

RETURN TO 396-SS

40-8027
PDR/LPDR

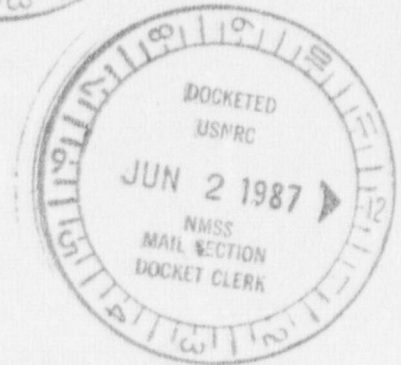
SEQUOYAH FUELS CORPORATION

POST OFFICE BOX 25861 • OKLAHOMA CITY, OKLAHOMA 73125

May 29, 1987

RE: 8739

CERTIFIED MAIL - RETURN RECEIPT REQUESTED



Mr. L.C. Rouse, Chief
Fuel Cycle Safety Branch
Division of Fuel Cycle, Medical,
Academic, and Commercial Use Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: License SUB-1010; Docket No. 40-8027
Presence of Hydrocarbons in UF₆ Cylinders

Dear Mr. Rouse:

In a letter from W.T. Crow dated March 2, 1987, SFC was requested to provide an assessment of controls which prevent or detect the introduction of hydrocarbons into the cylinders and UF₆ systems during processing and transport. Our original response was due 45 days from the date of the letter but was extended to May 29, 1987 by your letter of April 14, 1987.

SFC's assessment of this concern is attached to this letter. Based on our assessment we do not believe there is a need for additional license conditions over and above those conditions that already exist in Sequoyah Facility License SUB-1010.

Should you have any questions concerning our assessment, please contact me at your earliest convenience.

Sincerely,

J.C. Stauter

John C. Stauter, Director,
Nuclear Licensing Regulation

Enclosure as Stated (8 Copies)

jkw

xc: R. L. Bangart, Region IV

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A SUBSIDIARY OF KERR-MCGEE CORPORATION

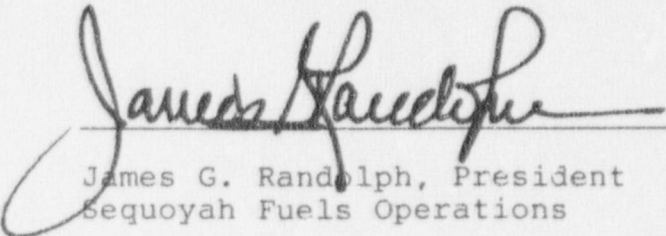
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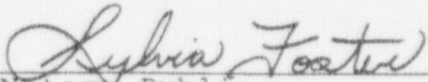
STATE OF OKLAHOMA
COUNTY OF OKLAHOMA

SS: License SUB-1010; Docket 40-8027
Presence of Hydrocarbons in
UF₆ Cylinders

I, James G. Randolph, President, Sequoyah Fuels Corporation, hereby attest that the facts contained in the attached documents are accurate to the best of my knowledge.


James G. Randolph, President
Sequoyah Fuels Operations

Subscribed and sworn before me on this 29th day of May, 1987.


Notary Public

My Commission Expires:

May 20, 1988

SEQUOYAH FUELS CORPORATION

ASSESSMENT OF CONTROLS WHICH PREVENT OR
DETECT THE INTRODUCTION OF HYDROCARBONS
INTO UF₆ CYLINDERS AND UF₆ SYSTEMS DURING
PROCESSING AND TRANSPORTATION

I. INTRODUCTION

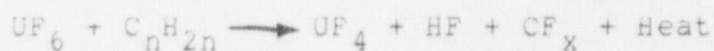
NRC's letter of March 2, 1987 requested SFC to provide an assessment of controls which prevent or detect the introduction of hydrocarbons into the cylinders and UF₆ systems during processing and transport. NRC further requested that SFC's assessment cover procurement, recertification, and maintenance of cylinders; the UF₆ processing systems, including cold traps if used, for filling or emptying cylinders; and seals on either full or "empty" cylinders during transport and storage. NRC's letter indicated that unless the above identified controls exist in SFC's license, the assessment should be presented in the form of a license amendment application and should be submitted within 45 days from the date of the letter.

In a letter dated March 20, 1987 SFC advised the NRC that Sequoyah Fuels Corporation would be hosting

an international meeting of a UF₆ Safety Working Group in Tulsa, Oklahoma on April 7 and 8. Since the subject of hydrocarbons in UF₆ cylinders and UF₆ processing systems is an industry-wide concern, SFC requested a 30 day extension to respond to NRC's letter of March 2, 1987 in order to include any industry recommendations from the meeting. By letter dated April 14, 1987 NRC extended SFC's response to May 29, 1987.

II. STATEMENT OF THE PROBLEM

Hydrocarbons react vigorously with UF₆, even in small quantities. In simplified form, the reaction can be represented as:



Under some conditions, sufficient energy can be generated to cause explosive rupture of containment systems, including cylinders.

Rapp^{1/} summarized four known UF₆ release incidents at the Oak Ridge Gaseous Diffusion Plants

^{1/}The Pattern of Explosive Reaction between Uranium

Hexafluoride and Hydrocarbon Oils: K/GD-1631, Rev. 1,

March 21, 1986

which apparently involved explosion of a container due to the reaction of UF_6 and an impurity. These incidents occurred in 1949, 1953, 1955 and 1975 and were deduced from the followup investigations to have the following four common elements:

- a) Condensed phase uranium hexafluoride,
- b) Moderately-elevated temperature,
- c) UF_6 partial pressure, sufficient to exist above that consumed by a reduction reaction, and
- d) Organic liquid contaminant in the container.

The first three elements are conditions routinely present in UF_6 conversion and enrichment facilities and can not be avoided. The prevention of introduction of organic materials -- hydrocarbons -- into the process and cylinder vessels is thus a priority concern for NRC licensees, Department of Energy (DOE) facility operators and others who process and handle UF_6 .

III. EXPERIENCE AT SEQUOYAH FACILITY

Review of Sequoyan Facility records reveals no indication of any process system problems related to the contamination of UF_6 with hydrocarbons.

Sequoyah takes extreme care to prevent introduction of such materials into UF_6 containers as routine analytical techniques are not practical for detecting their presence. The techniques for prohibiting introduction of hydrocarbon contaminants into UF_6 containers at Sequoyah can be considered in two areas:

- 1) the continuous process, and
- 2) batch cylinder handling.

CONTINUOUS PROCESS

From analysis of the incidents at Oak Ridge, three recommendations were made for precluding introduction of hydrocarbons into UF_6 and for safe handling in the event hydrocarbons were inadvertently introduced:

- a) Avoid oil-filled vacuum pumps.

The four incidents each appeared to involve momentary failures of electrical power to vacuum pumps, allowing backflow of lubricating hydrocarbon oil from the pump into the containers.

To preclude this potential event, the Sequoyah facility does not employ oil-filled vacuum pumps or blowers in the processing or handling of condensed UF_6 . Two cleanup reactor blowers and a main off-gas blower provide the motive force for transfer of gas phase UF_6 from fluorination tower to cold trap. These are operated with Krytox fluorinated lubricants, which cannot undergo vigorous reaction when combined with UF_6 .

Careful consideration has also been given to potential contamination from air compressors used in UF_6 service. The source of compressed air previously used to check for leaks in the UF_6 fill header was air compression systems with no oil source. The facility now uses nitrogen, purchased as bulk liquid, to check for leaks. As a rule, temporary air compressors are not used.

Moreover, Sequoyah has provisions to assure that technical and safety reviews are conducted for changes that are proposed to be made to the process. The facility License SUB-1010 requires

that an engineering description of any modification or change to process operations or equipment, that normally occur during operations, must be prepared by the Manager, Facility Engineering and be reviewed by:

the Manager, Health, Safety and Environment,
the Radiation Safety Officer, and
the Manager, Quality Assurance

and be approved by the General Manager, Sequoyah Facility. Planned major changes to process operations and to equipment design must be reviewed by the General Manager, Sequoyah Facility and be approved by the General Manager, Sequoyah Fuels Operations and the President, Sequoyah Fuels Corporation. The Plant Operations Review Committee must review all new operating procedures and changes thereto. SFC is confident this level of review and approval is adequate to prevent process modifications which could allow the inadvertent introduction of hydrocarbons into cylinders or the UF₆ systems during processing.

- b) If an oil-filled vacuum pump is used, employ cold traps, filters and check valves between the pump and the container.

As discussed previously, Sequoyah has elected not to use oil-filled vacuum pumps in evacuating containers prior to heating or filling with UF_6 . This potential route for introduction of hydrocarbons is not present in the main plant and the recommendation thus does not apply.

In Sequoyah's depleted UF_4 facility, a mobile UF_6 evacuation system, designed and built specifically for the Portsmouth Gaseous Centrifuge Enrichment Project, (GCEP), will be tested for evacuating certain cylinders prior to heating in the autoclave. A complete safety analysis will be performed before operation to insure that the backflow protection system, comprised of a cold trap, chemical trap and automatic shut-off valves, would effectively prohibit introduction of hydrocarbon oil vapor into a container. Comprehensive safe operating procedures will augment this mechanical system to insure proper operation.

- c) Whenever and wherever the possibility exists that condensed UF_6 may have inadvertently become contaminated with hydrocarbon, vapor phase transfer of the UF_6 should be made at room temperature from the potentially contaminated cylinder.

Sequoyan will follow this recommendation, if necessary, by employing the carefully designed GCEP evacuation system and attendant operating procedures described above in (b).

Sequoyan Fuels has also considered the possibility of reaction from inadvertent mixing of UF_6 with Freon or glycol-water mixtures which are used as coolants in cold trap refrigeration. Laboratory reaction rate experiments were designed and carried out to combine liquid UF_6 with either of these coolants. No deflagration was observed in either case. The experiments indicated freon to be virtually unreactive with liquid UF_6 . When intentionally mixed with UF_6 , glycol-water mixtures promptly hydrolyzed the fluorinated compound, while ethylene glycol by itself reacted slowly with UF_6 .

Sequoyah understands that Allied and Eldorado also employ water-glycol coolant on the "tube side" of the primary (higher temperature) cold traps. UF_6 is condensed on the opposite side of the heat exchangers, i.e., on the "shell side". Mixing of the materials on opposite sides of the heat exchanger tube surfaces therefore does not take place. Comurhex and BNFL designed their primary cold traps specifically for Freon coolants. All five of these UF_6 conversion facilities employ Freon in the secondary (lower temperature) cold traps, which are below the operating range of water-glycol mixtures. Historically, this cold trapping operation has performed well and Sequoyah is not aware of any reason to recommend change.

BATCH CYLINDER HANDLING

In SFC's April 20, 1987 response to License Condition #11, a Probabilistic Risk Assessment was presented concerning UF_6 process systems and filling of UF_6 cylinders. Section D.1.4.8 on page D.1-40 contained a fault tree for the event of mixing hydrocarbons and UF_6 .

The assessment also indicated that supplier processing and QA on new cylinders should ensure that no new cylinders arrive containing contamination. Furthermore, Sequoyah does not anticipate receipt of any new cylinders in the foreseeable future.

The probability is very low that cylinders returned from DOE to the facility would be contaminated with hydrocarbons, but there is a need for assurance that the cylinders have been handled in such a way as to preclude contamination. We have found no recorded evidence of contamination of cylinders returned from DOE and understand that DOE handling of the cylinders precludes opportunity for introduction of contaminants.

Several Sequoyah facility operating procedures have been established to minimize greatly the use of a contaminated cylinder. Operating Procedure N-280-1 addresses items such as a) New Cylinders, Cylinder Cleaning And Hydrostatically Testing, b) Inspection Of Returned Cylinders, c) Replacing Cylinder Parts, d) Inspection Before Filling, e) Preparing Cylinders for Shipment and f) Shipping of Filled Cylinders. Operating Procedure N-280-3, addresses cylinder washing,

inspection, and hydrostatic testing. Operating Procedure QA-001 addresses Quality Assurance for UF₆ shipping cylinders and QA-002 Quality Assurance addresses inspection for UF₆ shipping cylinders. These procedures were developed using criteria and guidance provided in ANSI 14.1 and ORO-651 - Uranium Hexafluoride: Handling Procedures and Container Criteria.

IV. TAMPER PROOF CYLINDERS

In the October 2, 1986 NRC Order Modifying License, Sequoyan Facility, by License Condition #24, was required to implement a method to "tamper safe" UF₆ cylinder valves and that UF₆ cylinders be made "tamper safe" on or before October 1, 1988. Although Sequoyan has not finalized its "tamper safe" design for long term use, an interim demonstration method has been put in place to minimize the possibility of introduction of hydrocarbons into cylinders.

Operating Procedure N-280-7 establishes a procedure for equipping UF₆ cylinders with tamper detecting devices. Cylinders that are subject to this procedure include models 48X, 48Y, 48G, 30A and 30B when they are received, washed, tested or filled. The tamper detecting device consists of a

heavy gauge plastic envelope, which is placed over a cylinder valve, drawn tight with a wire drawstring and sealed with a numbered metal seal which cannot be removed without its destruction once it secures the wire drawstring. The procedure further requires that no UF₆ cylinder be taken from a storage area unless the tamper detecting device is intact and the seal number matches the previously recorded number. If the tamper detecting device is not intact, the Manager of Engineering must be contacted and further handling of that cylinder will be done only after appropriate evaluation is made.

Although this is an interim method to assure tamper safe cylinders, SFC maintains it is adequate for its intended use and notes the industry has found it acceptable. The UF₆ Safety Working Group meeting in Tulsa, Oklahoma on April 7 and 8, 1987 endorsed this concept. Each company representative reported they now employ or are contemplating employing the use of a similar method. DOE facilities also use such a technique.

SFC does not now wish to commit to this method as our final design and will continue to evaluate alternative methods.

V. LICENSE CONDITION

As discussed above, SFC maintains that adequate controls, including review and approval systems, are currently in place to prevent or detect the introduction of hydrocarbons in UF6 cylinders or UF6 process system. Aside from License Condition 24 which requires a method to "tamper safe" UF6 cylinder valves on or before October 1, 1988, no additional License Conditions are indicated at this time.

DOCKET NO. 40-8027
CONTROL NO. 28258
DATE OF DOC. 05/29/87
DATE RCVD. 06/02/87
FCUF ☒ PDR _____
FCAF _____ LPDR ☒
I & E REF. ☒
SAFEGUARDS _____
FCTC _____ OTHER _____
DATE 6/2/87 INITIAL CEE