

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
WASHINGTON, DC 20555-001

October 31, 2002

NRC INFORMATION NOTICE 2002-31 POTENTIALLY DEFECTIVE UF₆ CYLINDER
VALVES (1-INCH)

Addressees:

All licensees authorized to possess and use source material and/or special nuclear material for the heating, emptying, filling, or shipping of uranium hexafluoride (UF₆) in 30- and 48-inch cylinders.

Purpose:

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees about safety concerns related to UF₆ cylinder valves manufactured by the Hunt Valve Company, Inc., of Salem, Ohio. The two safety concerns involve (1) cracked packing nuts and (2) the loss of material traceability and failure to conduct hardness testing of the valve stems.

NRC anticipates that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute new NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

Hunt Valve Company is an approved supplier of one-inch and 3/4-inch UF₆ cylinder valves for the United States Enrichment Corporation (USEC) and others. These valves are required to be manufactured under NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications," and ANSI N14.1, "American National Standard for Nuclear Materials - Uranium Hexafluoride - Packaging for Transport." On December 4, 2000, Hunt Valve Company made a 10 CFR Part 21 notification concerning discovery of defective packing nuts for one-inch UF₆ valves. During visual inspections, several packing nuts were observed to have surface cracks. The cracked packing nuts were originally isolated to heat codes **AXP** and **AFD**. Subsequently, additional defective nuts were identified for the following heat codes:

AFM ATE AFB AFC AXN BXN BXP CCF CCG

The NRC has subsequently been informed of several other possible deviations from the purchase orders that occurred on UF₆ valves. Those deviations allegedly involved the loss of material traceability and the failure to conduct hardness tests for valve stems. Possible suspect valve stem heat codes are PEN and PFV. The NRC is continuing to investigate this matter, and will release additional information when it becomes available.

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Discussion:

There are two types of UF₆ cylinder valves in use in NRC licensed activities (1) a 3/4-inch valve designated as cylinder valve 51 (by ANSI N14.1) which are not known to be affected by the defects addressed in this notice and (2) a one-inch valve designated as cylinder valve 50. These UF₆ valves form part of the pressure boundary for Model No. 30B (30-inch diameter) cylinders that contain low enriched uranium (up to 5 percent U²³⁵) and various 48-inch diameter cylinders containing enriched, natural and depleted (tails) uranium. As such, the valves perform several safety functions.

First, UF₆ is a chemically hazardous material. The related hazards involve soluble uranium toxicity (a heavy metal health threat to the kidneys) and hydrogen fluoride (exterior chemical burns, interior lung damage due to inhalation and electrolyte imbalance), which is a chemical reaction by-product that occurs when UF₆ is exposed to moisture in the air. Second, both natural, depleted and low-enriched uranium are slightly radioactive. In addition, for enriched uranium, nuclear criticality could occur if a sufficient amount of water was accidentally introduced into a cylinder.

The UF₆ valves perform their intended safety functions in two ways. Before UF₆ cylinders are filled, emptied or sampled, the UF₆ is liquified by heating and pressurizing it to well above atmospheric pressure. When the valve is open, the packing nut serves as a secondary barrier to prevent leakage past the valve stem. For emptying and sampling UF₆ cylinders, the cylinders are typically heated in a secondary pressure vessel designed to contain any UF₆ leakage. However, in some applications, UF₆ cylinders may be filled with liquid UF₆ while the cylinder is not in such a secondary pressure vessel.

When the cylinders are put in storage or transported, the valves are closed and the seated valve stem provides the primary pressure barrier. The barrier provided by the valve is an important design safety feature during transport of filled cylinders. Transportation containers must be capable of withstanding normal transport conditions and accidents, including impact, fire, and water immersion. Radiological and criticality safety of enriched UF₆ in transport relies on the cylinder and valve preventing the release of material and assuring that there is no water leakage into the cylinder, even in the event of an accident and immersion in water.

UF₆ valves that could have cracked packing nuts or valve stems that do not meet the purchase order material traceability or hardness requirements may not be able to fully meet the safety margins required for certain plant operations and transportation, and routine procurement receipt inspections may not be able to detect all of these deficiencies.

Related Generic Communications

- Information Notice No. 89-78: "Failure of Packing Nuts on One-Inch Uranium Hexafluoride Cylinder Valves" dated November 22, 1989.
- Information Notice No. 97-24: "Failure of Packing Nuts on One-Inch Uranium Hexafluoride Cylinder Valves" dated May 8, 1997.

This information notice does not require any specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate project manager in the NRC's Office of Nuclear Material Safety and Safeguards (NMSS).

/RA/

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1. List of Recently Issued NMSS Information Notices
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