

U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Report No. 030-05097/96001(DNMS)

License No. 24-06015-02

Terminated

Docket No. 030-05097

Licensee: AT&T Microelectronics (now Lucent Technologies)
777 North Blue Parkway
Lee's Summit, MO

Inspection Dates: April 24-25, May 21 & 23, and June 5, 1996

Inspection Location: Isovac Engineering, Glendale CA - April 24 and 25
AT&T Microelectronics, Lee's Summit, MO - May 21 and 23

Inspectors: John D. Jones, Senior Radiation Specialist
W. Geoffrey West, Radiation Specialist

Approved By: Monte Phillips, Chief, Nuclear Materials Inspection Branch 2

Inspection Summary

Inspection Conducted April 24-25, May 21 & 23, and June 5, 1996 (Report No. 030-05097/96001(DNMS))

Areas Inspected: This was a special, announced inspection to determine if Tracerflo devices formally licensed by AT&T Microelectronics under NRC license No. 24-06015-02 (terminated) and still in the possession of AT&T Microelectronics, may be contaminated as a result of insufficient decommissioning activities. In addition, the inspection reviewed the actions taken by AT&T Microelectronics (a former licensee) to terminate the license.

Results: The inspectors determined the following: (1) the licensee failed to properly decontaminate 2 Tracerflo krypton-85 leak testing devices prior to AT&T Microelectronics requesting termination of its license to possess krypton-85, (2) the documentation provided on a Service Report dated 12/03/93 by the licensee's technical consultant did not accurately represent the degree of residual contamination remaining on/in the equipment after decontamination, and (3) the licensee failed to dispose of byproduct material known to be present even after the license was terminated. One apparent violation was identified for failing to provide to the Commission information that was complete and accurate in all material respects and one apparent violation of 10 CFR 30.3 was identified involving possession of byproduct material without a license. (Sections 5 and 8).

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DETAILS

1. Place of Use

Lucent Technologies (formally AT&T Microelectronics)
777 North Blue Parkway
Lee's Summit, MO

2. Persons Contacted

- +*Jan Freeman - Operations Director for Microelectronics
- +*Ken Baurle - Safety & Environmental Coordinator
- +Steve Oberkrom - Environmental Engineer
- +Robert L. Griffle - Former RSO AT&T Microelectronics
- +George Neff, President and founder of Isovac Engineering
- +Jimmy Neff, Mechanical Engineer, Isovac Engineering

+ Interviewed

* Present at exit meeting held May 23, 1996

3. Scope of Licensed Program

American Telephone and Telegraph (AT&T) was in the process of creating an independently owned company from its microelectronics group. The new company, Lucent Technologies, was still owned by AT&T (85% shareholder as of May 21, 1996); however, AT&T planned to divest itself of all ownership by September 1, 1996.

Prior to December 1993 when the licensee, AT&T Microelectronics (AT&TM), requested termination of its license the former licensee's facilities consisted of a large plant involved in the manufacture of electronic equipment. During the time that the license was active, from April 17, 1963 until it was terminated on February 4, 1994, AT&TM was licensed to possess up to 250 curies krypton-85 to be used in two Tracerflo krypton-85 leak testing machines, Model 20010-2A and Model 30010-1B. The license permitted use of the devices for leak testing of sealed components. It also permitted use of up to 100 millicuries krypton-85 in sealed glass tubes to be used for instrument calibration. At present, the facilities where the licensed material was used mostly consisted of empty space.

4. Use of Radioactive Material

As stated above, the license authorized use of Tracerflo krypton-85 leak testing machines. Krypton-85 is a radioactive inert gas which decays 99.6% of the time with the emission of a 0.687 MEV beta ray and 0.4% of the time it emits a 0.514 MEV gamma. It has a half life of 10.72 years. The krypton-85 leak detecting device consists of a compressor, one or more vacuum pumps, an activation chamber into which components (usually electronic devices) are placed for testing, and a heavily shielded storage chamber (or tank) for storing the krypton-85 gas. The storage chamber may contain up to 15 curies of krypton-85 prior to

decommissioning. Components are placed in the activation chamber for various specified times under pressure. After exposure to the gas, the remaining krypton-85 gas is returned to the storage chamber, the activation chamber is vented to the atmosphere, the components are removed, and the radioactivity remaining due to leakage into the components, is measured using a scintillation counting system.

5. Decommissioning of Facility

In a letter dated December 17, 1993, the RSO for AT&TM requested discontinuance of License No. 24-06015-02. The letter stated that the company had decommissioned the facility. Attached to the letter was NRC Form 314 (Certificate of Disposition), which had been signed on December 20, 1993. Item 4 of Form 314 was checked to indicate that "materials had been disposed of in the following manner" and referenced two attachments which contained a description of the disposal procedures, a final radiation survey of the facility, and a December 3, 1993, Service Report.

The December 3, 1993, Service Report (Customer's Reference No. POKCS22207) stated that the systems were air washed via the exhaust blower stack, contaminated pump oil was outgased via the exhaust stack, and all krypton-85 contaminated components, vacuum pumps, compressors, valves and metal parts were placed in two 55 gallon drums for disposal. It also stated that final radiation surveys of both units, room and exhaust stack showed all surfaces at background (0.025 mrad/hr). Based on this information, the NRC terminated the license on February 4, 1994, by issuing amendment No. 25.

However, the former licensee did not actually dispose of the two 55 gallon drums. The former RSO stated that his intent, based on previous experience with krypton-85 contaminated equipment, was to place the drums containing the material under the fume hood. He assumed that the residual krypton-85 contamination would soon leak away into the atmosphere and that the material could be disposed of as ordinary waste.

APPARENT VIOLATION

10 CFR 30.9(a) requires, in part, that information provided to the Commission by a licensee be complete and accurate in all material respects. However, the licensee did not provide to the Commission information that was complete and accurate in all material respects. The letter stated that the company had decommissioned the facility. Attached to the letter was a NRC form 314 (Certificate of Disposition) signed by the RSO, December 20, 1993. This information was material because based on this information on February 4, 1994, the NRC terminated the license with amendment No. 25.

APPARENT VIOLATION

Also, 10 CFR 30.3 requires, in part, that except for persons exempted, no person shall possess or use byproduct material except as authorized by a specific or general license issued pursuant to Title 10, Chapter 1, Code of Federal Regulations. However, since the license was terminated

on February 4, 1994, and the former licensee did not dispose of the radioactive waste, the failure to dispose of the material is an apparent violation of 10 CFR 30.3

The root cause of these apparent violations appears to have been a lack of knowledge of the former licensee of the presence of significant amounts of byproduct material after decommissioning of the leak detecting equipment and incorrect assumptions made by the RSO that the residual krypton-85 would dissipate within a short period of time. The licensee was apparently also influenced in these assumptions by wrong information provided by its consultant.

6. AT&TM Post Decommissioning Activities

Sometime in late 1995, a purchasing agent representing AT&TM made an inquiry of Isovac Engineering, Burbank California, regarding the disposal of the Tracerflo machines. In a fax dated November 3, 1995, addressed to the attention of the purchasing agent, Isovac Engineering informed the individual at AT&TM that based on experience with similar equipment, the gas storage tanks on the devices may have from 500 to 850 millicuries of residual krypton-85 remaining adsorbed onto varnish-like residues inside the gas storage tanks.

The licensee's Safety & Environmental Coordinator (S&EC) was made aware of the possibility of contamination and possible disposal problems by the purchasing department, which informed him of the fax received from Isovac Engineering. The S&EC initiated an investigation in November 1995. A survey of the devices was performed with a Nuclear Chicago G.M. counter and "slightly high" readings were found. The S&EC contacted the contractor who had performed the original decommissioning activities and had written the above Service Report. He stated that the devices should be ok. On December 7, 1995, the former licensee shipped out 4 drums of waste to Chem Nuclear, including the above two 55-gallon drums containing the krypton-85 leak detection components. The remaining two drums contained krypton-85 and radium contaminated cold cathode electron tubes. The listed activity of the parts was 1.24 millicuries. All the drums were shipped to Barnwell by Chem Nuclear, who arranged shipment with Tri-State Motors. Chem Nuclear would not take the gas storage tanks because of the lead content.

In January 1996, the decision was made to cut open the spare gas storage tank. At the time of the decision, it was thought the tank was "very slightly contaminated" due to the survey done in November. The purpose of cutting the tank open was to verify that it was safe to dispose of the tanks as regular waste. After cutting open the tank with a band saw, the S&EC confirmed the presence of residual radioactive material. He did not notify the Nuclear Regulatory Commission of these results either at the time of discovery, nor during a subsequent phone call from the inspector on February 14, 1996. He did not mention it to the NRC inspector until contacted again on May 14, 1996, when the inspector announced this inspection. He indicated that he initially didn't

mention that they had cut the tank open because he wasn't thinking about it at the time of the first call.

The former licensee has been negotiating with SEG to prepare the tanks for disposal as radioactive material by removing the lead shielding surrounding the steel tanks. Mr. Baurle stated in a telecom on June 5, that he expected the material to be shipped to a waste site in the near future.

7. Residual Radioactivity Remaining in Krypton-85 Leak Detecting Components

Based on a review of the license file, there was no evidence that the former licensee had evaluated the internals of the krypton-85 storage tank for potential residual radioactive material. In an effort to determine if residual contamination would be present in such tanks, arrangements were made with a manufacturer, Isovac Engineering, to observe their decommissioning operations and make radiation surveys.

Isovac Engineering was established in 1969 by an individual who had worked for the Ardel corporation prior to that time and helped to develop the original Tracerflo device. On the day prior to the inspector's arrival at Isovac Engineering, they had cut the end off of the steel lead lined chamber used to store the Krypton-85 gas. The gas storage chamber of the device had been vented, back flushed with air, and stored under 0.5 mm vacuum since February 1995. The inspector observed a thick oily substance lining the inside of the chamber. Some of this material was scraped up into a small pile by an Isovac representative and the inspector obtained a reading of 64,000 cpm using a Ludlum Model 3 pancake G.M. counter 1 1/2 inches above the residue. Using NUREG-5849 methodology, this roughly equates to 1.3×10^6 dpm/100cm². NRC Guidelines specify surface contamination levels for unrestricted release be less than 5000 dpm/100cm² average. A Bicon ionization meter RSO-5 (open window) suspended 3/8 inches above the residue gave a reading of 8 mR/hr beta. This same residue (representing approximately 5% of the total residue in the chamber, was placed on a calibrated scintillation counter (equipment owned by Isovac) and was determined to have approximately 1 microcurie of radioactivity. This would indicate that a significant amount of radioactive material (krypton-85) remains in the gas storage chambers even after venting and back flushing with air.

The inspectors also determined that it may be possible to determine that the Krypton-85 remained in the tank even after it had been vented and backflushed several times with air without cutting open the tank. The tank was pressurized with about 10 psi air, then allowed to vent while holding a pancake GM meter over the outlet. Activity was detected by the meter on all three attempts made to demonstrate this process.

In addition to the tank, the inspector also found residual radioactivity in several other components of the leak detecting equipment. A valve bonnet for the #16 valve was removed from a unit which had been under vacuum for at least one year and was found to have approximately 17.8

microcuries of krypton-85 still trapped in the valve. Two other bonnet valves, #9 and #8 were found to have approximately 13.5 microcuries and 19.3 microcuries trapped inside, respectively.

A Tecumsee Compressor, similar to the type used in refrigerators, was taken from a unit that had been cut open prior to 1993. The internal parts were still significantly radioactive. The highest reading with the Ludlum Model 3 Pancake GM detector was 180,000 cpm at a distance of 1 1/4 inch from the surface. This roughly equates to 3.8×10^6 dpm/100cm², a level of contamination some 750 times the NRC criteria for release to unrestricted use. The Ludlum micro-R meter gave a reading of 100 μ R/hr, and the Bicron RSO-5 gave a reading with the beta window open of 80 mR/hr.

One of the vacuum pumps used with the krypton leak detection device not only had radioactivity associated with the pump oil but internal parts such as the Lexan plastic window on the side of the pump was demonstrated to have significant radioactivity. This apparently lasts for years as the krypton is somehow trapped inside the Lexan. The inspector observed that external radiation emitted from the vacuum pumps appears low but when the pumps are dismantled high beta doses are obtained because the krypton decays principally by beta emission and is shielded by the pump housing in a way similar to the gas storage chamber of the devices. However, the inspector noted that a microR meter appears to be useful in establishing the presence of krypton-85 inside the compressor and vacuum pumps by measurement of the gamma rays.

Based on decommissioning activities performed by Isovac Engineering for 51 units, residual radioactivity before decontamination ranged from 100 to 800 millicuries for all of the component parts. Estimates of activity in the gas storage chamber alone ranged from 35 millicuries to 320 millicuries for the 51 units.

Given these results, the NRC determined that a confirmatory survey of the licensee's facilities was warranted.

8. Confirmatory Surveys of Facility by NRC

The two "decommissioned" Tracerflo krypton-85 detectors were located in a single isolated secure room in the facility, along with some other related equipment and parts, including a vacuum pump and two empty shipping canisters for krypton-85.

Both Tracerflo units were found to have had the vacuum pumps and compressor removed. Two vacuum pumps, which had been attached to the leak testing units remained in the room. Both pumps were surveyed and no significant measurable radioactivity was found. This finding was consistent with information obtained during a site visit to Isovac Engineering, in that typically only one of the two vacuum pumps associated with the leak testing systems were found contaminated. The inspectors were told that the contaminated pumps were shipped as radioactive waste in November of 1995.

The inspectors performed surveys of all of the remaining equipment using the following NRC portable instrumentation:

<u>Survey instrument</u>	<u>Serial No.</u>	<u>Last calibration</u>
Ludlum Model 12	046944	05/10/96
Ludlum Model 19		
MicroR Meter	NRC010617	04/11/96
Ludlum Model 44-9		
Pancake Probe	110199	05/10/96
Ludlum Model 44-10		
NaI detector	110263	05/10/96

External contamination of the activation chambers of each of the two units was found on the inside rim of the chambers. On the unit identified as #H482033-80, the maximum dose rate at the surface of the rim of the activation chamber using the Micro-R meter was 2.5 mR/hr. The maximum non-removable radioactivity was estimated to be approximately 10,000 dpm/100 cm². The other unit #W-907426 had much less detectable contamination as seen by the microR meter (.045 mR/hr) and negligible beta activity. The krypton-85 gas storage tanks were still attached to each Tracerflo apparatus. The tank of unit #H482033-80 was pressurized to 10 psi and left under pressure for 15 minutes. Following pressurization, the air was slowly released from the tank. A pancake probe was positioned in the air stream and a maximum of 1,500 cpm was measured indicating residual krypton-85 remaining in the tank. Based on information obtained during the Isovac Engineering site visit, this test may serve to indicate amounts of krypton-85 in the range from 35 to 320 millicuries still remain in the storage tank - probably in the form of gas trapped in the oil residue.

Minor external contamination was also located on the inside rim of the activation chamber of the other unit. In this case, the maximum dose rate using the micro-R meter was 0.045 mR/hr and background levels of beta as measured by the pancake probe. A swagelok fitting removed from the second Tracerflo gas storage tank measured 23,000 cpm (57,000 dpm) using the pancake probe. The tank was pressurized to 10 psi and left for 15 minutes before purging, however, no significant radioactivity was observed in the air stream for this tank. The empty shipping canisters were checked with the micro-R meter and no significant radiation was detected.

The December 3, 1993, Service Report had stated that final radiation surveys of both units showed all surfaces at background (0.025 mrad/hr). Based on the inspectors' findings on the day of the inspection this statement was inaccurate, in that contamination could be detected on the inside rims of the activation chambers for both units.

The tank which had been cut open was in the facility's "Reclamation Area". This large room contained a large fume hood in which were stored the two halves of a krypton-85 gas storage tank. This was a spare krypton storage tank left over from the decommissioning. This tank had been cut apart sometime in January 1996 (see section 6 above). A

pancake probe inserted inside each of the two halves of the tank indicated a maximum reading of 120,000 cpm. Using NUREG-5849 methodology, this roughly equates to 1.7×10^6 dpm/100cm². NRC Guidelines specify surface contamination levels for unrestricted release be less than 5000 dpm/100cm² average. Calculations based on this measurement estimate there was approximately 30 microcuries of krypton-85 in the residue remaining in the cut open tank. Surveys of the area where the tank was cut and the saw blade used were made and no residual radioactivity was detected in the area.

9. Conclusions

The inspectors determined that significant amounts of krypton-85 remain in at least two of the storage tanks even after venting and backflushing, indicating that the former licensee had failed to properly decontaminate two Tracerflo krypton-85 leak testing devices prior to AT&TM requesting termination of its license to possess krypton-85. In addition, the documentation provided in the December 3, 1993, Service Report by the former licensee's technical consultant did not accurately represent the degree of residual contamination remaining on/in the equipment after decontamination.

The inspectors identified two apparent violations: (1) One apparent violation was identified for failing to provide to the Commission information that was complete and accurate in all material respects and (2) One apparent violation of 10 CFR 30.3 was identified involving possession of byproduct material without a license.

The root cause of these apparent violations appears to have been a lack of knowledge of the former licensee of the presence of significant amounts of byproduct material after decommissioning of the leak detecting equipment and incorrect assumptions made by the RSO that the residual krypton-85 would dissipate within a short period of time. The licensee was apparently also influenced in these assumptions by wrong information provided by its consultant.

10. Exit Interview

An exit meeting was held at the Lucent Technologies facility on May 21, 1996, with those individuals identified in Section 2 of this report. A summary was given of the areas inspected, and the licensee was informed of the apparent violation. The licensee did not identify as proprietary any materials provided to and reviewed by the inspector.