
Radiation Safety
2000 Annual Report
Shield Source Incorporated
Licence Number: NSPFOL-12.00/2003

Summary:

In June 2000 the new Nuclear Safety and Control Act (NSCA) came into effect and as a result Shield Source Incorporated (SSI) is now a Class 1B Nuclear Facility. In July 2000 SSI was granted a Nuclear Substance Processing Facility Operating Licence by the Canadian Nuclear Safety Commission (CNSC), (formerly the AECB), for a period of 3 years.

Under the new NSCA a licence is required to operate a dosimetry service. SSI met the requirements for the operation of a dosimetry service and in June 2000 SSI was issued a 5 year licence to operate a Category II internal dosimetry service for in-vitro bioassay for tritium.

Golder Associates was contracted by SSI to review and revise the SSI Environmental Monitoring Program (EMP). Golder found several errors in the SSI EMP written by Twin Oaks Consulting. Therefore in May 2000, SSI submitted to the CNSC a document entitled "Proposed Environmental Monitoring Program" written by Golder Associates revising the Pathway Model Assessments and the Derived Emission Limit (DELs) calculations that were previously submitted by Twin Oaks Consulting. This document currently remains under review by the CNSC.

Revision 11 of the Radiation Safety and Procedure Manual, reflecting the new DELs, was submitted for approval in October 2000 and currently remains under review by the CNSC.

A data acquisition program was developed and purchased from AECL to measure tritium gas and oxide emissions from the stack. The program has been running successfully since November 2000 giving more accurate emission calculations.

Radiation Safety Personnel:

The Radiation Safety Committee consists of the following:

1. Office Assistant – employee [REDACTED]
2. Production Supervisor – employee [REDACTED]
3. GTLS Fill Operators – employees [REDACTED], [REDACTED], [REDACTED]

Radiation Safety Meetings were held monthly with the RSO, the Radiation Safety Committee and all other SSI employees. New and/or existing projects, procedures, policies, problems or concerns were discussed at each meeting. Topics such as rig operating procedures, liquid scintillation counting and emergency procedures were reviewed.

The Radiation Safety Officer (RSO) commenced a leave of absence in May 2000 leaving the RSO responsibilities to the office assistant who has been trained as the back up RSO. The office assistant started a leave of absence in October 2000 leaving the RSO responsibilities to the Production Supervisor (PS). The PS was fully trained during the past year as backup RSO. As of January 2, 2001 the Radiation Safety Officer returned to work and resumed her duties. The PS will continue as the RSO backup and be kept current on all radiation safety matters.

Tritium Use:

Shield Source fills phosphor coated borosilicate glass tubes with tritium gas and manufactures Egress signs. SSI employs 13 personnel including 3 fulltime operators who are responsible for filling the glass tubes with tritium gas and 3 other members of staff who are also cross-trained to operate the machinery as back-up, one of which is responsible for all maintenance. The remaining staff consists of office staff and assemblers/packageers who only handle sealed sources.

Tritium Gas was purchased from two suppliers in 2000, [REDACTED] and [REDACTED].

A total of 1.93×10^{16} Bq of Tritium Gas was purchased in 2000. There were 10 shipments from [REDACTED] totaling 1.36×10^{16} and 3 shipments totaling 5.66×10^{15} Bq from [REDACTED]. A total of 661,199 light sources were produced consuming 1.89×10^{16} Bq Tritium Gas. This includes the following:

- 2980 devices totaling 1.24×10^{15} Bq were shipped to various customers in Canada.
- 7014 devices totaling 2.44×10^{15} Bq were shipped to various customers in the United States.
- 526,025 light sources totaling 1.47×10^{16} Bq were shipped to sign manufacturers in the United States.
- 13748 light sources totaling 4.82×10^{14} Bq were shipped to a customer in South Africa.
- 124 Devices totaling 8.15×10^{13} Bq were shipped to a customer in Hong Kong.

Shield Source is not equipped for tritium reclamation, however light sources from various expired lighting devices were sold to [REDACTED]. Their intent was to reclaim the tritium and use it in their light products. A

total of 6.01×10^{16} Bq of tritium in light sources were shipped to [REDACTED] for reclamation in 2000.

Contamination Control Program:

Surface contamination swabs were taken throughout the facility each week and analyzed through liquid scintillation. If an area was found to be above SSI criteria then the source of contamination was investigated. The area was washed and re-swabbed until criteria were met. No significant contamination problems occurred in 2000.

Incidents:

A tritium oxide emission occurred between August 15 and August 21, 2000 that exceeded the weekly administrative limit of 0.99 TBq. The oxide emission for this period was 1.50

TBq. A small amount of gas was released from the fill machines caused by human error contaminating the oil in the machine pumps. An oil change on August 18 produced an oxide reading that exceeded our limits. All emission levels returned to normal after the oil change was completed.

No incidents occurred that resulted in personnel exposures to exceed administrative or regulatory limits.

Personnel Dosimetry:

Personal radiation exposures for all employees were below the administrative limits. Attached in appendix A is a copy of the Year 2000 Radiation Exposures Summary for employees. As shown in appendix A, the operators received the highest dose ranging from 1.126 to 2.589 mSv. Dose levels for all other employees ranged from 0.006 mSv to 0.622 depending on the amount of time worked and the type of duties.

In 1997 the Atomic Energy Control Board requested that SSI review all past exposures for employees to determine effective doses due to tritium gas. Doses were to be calculated for all bioassay measurements greater than SSI's derived investigation level for acute exposures. Due to a misinterpretation of this request, only levels greater than SSI's derived investigation limits were recalculated. In September 2000 SSI submitted revised dose calculations from 1989 through 1997, recalculating the yearly data for all employees who have had exposures exceeding the acute levels.

Waste Management:

Shield Source did not use a municipal garbage system for waste disposal in 2000. All waste was either recycled or shipped to Atomic Energy of Canada Limited in Chalk River for disposal.

There were 3 shipments of waste totaling 3.70×10^{12} Bq sent to Chalk River Laboratory in 2000. The following waste quantities were released to Chalk River:

19 boxes (1.71 m³) of compact general waste into low level sand trench, containing a total of 2.65×10^7 Bq.

15 drums (1.05 m³) of glass tube stubs into low level sand trench, containing a total of 2.84×10^8 Bq.

7 drums (0.42 m³) of cemented contaminated oil and rig parts into Irus bunker, containing a total of 3.7×10^{12} Bq.

Waste water from Shield Source is currently collected into two holding tanks, analyzed and then discharged into a septic system. The septic tank was pumped out weekly and its contents were land spread according to the Waste Water Disposal Procedure in the SSI Radiation Safety and Procedure Manual.

A total of 30910 liters of waste water was released from the SSI holding tanks into the septic system. This waste water contained a total of 5.67×10^8 Bq, having an average of 1.83×10^4 Bq/L. The waste water was analyzed prior to being released into the septic system.

A total of 3.19×10^{13} Bq of Tritium Oxide and 9.18×10^{13} Bq of Tritium Gas were released to the atmosphere. These quantities meet both the regulatory and administrative emission requirements.

Environmental Monitoring Program (EMP):

Twin Oaks Consulting was originally contracted by SSI to establish and maintain the SSI EMP. Twin Oaks Consulting failed to complete phase 1 of the EMP, therefore in a letter dated November 2, 1999 from the AECB to SSI, it was recommended that Phase 1 sampling of the EMP be repeated. From October 3, 1999 to December 22, 1999 environmental samples were collected by SSI on a weekly basis and sent to Monserco Laboratories for analysis. As of January 2000 samples have been collected monthly by SSI and sent to Monserco Laboratories for analysis.

Golder Associates were contracted to review the SSI monitoring program. Although the SSI EMP written by Twin Oaks Consulting was approved by the former AECB, Golder found several errors in the calculations. Therefore in May 2000 SSI submitted to the CNSC a document entitled "Proposed Environmental Monitoring Program" written by Golder Associates revising the Pathway Model Assessments and the Derived Emission Limit calculations that were previously submitted by Twin Oaks Consulting. However, this document currently remains under review by the CNSC.

Samples will continue to be collected monthly by SSI until the revised EMP is approved and operating. Golder Associates will forward an annual EMP report to CNSC by April 13, 2001. This report will include a summary of the environmental monitoring results, including emissions data and critical group dose calculations and a summary of local land usage, meteorological data and unusual releases. It is difficult for SSI to complete Phase I of the EMP due to the errors associated with the approved EMP by Twin Oaks

Consulting. SSI is ready to finalize Phase I and begin Phase II of the EMP, however SSI is not able to do this until the revised EMP is approved.

Radiation Safety Training:

A Radiation Safety Meeting was held once a month with all staff for approximately 1 hour. New and/or existing projects, procedures, policies, problems or concerns were discussed at each meeting. Topics such as rig operating procedures, liquid scintillation counting and emergency procedures were reviewed.

The Production Supervisor was trained in the responsibilities of the Radiation Safety Officer due to leave of absences. The PS began training in April and assumed the role of RSO in October. Normal duties were assumed in January when the RSO returned to work. The PS will remain as backup RSO and will be kept apprised of all radiation safety matters.

Two new employees were hired at SSI in 2000. An employee was hired in the office to assist during the leave of absences. Training for this position has occurred in such areas as shipping, documentation requirements, safe handling of tritium, emergency and barrier procedures. A new rig operator was hired in October 2000 replacing an employee. Training for this position has occurred in such areas as safe handling of tritium, emergency, barrier, decontamination and rig operating procedures.

Future Outlook:

A plant expansion is being assessed to include glass forming and phosphor coating of the SSI Gaseous Tritium Light Sources. A feasibility study is being done to build a new plant that would accommodate the expansion. It is hoped the study will be complete and a decision made by early summer. Guidance and assistance from CNSC will be much appreciated.

In 2000 SSI worked with an Asian customer developing prototype signs. SSI plans to continue to research and develop new product in order to explore the Asian market.