

ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Docket: 030-05852
License: 34-13012-01

Report: 030-05852/96-001(DNMS)

Licensee: Shell Chemical Company

Facility: G-2 Finishing Building

Location: 2982 Washington Boulevard
Belpre, Ohio 45714

Date of Inspection: August 27, 1996 through September 27, 1996

Inspector: D. G. Wiedeman, Senior Radiation Specialist

Approved: B. J. Holt, Chief Nuclear Materials Inspection
Branch No. 1

Attachments: A: Partial list of persons contacted and
list of Acronyms used;
B: Licensee's 30 day report;
C: Analysis of leak test samples
D: Photographs of the damaged gauges

EXECUTIVE SUMMARY

Shell Chemical Company
Belpre, Ohio
NRC Inspection Report 030-05652/96-001(DNMS)

At approximately 3:30 a.m. on August 25, 1996, an explosion and fire occurred in the G-2 Finishing Building at the licensee's Belpre, Ohio facility. Several gauging devices containing cesium-137 and ranging in activity from 5 millicuries (185 megabequerels (MBq)) to 50 millicuries (1850 MBq) were mounted on process equipment in the area of the fire and explosion. Two 10 millicurie (370 MBq) cesium-137 gauges sustained extensive heat damage. Radiation measurements indicated that the lead shielding in the gauge may have been compromised. The remaining devices were not affected. The licensee reported the event to the NRC Operations Center at 11:30 a.m. on the same day. On August 26, 1996 an NRC inspector was dispatched to the site to evaluate the radiological consequences of the event and the licensee's plan for recovery of the devices.

With assistance from a representative of the Ohmart Corporation (the gauge vendor), the licensee developed a gauge recovery plan and successfully implemented the plan. The shutters on the damaged gauges were found to be melted in the "open" position. Leak test results indicated no evidence of source leakage or contamination.

The two damaged gauges were packaged and transferred to the Ohmart Corporation for subsequent disposal with no incident.

Report Details

1. Program Overview

Facility Description

The Belpre facility is a large complex which processes petroleum products and chemicals. The licensee has approximately 100 NRC-licensed gauges onsite which are principally used for measuring levels of bulk materials in tanks and vessels. The activity of the gauges ranged from several millicuries to several thousand millicuries per gauge. A total of 13 nuclear gauges were located in the G-2 Finishing Building; however, only two 10 millicurie cesium-137 (370 MBq) gauges (Ohmart Model SH-100) were directly involved in the area that was damaged by the fire and explosion.

Gauge Program

License No. 34-13012-01 was issued on May 19, 1995 and will expire on May 31, 2003. The license authorizes use of an unspecified number of gauging devices that have been evaluated and approved for licensing purposes and authorized for distribution under a license issued by the NRC. The license authorizes gauge installation, initial surveys, and relocation of gauges provided that the activities are performed under the supervision and in the physical presence of six specified individuals. Two of these specified individuals are the Radiation Safety officer (RSO) and the Assistant RSO.

2. Explosion and Fire

Inspection Scope (IP 87100, 83822, 83726, 87103)

At approximately 3:30 a.m. on August 25, 1996, an explosion and fire occurred in the G-2 Finishing Building at the Shell Chemical Company's Belpre, Ohio facility. At 11:30 a.m. the licensee reported the event to the NRC Operations Center. On the morning of August 27, 1996 an NRC inspector and licensee representatives toured the outside perimeter of the G-2 Finishing Building.

Observations and Findings

The licensee initially reported to the NRC that there were five gauges in the area of the explosion and fire ranging in activity from 5 to 50 millicuries (185 MBq to 1850 MBq) of cesium-137. The licensee stated that at least one 5 millicurie (185 MBq) gauges showed evidence of fire damage. The licensee restricted access to the building until structural hazards were assessed and hydrocarbon levels in the air decreased to a safe level.

After the fire was extinguished, the licensee's radiation safety staff performed direct radiation measurements on the five gauges and noted that two gauges showed radiation levels in excess of that which was normally expected (2.0 millirem/hour vs 1.0 millirem/hour) {516 nC/kg/hr vs 258 nC/kg/hr}. The licensee believed that damage gauges contained 5 millicuries (185 MBq) of cesium-137. During the NRC inspector's review of the

licensee's inventory and leak test records, the inspector determined that the damaged gauges contained 10 millicuries (370 MBq) of cesium-137, rather than the 5 millicuries (170 MBq) initially reported by the licensee.

The NRC inspector noted minor fire damage on the exterior of the G-2 Finishing Building, however, the effect from the explosion was extensive in certain isolated areas on the second and third floors. At the time of the inspection, the licensee was still investigating the cause of the explosion and fire.

Conclusions

The inspector concluded that other than some confusion on the licensee's part regarding the quantity of cesium-137 in the damaged gauges, all aspects of the licensee's initial report were correct.

The fire and explosion that occurred on the morning of August 25, 1996 caused sufficient damage to the building and equipment to prevent the licensee from restarting its operations until extensive structural repairs have been performed and certain process equipment has been repaired or replaced.

3. Recovery Planning Activities

Inspection Scope (IP 87100, 83822, 83726, 87103)

The NRC inspector reviewed the licensee's radiological monitoring and device recovery plans for the removal and subsequent disposal of damaged gauges. The NRC inspector accompanied the recovery personnel during the recovery phase.

Observations and Findings

On the morning of August 27, 1996, the inspector reported to the site and participated in a meeting with several members of the licensee's staff, the gauge vendor (Ohmart) and a representative from the Ohio Department of Health. The purpose of the meeting was to discuss the recovery activities planned for the day and to agree on a safe approach to achieve those goals. It was agreed that continual radiological monitoring would be conducted within the G-2 finishing area by the RSO and during each of the investigative and recovery phases. The licensee's gauge recovery plans included: (1) radiation surveys upon entry to the building, when approaching the gauge, and upon exit of personnel and materials from the building, (2) identification of any gauge with external damage, (3) manually closing the shutter, (4) removal of the damaged gauges from their fixed location by a two-man team and placement of the gauge into a blanket, (5) leak testing of the gauges within the restricted area, and (6) packaging and shipment of the damaged gauges to the manufacturer for disposal.

Two 10 millicurie (370 MBq) cesium-137 gauges involved in the fire and explosion showed extensive external heat damage, see Attachment D. According to the Ohmart representative, the radiation level profiles measured by the licensee and confirmed by the NRC indicated that the internal lead shielding may have been compromised. In addition, the shutters to the gauges were melted in the "open" position.

Conclusions

With assistance from Ohmart, the licensee developed a successful gauge recovery plan. There was a sufficient number of trained personnel available to implement the plan. In addition, the licensee possessed adequate radiation survey instrumentation and conducted appropriate radiological monitoring to insure protection of workers from unnecessary radiation exposure.

The recovery plan was implemented and two damaged gauges were removed from the building without incident. The damaged gauges were then packaged by the Ohmart representative and transported back to Ohmart facilities for subsequent disposal.

4. Independent Radiation Measurements

Inspection Scope (IP 87100, 83822, 83726, 87103)

The inspector performed independent radiation measurements with a Ludlum Model 3, Serial No. 109308, calibrated on January 2, 1996. A side-by-side comparison of the licensee's survey instruments and the NRC inspector's instrument was made with a 1.0 microcurie (μCi) {37 kBq} cesium-137 button source. Both survey instruments were in agreement within 20 percent. The inspector performed leak tests on both damaged gauges.

Observations and Findings

Radiological surveys performed during the tour of the outside perimeter of the building revealed no radiation levels above natural background. The NRC inspector conducted a visual inspection and radiation surveys of the thirteen gauges located in the G-2 Finishing Building and noted that two of the thirteen gauges which were in the area near the fire and explosion showed considerable external damage on the outside of the housings. Direct radiation measurements on the damaged gauges showed a maximum level of 6.0 milliroentgens/hour (mR/hr) {1,548 nC/kg/h} on direct contact with the gauge housing. The remaining eleven gauging devices located adjacent to the area damaged by the fire and explosion revealed no apparent problems.

After the gauges were removed from their fixed positions, the licensee performed a "field" source leakage test and did not identify any gross removable contamination. The results of this leak test were confirmed by the NRC inspector. Further analysis of the leak test samples in the Region III Laboratory confirmed that no removable contamination was identified, see Attachment C.

Conclusions

The inspector confirmed that based upon radiation measurements, two 10 millicurie {370 MBq} cesium-137 density gauges (serial Nos. 70592 and 70594) were damaged during the fire and explosion that occurred on August 25, 1996. The inspector confirmed further that the cesium-137 sources contained in the gauges remained intact.

5. Regulatory Issues (Reports)

In accordance with 10 CFR 30.50 the licensee made an immediate report to the NRC Operations Center within the specified time frame and a written report within the 30 day reporting period, see Attachment B.

Exit Meeting Summary

The inspection findings as noted in this report were discussed with the licensee during an exit meeting conducted on August 27, 1996. The licensee did not identify any information reviewed during the inspection and proposed for inclusion in this report as proprietary.

ATTACHMENT A

PARTIAL LIST OF PERSONS CONTACTED

Mike Hershman, RSO
Rick Cochran, Assistant RSO
Jerry Williams, Service Engineer, Ohmart Corp.
Mike Snee, Health Physicist II, Ohio Department of Health

INSPECTION PROCEDURES USED

IP 87100: Appendix E, Industrial Inspection Field Notes
IP 87103: Inspection of Incidents at Nuclear Materials Facilities
IP 83822: Radiation Protection
IP 83726: Control of Radioactive Material, Contamination, Surveys and Monitoring

LIST OF ACRONYMS USED

| | |
|--------|-------------------------------|
| Cs-137 | cesium-137 |
| GBq | Gegabequerel |
| IP | Inspection Procedure |
| kg | kilogram |
| MBq | megabequerel |
| mR | milliroentgen |
| nC | nanocoulomb |
| NRC | Nuclear Regulatory Commission |
| RSO | Radiation Safety Officer |
| TI | Temporary Instruction |

Shell Chemical Company



PO Box 235
Belpre, OH 45714

September 9, 1996

CERTIFIED MAIL
RECEIPT REQUESTED

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir/Madam:

As per Part 30.50, Rules of General Applicability to Domestic Licensing, this report will fulfill the requirements necessary to meet all applicable rules and regulations. The following events are described in order of sequence.

On August 25, 1996, at 0323 hours, a small hydrocarbon explosion occurred in the G-2 Finishing Department of the Shell Chemical Plant located at 2982 Washington Boulevard, Belpre, OH 45714. The subsequent fire was extinguished approximately 1 hour later. There were no injuries involved from or during the suppression of the incident.

At approximately 1000 hours of the same day, L. H. Cochran and M. W. Hershman, Shell RSO's, surveyed the primary fire area to assess the integrity of the devices that were directly involved in the incident. Two devices were found to have the shutters melted. Readings were taken which are mentioned later in this report. The immediate area around the two devices was taped off with red danger tape and tagged as a possible radiation hazard area. The two devices were Ohmart sealed source level gauges, Model SH-100, containing 10 mci of Cesium 137 each. They were located on V-9211 and V-9212 of the G-2 Finishing Area. Serial numbers for each: V-9211 - #70592 and V-9212 - #70594.

At approximately 1130 hours of the same day, Mr. George Brown, RSO, Ohmart Corporation, was notified for consultation and forward plan of action.

At approximately 1145 hours, Mr. Gould, Nuclear Regulatory Commission, was contacted via telephone on the emergency number and given all the pertinent information surrounding the incident and our findings. At approximately 1330 hours Mr. Weiderman, Nuclear Regulatory Commission, contacted us for a more detailed report. He again called at approximately 1450 hours to suggest that Ohmart Corporation be on site for the removal of the two damaged devices and that he would like to oversee that operation.

ATTACHMENT B

Page 1 of 2 Pages



It was planned to remove the devices on Tuesday, August 27, 1996. All necessary parties were notified and met Tuesday morning at the Administration Building at Shell Chemical. They were: Mr. Weiderman, NRC, Mr. Snee, Ohio Department of Health, Mr. Williams, Ohmart Corporation, and L. H. Cochran and M. W. Hershman, Shell RSO's.

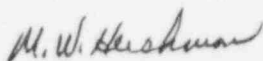
V-9211 device (Serial #70592) was removed first with readings taken prior to removal. The readings were 2 mr/hr @ 18 inches and 0.6 mr/hr @ the taped perimeter. It was unbolted and removed from the area without incident.

V-9212 device (Serial #70594) was last to be removed with readings taken prior to removal. The readings were 6 mr/hr @ surface, 1.5 mr/hr @ 18 inches, and 0.1 mr/hr @ 6 feet. It also was unbolted and removed from the area without incident.

After removal to the ground floor, Mr. Weiderman performed a wipe test for leakage and no detectable radiation was noted. Both devices were packaged in a wooden box lined with lead plates and transported back to the Ohmart Corporation by Jerry Williams.

All work was performed under the direct observation of the NRC Inspector, Mr. Weiderman, and no worker exceeded 100 mr/hr exposures. All survey forms and bills of lading are on file. We might also note that Mr. Snee, Ohio Department of Health, was extremely courteous and helpful in the removal process.

Sincerely,



M. W. Hershman
Shell - Belpre RSO



L. H. Cochran
Shell - Belpre RSO

/bkc

cc: **CERTIFIED MAIL**
RECEIPT REQUESTED

United States Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60532-4351

Ohio Department of Health
Radiological Health Program
ATTN Mr. Mike Snee
P.O. Box 118
Columbus, OH 43266-0118

96 - Ø 51

REGION III LABORATORY

DATE REQUIRED

DATE REQUIRED
26 Sept 96

SAMPLE LOCATION:

Shell Chemical Co.

DATE ANALYSIS BEGAN

26 Sept 96

DATE COMPLETED _____

DATE COMPLETED
26 Sept 96

ANALYZED BY

Gu. F. 2000

DATE _____

26.5276

COLLECTED BY

D. Wiedemann

DIVISION

TELEPHONE

CONTACT NOTIFIED

DATE _____

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W. H. H. H. H.

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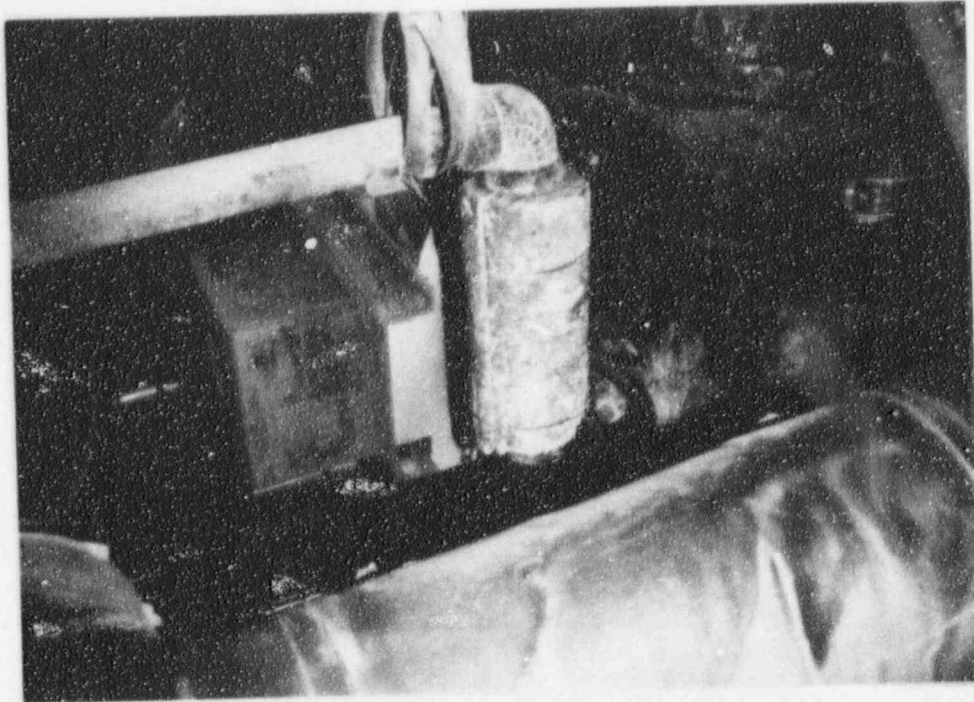
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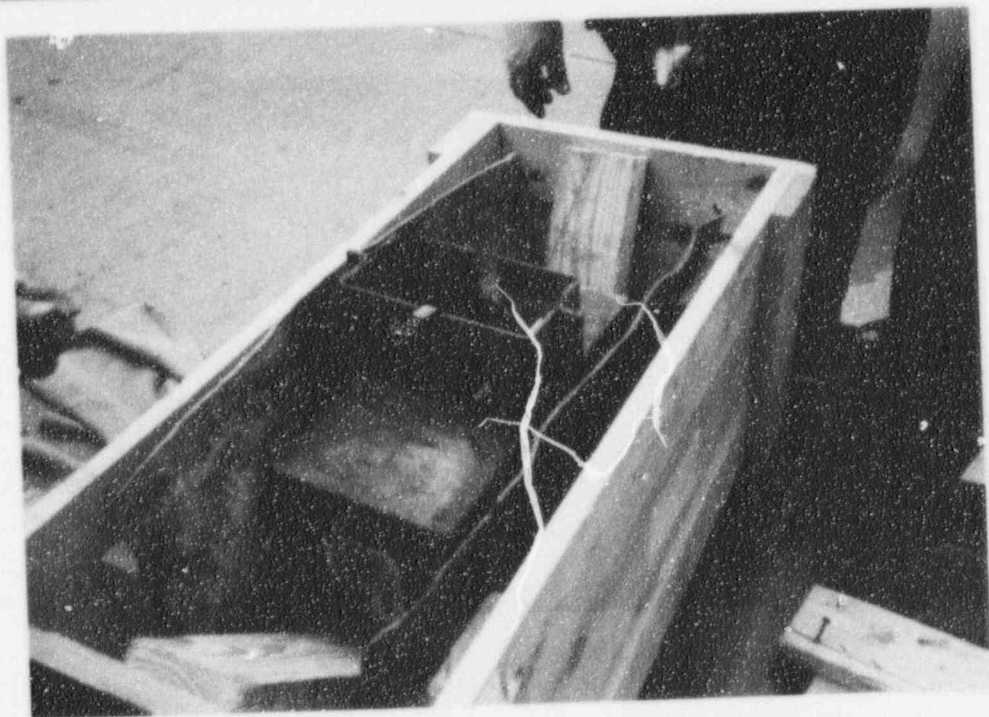
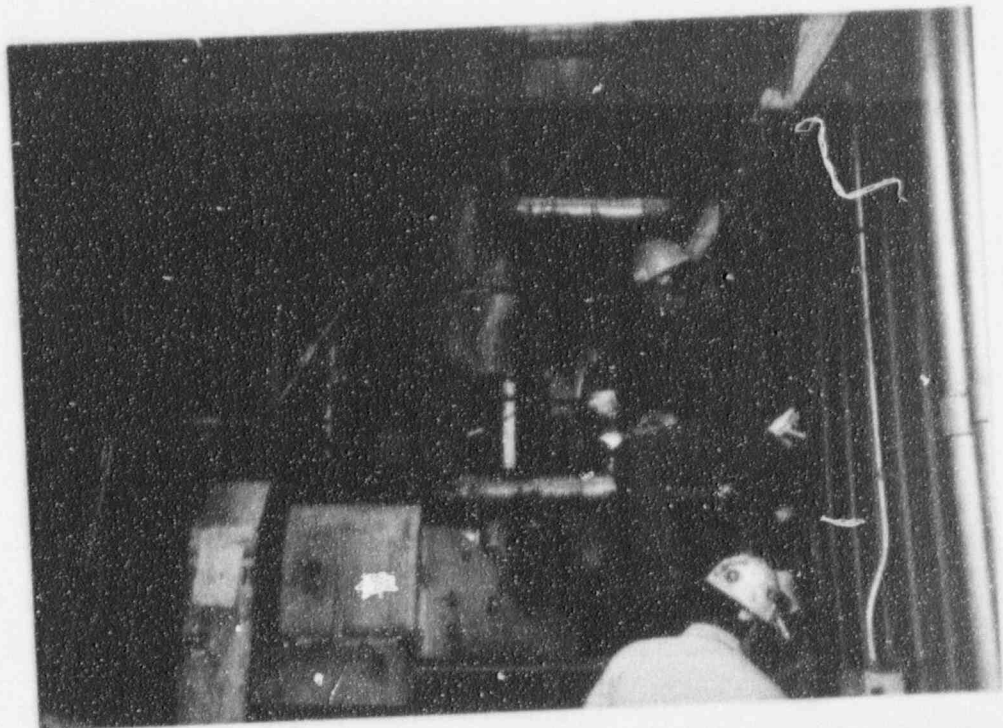


* Random uncertainties reported are 2 standard deviations, results $\leq 2\sigma$ are interpreted as including "zero" or as not directed. If appropriate, estimates of possible systematic errors are reported in parentheses.

INSPECTOR



Shell Chemical Co., Belpre, Ohio
License No. 34-13012-01, Docket No. 030-05852
10 millicurie gauges damaged from fire and explosion -August 1996



Shell Chemical Co., Belpre, Ohio
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