ACC #249163
DP-MS-88-29X

**MONITORING SYSTEM FOR UNPLANNED RELEASES AT THE
SAVANNAH RIVER PLANT**

by

J. F. Schubert

E. I. du Pont de Nemours and Company
Savannah River Laboratory
Aiken, SC 29808

SECRET

RECEIVED
APR 30 1993
OSTI

This paper was prepared in connection with work done under Contract No. DE-AC09-76SR00001 with the U.S. Department of Energy. By acceptance of this paper, the publisher and/or recipient acknowledges the U.S. Government's right to retain a nonexclusive, royalty-free license in and to any copyright covering this paper, along with the right to reproduce and to authorize others to reproduce all or part of the copyrighted paper.

1st MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831; prices available from (423) 576-8401.

Available to the public from the National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

**MONITORING SYSTEM FOR UNPLANNED RELEASES AT THE
SAVANNAH RIVER PLANT***

by

J. F. Schubert

E. I. du Pont de Nemours and Company
Savannah River Laboratory
Aiken, SC 29808

ABSTRACT

The monitoring system for unplanned releases at the Savannah River Plant (SRP) consists of separation facilities stack monitors, production reactor filter compartment and stack monitors, 12 site perimeter monitors, the NOAA-Geostationary Operational Environmental Satellite (GOES) data link, meteorological tower system, Weather Information and Display (WIND) system computer, and the VANTAGE database management system. The unplanned release monitoring system provides automatic monitoring of abnormal stack releases and automatic inclusion of these in the WIND system emergency response codes.

INTRODUCTION

The Savannah River Plant (SRP) unplanned release monitoring system is a new concept in emergency response. This system was designed to provide accurate realtime release source terms to

* The information contained in this article was developed during the course of work under Contract No. DE-AC09-76SR00001 with the U.S. Department of Energy.

the Weather INFORMATION and Display (WIND) system computer for automatic inclusion in the SRP emergency response codes in the event of an unplanned release of abnormally high concentrations of radioactive isotopes to the biosphere. These data are collected for immediate use during the response to the unplanned release and are also archived for later use in research and computer code development.

The 800-km² SRP site, which is operated by E. I. du Pont de Nemours and Company for the U.S. Department of Energy, produces nuclear materials for the U.S. Government. SRP is considered a complete nuclear complex. Major facilities at SRP include:

- Three operating nuclear production reactors moderated and cooled with heavy water.
- Two chemical separations plants for separating and purifying the reactor products.
- A fuel manufacturing facility for producing fuel for the U.S. Navy's nuclear-powered ships.
- A Defense Waste Processing Facility, which will process high-level radioactive waste for incorporation in glass for underground storage.

Although the facilities of SRP have a very low potential for hazardous releases to the environment, the Environmental Technology Division of the Savannah River Laboratory (SRL) with the aid of SRP personnel has designed and installed a realtime remote monitoring system. This system places the latest monitoring technology in existing production facilities to provide accurate source terms to

a central computer system for radioactive effluents that might be released to the biosphere.

Under the old system, key stack and filter compartment alarms would be manually monitored by control room personnel, and these data would then be verbally transmitted to the Weather Center Analysis Laboratory (WCAL) and/or to the Emergency Operating Center (EOC). The data would then be manually entered into the WIND System Computer (Garrett et al., 1983). The WIND system combines the stack release data and local meteorological data and calculates the transport and dispersion of toxic and/or radioactive pollutants. The WIND system also calculates the predicted dose rates for both onsite and offsite populations.

Under the old system, delays could occur in obtaining the necessary information about the possible dose consequence to the offsite populations because of the large amount of manual data entered and the verbal communications between the EOC and operating areas. To eliminate these delays and the potential for human error, the new system of electronic filter compartment and stack monitors transmits data from the separations and reactor areas and perimeter monitors directly to the WIND system computer.

SYSTEM DESCRIPTION

Each of the operating areas of SRP (Reactors, Separations, Tritium Production) have monitors for stack effluents. In addition, the production reactors also have monitors in each of the exhaust air filter compartments. The following is a list of the monitors by area:

- Reactor Area: Filter compartments 1 to 5, breakthrough monitors, filter compartment near side, filter compartment far side, and total stack activity.
- Separations Area: Low range alpha monitor, low range fission product monitor, low range radioiodine monitor, high range alpha, high range fission product, high range radioiodine, backup high range radioiodine, and stack breach monitor.
- Tritium Production: Tritium forms monitor for elemental tritium, tritium oxide, and total tritium.

Another part of the system consists of 12 perimeter monitors equally spaced around the perimeter of the plantsite to measure low range gamma, high range gamma, and tritium (transmits at 2- to 10-minute intervals on the USGS-GOES data channel for readings above the threshold value).

The emergency response codes also use data collected from the eight meteorological towers, one at each of the operating areas (wind speed, wind direction, sigma azimuth, sigma elevation), and a TV tower located about 20 miles from the center of the plantsite (seven levels with wind speed, wind direction, sigma azimuth, and sigma elevation).

RESULTS

As each data link to the WCAL was completed, it was linked to the WIND system computer and the VANTAGE remote environmental monitoring system VAX 11/780 computer and the VANTAGE database management system. The VANTAGE database management system provides

seven levels of alarm and alert functions. It also can display up to four variables (in any combination) on an electronic strip chart. VANTAGE archives all the variables in such a fashion that they are immediately available to the WIND system emergency response codes, or are available at a later date for other purposes.

The unplanned release monitoring system provides automatic monitoring of key stack releases. This will eliminate verbal communications and delay in receiving the necessary information needed for the emergency response codes. This system provides complete realtime accurate source term information for automatic inclusion in the emergency response codes.

REFERENCES

- Garrett, A. J., M. R. Buckner, and R. A. Mueller, "The Weather Information and Display Emergency Response System," Nucl. Tech., 60(1):50-69, 1983.
- Schubert, J. F., "Savannah River Plant Remote Environmental Monitoring System," American Nuclear Society Topical Meeting on Radiological Accidents: Perspectives and Preparedness, Bethesda, MD, September 15-17, 1986.