

CORROSION MONITORING OF PLUTONIUM OXIDE AND SNF

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Abstract

Corrosion is an insidious problem associated with long-term storage of spent nuclear fuel, plutonium oxide, or any commodity that has potentially aggressive chemistry with respect to its storage container. The corrosion monitoring technology described in this paper, the Magnetically Coupled Corrosion Gauge (MCCG)_{Patent Pending}, was specifically developed for on-line corrosion monitoring of plutonium oxide storage canisters at the Hanford Site.

The MCCG utilizes a series of corrosion coupons in a fixture, which is placed in contact with the corrosive environment in question. The coupons are attached to a rotating magnet, which is held in place by each individual coupon. Once a coupon reaches a predetermined level of corrosion, it breaks and allows the magnet to rotate to the next coupon station. The entire assembly is placed inside the container of concern. The rotating magnet is read outside the container of concern via magnetic reader(s) which then transmit information to a remote location or alarm.

The device is simple, robust, inexpensive, and offers no impacts to the performance capabilities of the storage container of concern. Furthermore, this approach allows continuous alarm monitoring capability for a large sample of storage containers.

This paper describes the production prototype results and initial performance data associated with the first MCCG. This paper also describes future applications and current technology limitations.

Drum venting is an issue across many industries, including transportation and packaging of nuclear and hazardous wastes. Each year, many unventilated drums pressurize and develop bulges, breaches, or in some cases, even explosions. Installing ventilated lids on drums at the time of packaging is a fairly straightforward process that simply involves the use of lids with vented and sometimes filtered bungs. However, insitu ventilation of a “bulged” drum involves dangerous work with risk of industrial accidents to workers and environmental accidents at worksites.

Two complementary technologies have been developed to address both insitu drum venting and continuous drum monitoring. Both technologies will be discussed in this paper for application to any transportation and packaging application that involves standard Department of Transportation 55 gal drums and associated overpacks.

Drum Venting

The drum venting technology, presently called, “Hanford –Drum Venting System” (H-DVS)^{Patent Pending} was conceptually developed for insitu venting of Transuranic waste drums at the Hanford Site. The system involves the integrated use of a properly ventilated portable containment with expansion bellows, a simple mechanical advantage ballast system, and a pneumatic ram, sintered metal filter ventilation system. The system allows operators to safely install environmentally compliant drum ventilation in the field on existing drums or newly discovered drums. The system is easily deployable and adds incrementally small costs to the total cost of a modest environmental remediation project that might involve repackaging of drums.

Drum Monitoring

Two new technologies are available for online drum monitoring for pressure and corrosion. Both technologies, the Magnetically Coupled Pressure Gauge (MCPG)^{Patent Pending} and the Magnetically Coupled Corrosion Gauge (MCCG)^{Patent Pending} were developed for use on Spent Nuclear Fuel and Plutonium Oxide canisters across the Department of Energy Weapons Complex. Both of these technologies utilize a sensor to drive a magnet inside a sealed container and a magnetic readout

located outside the sealed container to transmit either pressure or corrosion information to a remote location or alarm.

This paper describes the details and specifications associated with both drum venting and drum monitoring technologies. It also describes the current maturity of the existing systems and current applications.