



File In Docket: 70-0036 COMBUSTION ENGINEERING, INC.
HEMATITE

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May 18, 1990

Bruce S. Mallet, Ph.D., Chief
Nuclear Materials Safety Branch
U. S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

SUBJECT: EVENT REPORT - UF₆ LEAK FROM DEFECTIVE CYLINDER VALVE

Dear Dr. Mallet:

Enclosed is a copy of the ABB Combustion Engineering report on the defective cylinder valve discovered in April, 1990. Although this event is not reportable under 10 CFR 20.205, we agreed to furnish it because of possible generic interest to other UF₆ processors. Mr. Don Sreniawski and Mr. George France, of your staff, reviewed this event and examined the defective valve during the recent OSA team inspection at our site. Photographs of the valve, cylinder and vaporizer were also provided at that time.

Please advise if you require additional information.

Cordially yours,

H. E. Eskridge
Manager, Nuclear Licensing,
Safety, and Accountability

HEE/sld/8046

Enclosure

L-49

MAY 21 1990

ABB Combustion Engineering Nuclear Power

EVENT REPORT: UF₆ LEAK FROM DEFECTIVE CYLINDER VALVE

LICENSEE: ABB COMBUSTION ENGINEERING NUCLEAR POWER
COMBUSTION ENGINEERING, INC.
HEMATITE, MISSOURI
LICENSE NO. SNM-33

DATE: MAY 17, 1990

UF6 Vaporization

Vaporization of UF₆ by heating a 2½ ton cylinder in a steam chest (vaporizer) is the first step of the UF₆ to UO₂ conversion process. There are two vaporizers, but only one cylinder is on line at a time. The vaporizers are located in an enclosed area adjacent to the Oxide Building, which houses the remainder of the conversion process equipment.

Event Description

A UF₆ leak from the cylinder valve stem of a full, heated UF₆ cylinder (#GEW048) occurred on April 17, 1990 as the valve was opened in preparation for processing. As required by operating procedures, the steam to the #1 vaporizer had been turned off, and the UF₆ scrubber system turned on prior to opening the vaporizer access port. When the valve was cracked open, no UF₆ was detected, but as the valve was fully opened, a wisp of smoke (UF₆) was observed. The valve was closed several turns, but did not tighten snug, nor did the leak stop. Movement in the the valve stem indicated a possible broken or malfunctioning valve. The shift supervisor was contacted and he tried to reseal the valve. The valve seem to seat, but the UF₆ smoke was still noticed. He then tried to tighten the packing nut, but could not get it to move. CO₂ was sprayed on the valve, but had little effect on the leak. A small amount of water was then sprayed on the valve which slowed the leak. The access port door was closed, the line cold trapped, and the system cooled. Although the second vaporizer was not affected and the system remained operable, conversion operations were suspended as a precautionary measure. The cylinder was allowed to cool for 2½ days with the vaporizer closed and the scrubber operating to contain the UF₆.

Recover Operations

On April 20, 1990, the vaporizer access port was opened. An accumulated mass of UO_2F_2 on the cylinder valve was removed to provide visual access for inspection. It was determined the leak had stopped. Steam was momentarily introduced into the vaporizer to fix the fluffy UO_2F_2 coating. The access port was left open to allow air to sweep over the cylinder to aid in further cooling.

On April 21, 1990, after checking to determine that the cylinder had cooled to ambient temperature, two operators, wearing full chemical protective suits and self contained breathing apparatus, removed the vaporizer lid carefully while checking for fumes. The top of the cylinder had a 1/8" to 1/4" thick UO_2F_2 coating. The rest of the cylinder had a thin coating. The cylinder was washed down twice with water and sponges in the vaporizer, with the drain plugged. The cylinder was then washed with magnesium sulfate solution to neutralize hydrofluoric acid. The cylinder was transferred to the clean #2 vaporizer and the valve was replaced. The #1 vaporizer was cleaned with water and scouring powder until the wash water was clean. Both vaporizers were then released for use.

Material Balance

The wash solution was pumped into pails, sampled and analyzed for gU/l. The cylinder check weight after cleaning indicated a 14 pound loss or 4.29 KgU.

The following material balance was thus obtained:

UF_6 Cylinder Check Weight		6086 lbs	
UF_6 Cylinder Weight After Valve Failure		<u>6072</u> lbs	
		14 lbs UF_6	= 4.293 KgU
UF_6 Cylinder Cold Trap	4 kg UF_6 =	2.705 KgU	
Clean Up Liquors		1.913	
			<u>4.618 KgU</u>
		Weight Gain	<u>0.325 KgU</u>

The material balance is well within the limit of error of the UF_6 cylinder scale, indicating that no significant loss occurred.

Radiological Monitoring

A small amount of liquid which collected in the scrubber vent line leaked into the storm drain through a drain valve with a defective solenoid that kept it from closing. A storm drain sample taken at the discharge to the site pond indicated a level of 15% MPC. The fixed air sample adjacent to the vaporizer was analyzed immediately and the result was 0.64×10^{-10} uCi/ml.

Bioassay samples collected from the operator involved with the initial leakage showed 24.0 ugU/liter for a sample collected the day of the event, and 2.3 ugU/liter two days later, indicating no significant uptake of uranium. A sample collected from the production supervisor showed 8.0 ugU/liter.

Lapel (BZ) and fixed air samples taken during recovery operations showed no levels above normal operating values. Bioassay samples collected from all personnel involved were less than 1.0 ugU/liter.

Investigation and Corrective Action

The defective valve was disassembled and cleaned for inspection. The inspection found the valve seat scored and packing nut cracked. The crack extended about 270° of the packing nut with a maximum opening of 1/8". It was concluded that the nut was probably cracked before the valve was opened. Opening the valve disturbed the packing, thus causing the leak. The possibility that the valve was broken caused the operator to assume the valve couldn't be closed. UF₆ leaking through the stem caused a buildup that prevented a tight seal when the supervisor tried to close the valve, and the uncertainty of the valve integrity caused further efforts to close the valve to be abandoned. The valve removed was Superior 11246, Lot 51-1,#14. This was not one of the reject valves listed in NRC memo 70-36, dated February 25, 1988.

In the future, the valves on all cylinders from outside vendors will be carefully inspected for valve defects on receipt. The serial numbers will be checked against those listed on NRC memo 70-36. Any defective or reject valves will be replaced prior to heating the cylinder.