

# VISTA ENGINEERING TECHNOLOGIES, L.L.C.

## A Magnetically Coupled Pressure Gauge for Use in a Multi-Canister Overpack (MCO)

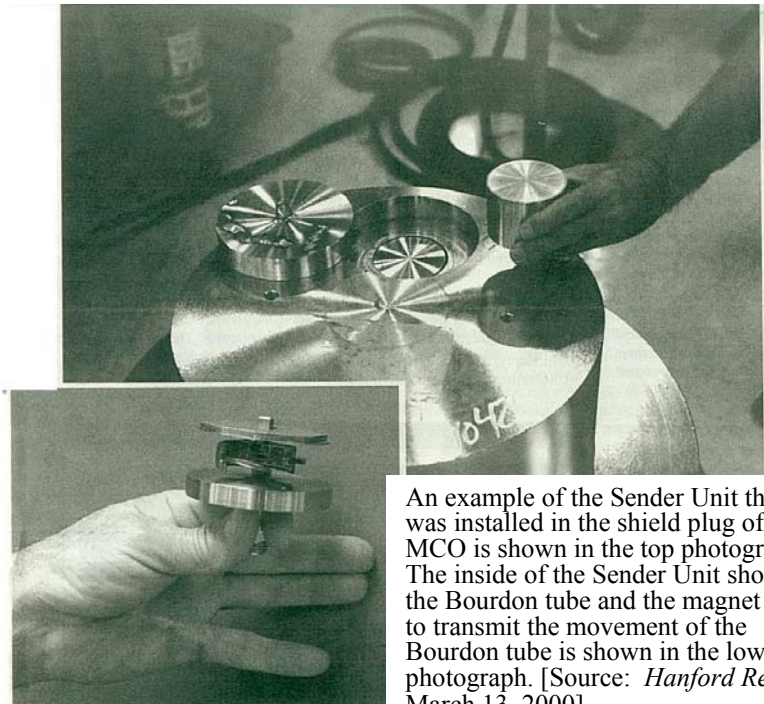
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The Spent Nuclear Fuels Program at the Department of Energy's (DOE) Hanford Site (Richland, Washington) will package decaying uranium fuel rods in sealed stainless steel canisters called Multi-Canister Overpacks (MCOs). Approximately 400 MCOs will be loaded with fuel and stored for 40 years in the Canister Storage Building at the Hanford Site. To ensure that the internal pressure of the MCOs remains within acceptable limits, the internal pressure in each MCO needs to be measured, with no penetrations of the sealed container.

The staff of Vista Engineering Technologies, L.L.C., developed a novel method for making this measurement: the Magnetically Coupled Pressure Gauge (MCPG). Two types of gauges were made. The first gauge *measures* pressures from 0 to 100 psi with a precision and accuracy of 3%. Six of these type of gauges will be installed in the MCO for special monitoring. The second type of gauge is used to *monitor* the pressure over the 40-year storage life of the MCO with an accuracy of 10% over a range of pressures from 0 to 600 psi.

The MCPG is comprised of a magnetically coupled pressure sensing and transmitting unit (called the Sender Unit) and a pressure measurement unit (called the Readout Unit). The 600-psi sender unit is approximately 3 in. in diameter and 2.25 in. in height. The 100-psi Sender unit is only 1.5 in. in diameter and about 1.25 in. in height. The Sender Unit will be placed in the MCO before it is sealed. For the long-term storage using the 600-psi Sender Unit, the Readout Unit will be placed on the outside of the MCO pressure boundary in the weld cap. An example of the inside of the Sender Unit and a completed Sender Unit installed in an MCO is shown in the photographs at the right, published in the March 13, 2000 issue of the *Hanford Reach*.



An example of the Sender Unit that was installed in the shield plug of the MCO is shown in the top photograph. The inside of the Sender Unit showing the Bourdon tube and the magnet used to transmit the movement of the Bourdon tube is shown in the lower photograph. [Source: *Hanford Reach*, March 13, 2000]

The Sender Unit senses the pressure with a Bourdon tube installed in an aneroid reference cell; it transmits the sensed pressure by rotating a magnet by an angular amount that is (approximately) proportional to the pressure. The method of sensing pressure is similar to that used in most mechanical pressure gauges. Since the MCO is made of stainless steel, it is essentially transparent to magnetic flux, and a "compass needle" mounted in the Readout Unit located outside the MCO aligns itself with the transmitted angular position of the sender magnet. The 100-psi Readout Unit is shown in the photograph below. It is held above a 600-psi Sender Unit. In the 600-psi application, the Sender and Readout Units are separated by approximately 8 in. of stainless steel. The MCPG system is entirely passive. It does not require any external power or any connection between the Sender and Readout Units. The MCPG has a design life of 40 years.

The technology and any systems implementing the technology are the proprietary intellectual property of Vista Research, Inc. A patent is pending on the technology. A three-phase program was undertaken in 1999 with Fluor Hanford, Inc., to develop the implementation of this technology for the MCOs. The first two phases were performed by Vista Research, and the last phase is being performed by Vista Engineering Technologies, a spin-off of Vista Research. In the first phase, a workable design was developed. In the second phase, an engineering prototype was built and tested to validate the performance of the system. The third phase is to manufacture and deliver MCPGs.



Photograph of a 100-psi Readout Unit held 8 in. above a 600-psi Sender Unit

Vista Engineering Technologies obtained a license from Vista Research to manufacture the gauge. The first order for 36 units (five 100-psi units and thirty-one 600-psi units) were delivered at the end of September 2000. One of these MCPGs has been officially installed in the first MCO containing spent nuclear fuel. A second order for 370 units is in the process of being placed, with at least 50 units to be delivered in the next nine months.

For more information about the MCPG technology, or other technologies innovated and developed by Vista Engineering Technologies, please contact us at (509) 375-3374.