes observed on MSBVs such as spallation of traditional bond coatings and topcoats of ceramic coating, and erosion and corrosion are eliminated with the application of BM-1600 to the valve trim.

This presentation will discuss case studies featuring Callidus' proprietary BM-1600 coating with results from field trials.

Keywords: Pressure Oxidation, POx, severe service, fused coating, metallurgical bond, sulphuric acid, surface modification, equipment, autoclave, ASTM G124, corrosion, erosion, performance, duplex stainless steel, Alloy 20, high temperature, repair, refurbishment, properties, performance