

# NRRPT® NEWS

## National Registry of Radiation Protection Technologists

Spring 2007 Edition

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### Chairman's Message



Kelli Gallion

#### Congratulation Members of Distinction!!

#### Member Emeritus:

The Awards Committee received and honored an applicant requesting Member Emeritus status within the Registry. The newly honored member is Adrien R. (Dick) Trudeau. Mr. Trudeau has been registered since 1981

and is currently in good standing with the Registry. Mr. Trudeau has reached the "Member Emeritus" age requirement and is no longer active in the radiation protection field due to his retirement from the field of radiation protection. All Awards Committee members present for the meeting recommended that Adrien R. Trudeau be awarded Member Emeritus. "Thank you for your years of dedication to the field of Radiation Protection!!"

#### Fellow Members:

The Awards Committee has recommended Kelly Neal to receive recognition as a Fellow Member. Kelly has given outstanding service to the NRRPT in the form of administrative contributions as Secretary/Treasurer for the Registry. He has served a long and memorable term on the Board of Directors in that position. He has also have served as Chairman for the Finance Committee and is a strong supporter and promoter of the goals, programs and benefits of the Registry. In addition to Kelly's dedication and contributions to the Registry, I truly admire Kelly's positive and uplifting attitude. He always sees the good in everything and has a smiling face.

### CONTACTS

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**Arthur F. Humm, Jr. Award:**

The Awards Committee received a number of recommendations for the Arthur F. Humm, Jr. Award, and I am pleased to announce that Dave Biela is the successful nominee. Dave will receive his ever so deserving Arthur F. Humm, Jr. Award at the Annual Meeting in Portland, Oregon during the 68<sup>th</sup> gathering of the **NRRPT** Board of Directors and Panel of Examiners Meeting. Dave served as Exam Panel Chairman from 1999-2005 and was very instrumental in the development of the Canadian Exam (among a variety of other notable mentions). Dave is currently the Vice Chairman and soon to be Chairman beginning January 2008. Congrats Dave!

For the latest update of new nuclear power plants being built, visit NEI website at: <http://www.nei.org/index.asp?catnum=2&catid=344>

Just a reminder: The next **NRRPT** Board and Panel meeting will be held in conjunction with the HPS Annual Meeting July 8-12, 2007 in Portland, OR. For more information please visit <http://hps.org/meetings/meeting7.html>. Remember, all members are invited to attend the unrestricted portions of the **NRRPT** Board of Directors meeting held Saturday July 7th and Tuesday July 10th.

Thank you all for your continued support!!!!

My sincere thoughts and prayers go out to the families and friends of those lost or injured at Virginia Tech.

Sincerely,  
Kelli Gallion  
**NRRPT**, Chairman of the Board of Directors

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## Welcome New Members

Congratulations to the following individuals who successfully passed the **NRRPT** February 10, 2007 examination:

Kiara K. Ashford  
Donald S. Asquith  
Clarence R. Brunson  
Timothy C. Collins  
Ben E. Edwards  
Matthew C. Enyeart  
David J. Gerth  
Stanley D. Heath  
Pamela K. Hoggan  
Joseph M. Hynes

Bryan L. King  
Robert G. Lukes  
Jeremy W. McKinney  
Kevin M. McNeil  
Charles E. Mills  
Johnny F. Mills, II  
Margaret M. Owen  
Charissa F. Rhodes  
Bradley W. Ross  
Jessica L. Skaar

Eric J. Steele  
James N. Stokes  
Gordon M. Tannahill  
Wesley K. Terry  
Christopher M. Tiemens  
Ethan N. Turner  
Mark D. Voss  
Michael S. Whittenbarger  
Phillip R. Williams

Congratulations to the following individuals who successfully passed the **NRRPT** Canadian exam administered in Ontario Canada on February 26, 2007:

Clive A. Bands  
Jim J. Brookes  
Alan B. Carmichael  
James P. Rodgers

**New Members:** If you do not have access to the "Members Only" portion of the website, please contact the Executive Secretary ([nrrpt@nrrpt.org](mailto:nrrpt@nrrpt.org)). Your email address must be on file in order for you to gain access.

## Start-Up and Deactivation Projects at Savannah River Tritium Facilities

Ron Lee, R.R.P.T., Washington Savannah River Company

The permanent closing of the last of the Department of Energy's (DOE) production reactors at the Savannah River Site (SRS) in 1988 left the U.S. with no source of tritium for its thermonuclear weapons except for gas recovered from recycled weapons components. As tritium has a relatively short (12.3-year) half-life, it was clear that a new source must be developed. This need resulted in a DOE plan to irradiate lithium-6 targets in commercial power reactors at the Tennessee Valley Authority (TVA) and to extract the resulting tritium from the target rods at a new Tritium Extraction Facility (TEF) to be constructed at SRS. Also planned was a modernization project that would utilize new technology to purify the extracted gas to make it suitable for weapons use. At the same time, DOE planned the deactivation of the original tritium extraction and purification plant in the SRS Tritium Facilities. This resulted in an interesting dichotomy of missions, the shutdown and deactivation of an old facility as its replacement projects undergo construction and start-up. These opposing, yet complementary, milestones were safely accomplished between 2000 and 2006 with the Tritium Facilities Radiological Control Operations (RCO) staff fully involved in both endeavors.

The shut down and deactivation of the original tritium extraction and purification facility was completed following over 50 years of operation. This facility extracted tritium gas from lithium-6 target rods after neutron irradiation in the Site's reactors, and then removed impurities to make the gas suitable for weapons use. The second function included the clean up of old gas recovered from weapons components returned from the nation's stockpile and the field for periodic refurbishment. Tritium and higher energy beta and gamma emitting fission products were of concern in the extraction portion of the building. In the gas purifying area tritium was of sole concern. The two operations led to an unusual mix of radiation protection problems for RCO, both while the facility was active and during deactivation work. In extraction, fission products produced contamination, airborne activity, and dose rate issues, in addition to the problems

from tritium produced airborne activity and contamination. The purification side, though without fission products, still provided challenges from tritium contamination and airborne activity. The combination of contaminants required a variety of portable field and count room instrumentation. In addition to the common dose rate and contamination detection instruments, RCO personnel also used the Scintrex hand-held tritium-in-air monitor for field work. In the count room, the Hidex Triathler liquid scintillation counter was used for tritium swipes. Other beta and gamma isotopes were counted with the ThermoEberline Hand-E-Count dual phosphor scintillation detector. Both the Triathler and Hand-E-Count are small and rugged enough to allow field use in addition to count room duty. When large numbers of samples must be counted, high capacity Beckman liquid scintillation counters were used, as well as a Tenelec counter for multiple fission products samples.

The deactivation was conducted in two phases. The extraction portion of the building was shut down and deactivated first. At approximately the same time, ground was broken for its replacement facility nearby. The gas purifying operations continued. RCO was quite busy with decontamination, waste, and facility characterization surveys and job coverage as this section of the building was steadily de-inventoried and decontaminated to the point it could be safely and permanently laid up. Negligible levels of fission product transferable contamination and air activity permitted the discontinuance of constant fission product air monitoring inside the facility. Long-term negative results for effluent fission products before and after the deactivation led to the eventual discontinuance of environmental release monitoring for fission products, while tritium monitoring continued.

The second deactivation phase of the purification part of the building was completed just months prior to the start-up of the replacement facility. Again, RCO was extensively involved in the preparations for eventual deactivation. This included the transfer of the equipment from a radiological materials laboratory housed in the build-

ing to a newly constructed lab facility. RCO staff participation was crucial in planning the move as well as the actual survey, decontamination, packaging, and movement of the old laboratory contents to ensure timely opening of the new one. RCO was involved in the full spectrum of start-up activities as this new radiological materials laboratory was opened.

As preparations for deactivation came to a close, the final tasks included modification of the building tritium air sampling and ventilation systems. All of the local installed air sampling systems were shut down. These consisted of banks of large, stainless steel ion chambers, developed at SRS and known as Kanne chambers, in conjunction with chart recorder readouts. The chambers are hard-piped to sample points throughout the building, and each has its own pump to provide airflow. The real time stack monitoring Kanne system was replaced with a retrospective tritium "bubbler" sampler. An instrument shed constructed adjacent to the old building houses the system in which a sample of stack effluent passes ("bubbles") through vials of ethylene glycol to collect tritium. RCO is now responsible for routinely collecting these vials for liquid scintillation analysis to measure any environmental release. The multiple exhaust and supply fans of the building ventilation system were reduced to a single operating exhaust fan providing minimal airflow through the facility. Once the ventilation and stack sampling modifications were completed, all water was drained from the building and all electrical power cut. It is now padlocked, retired in a "cold, dark, and dry" state, with entry limited to annual inspections by the Operations Department escorted by RCO.

Coinciding with this shutdown, the TEF and the Tritium Facilities Modernization and Consolidation Project (TFMCP) were being readied for start-up. The TFMCP provides the new purification capability for the Tritium Facilities. New tritium storage and purification technologies enabled the entire process to be contained in a single room of one of the existing tritium process buildings instead of a huge wing of the old multistory plant. Improved engineered glovebox containment and air sampling systems make the RCO staff's task much easier. Tritium is confined at negative pressure under a nitrogen gas atmosphere inside sealed stainless steel gloveboxes with their own ion chamber monitors. The

old facility had open air hoods that used flow through ventilation from the room to remain at negative pressure. Local air sampling in the new facility uses a modernized tritium air monitoring system that is computer based and can automatically cycle multiple sample locations or be set up by an RCO operator to provide a sampling scheme customized for specific jobs and situations. Worker exposures to tritium are generally limited to jobs involving removal of items through glovebox airlocks and to major maintenance evolutions during which a glovebox panel may be removed. The open glovebox maintenance evolutions are conducted in custom-built containments with additional air monitoring flexibility provided by a mobile cart holding five Kanne chambers. Because these engineering controls have been so successful, the area is essentially free of airborne activity and contamination.

The last stage of this long process, the startup of TEF, was completed in December 2006.

Like its predecessor, TEF deals with high dose rates along with contamination and airborne activity from fission products and tritium. Like the TFMCP, updated technology and successful engineering controls have made dealing with this mix of hazards far easier for RCO personnel.

TEF is divided into two sections, one heavily shielded with remote operations for handling the irradiated target rods and extracting tritium gas, the other for initial clean up of the gas prior to transfer to the TFMCP for final purification and eventual loading into weapons components. After delivery from the TVA, the rods are remotely removed from the shipping cask and cut open. They are then heated in a furnace to drive off the gas, which passes to the purification side for initial processing. The spent rods are packed in a waste cask for burial on Site. As in the TFMCP, engineered containments have been instrumental in minimizing the levels of fission product and tritium contamination and air activity. The only worker exposures expected will be during maintenance activities that may call for breach of containment. In this event, we may again expect to see a mixed bag of radiation protection problems, from high dose rates to fission product and tritium contamination and air activity.

Continued on page 7

## Musings of an Old!! RPT (And Then Some)

Hi to all of today's RPTs that may be reading this newsletter. I just got my February issue and read the plea for articles to be submitted so I said that I would just set down and write one and send it in.

Let me introduce myself first and then I will just meander around here and there in some reminiscent musings of my own. I am Maynard Wright, one of the charter members of the registry being registered in 1976. I believe there were 63 of us that passed that first exam.

I was working for Georgia Power Company at Plant Hatch then and there was no monetary benefit given for being registered. My only reason for taking and passing the exam was personal gratification. I wanted to be among the best and be able to prove it by my certification. That was it. I could take my certification plaque and a dollar bill and buy a cup of coffee with it.

About ten years later, in the mid eighties. The industry started paying a bonus for certification and then there were a lot of techs that took the exam so they could get the extra money. I looked on that sadly and wondered where was the personal pride that motivated me and those first techs to go the extra distance to be the best. Was certification no more than just a way to get more money? Was the love of money the only factor that was important to these recent RPTs? I think of this much like we want to believe about our doctors and nurses. I like to think that most of these doctors and nurses went to school and got their degrees in medicine because they have a real love for other people and they WANT to be able to relieve the suffering and pain that goes with sickness and disease. It is true that they do make a lot of money but I hope that money is not their main desire but rather their concern for our health is. I surely hope that the new RPTs will be able to see more to enjoy in life than the almighty dollar.

But let's move on to some lighter banter shall we? I am very glad that I got into the nuclear power field when I did. I started at Plant Hatch on June 12, 1972, seven years before the Three Mile Island event that turned the tide for nuclear power in America. Up until TMI the nuclear power industry was the "prince charming" of America. After TMI, nuclear power was DEAD! All the units that were under construction or even just being ordered were canceled. All of the rosy opportunities for RPTs vanished. Those of us that were established just had to cling to what we had and stay there until we could retire.

After my retirement in 1989 I went on the road as a contract tech for a few years and really enjoyed travelling to different places and learning how other plants were operating. All in all I believe that being a road tech gives you the best overall knowledge of the radiation protection field of work. The big drawback to that was the move that the industry made to shorten the outages to about 30 days more or less. It quickly reached the point where a contract tech could not keep enough work to make a living year round. Sadly, many good people had to leave the field and go into other types of work.

Here are my comments on the newsletter as it is. I personally would like to see less techie stuff with all of the formulas and theorems expounded and see more personal comment such as this that I am providing. After all, if we are already registered that means that if push comes to shove and we need to do some of this fancy calculating then I believe most of us can do it without having to holler "uncle" and yell for help. Now for my two cents worth let's hear from some of the rest of you about your pet peeves or your pride and joy.

Happy trails to you and keep smiling,  
Maynard Wright, NRRPT (retired)  
mrw-ss@juno.com

## Liquid Scintillation Counting (LSC) for P-32 and Other High Energy Beta Emitting Radioisotopes Using Cerenkov Counting

Robert Wills RRPT  
GEL Laboratories, LLC

As radiation protection technologists we tend to get our hands into all kinds of different activities. One such example is use of liquid scintillation counting for isotopes that emit beta, gamma or alpha radiation. The need to survey for, or analyze samples for isotopes that emit only beta or alpha particles is an area in radiation protection that is often not given enough focus. This short article will hopefully spark interest for you to investigate beta and alpha counting via LSC further.

The survey and counting methods used to detect and quantify a pure beta emitter is very dependent on the isotope and the energy of the beta particle. Today I want to focus on high energy beta emitting isotopes. For the purpose of this article let's look at P-32. I fully understand that we see many different isotopes depending on the environment the technologists are working in. Isotopes found at nuclear power plants, DOE facilities, medical facilities, and university laboratories are all very different and cover the full energy spectrum. LCS is a useful tool and requires a well thought out approach for survey and analytical testing.

The main isotopes that we encounter in the field that are pure beta emitters include but are not limited to, (Fe-55, Ni-63, C-14, H-3, Sr-89/90, P-32, and Tc-99).

Because this article addresses Cerenkov counting we will focus on the isotope P-32 and its use in biological and chemical sciences.

The method of cerenkov counting via liquid scintillation is interesting in that no scintillation cocktail is used. To understand why no scintillation cocktail is needed we need to understand what cerenkov radiation is. Cerenkov radiation is caused by beta particles with energy levels above 263 keV, which is the threshold energy required for production of Cerenkov radiation in water. When a beta particle possesses an energy of 263 keV or greater, it travels in water at a speed greater than the speed of light in the same medium. At this speed, the beta particle causes localized polarization along the path of travel resulting in emission of electromagnetic radiation. This is caused when the polarized molecules in the water return to their original state, losing energy in the form of electromagnetic radiation.

### Sample Volume Effects:

Because of the directional emission property of Cerenkov photons the sample volume can have an effect on counting efficiency. Optimum sample volumes are general about 10ml, however, plastic vials are not as effected by volume as are glass vials. Additionally you will see higher counting efficiencies in plastic vials.

### Quench Correction:

There is no chemical quench in Cerenkov counting, but color quench correction is necessary. In many applications of biology and biochemistry, P-32 must be analyzed from animal or plant tissue. The tissue may be ashed in a muffle furnace to destroy the organic matter to place the P-32 in soluble form. The ash is dissolved in dilute acid

resulting in a liquid solution with some color. This color will adsorb some of the electromagnetic radiation causing the sample to read lower in activity than it actually has. This correction is called "quench correction". The correction acts the same way detector efficiency needs to be calculated and understood in order to obtain the proper count rate of a sample.

#### **Advantages of Cerenkov Counting:**

1. The cost to perform Cerenkov counting is low as no fluor cocktails are required
2. A standard LSC instrument can be used
3. Counting efficiencies of over 55% can be achieved by Cerenkov counting of colorless samples and can approach 100% at times
4. A sample of P-32 in a liquid state can be counted directly without destroying the sample nor the addition of any fluor cocktail
5. No chemical disposal costs

I hope this short introduction to LSC by Cerenkov counting is of interest and encourages the RRPT to research methods, technology and applications further.

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### **Mark Your Calendar!**

NRRPT Board & Panel Meetings  
July 7 - 10, 2007  
Portland, OR  
Doubletree Hotel & Convention Center

**\*\* All NRRPT members are welcome and encouraged to attend \*\***

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#### **Continued from page 4**

In addition to process improvements, TEF has an upgraded real time tritium air sampling system, moving away from bulky Kanne ion chambers to a much smaller monitor. Known as a TAM, (Tritium Air Monitor) the system is a two-component unit, each about the size of a large lunchbox. One device houses the sample pump, dust filter, rotameter, and a small ion chamber detector. The other unit houses a digital ratemeter. The compact size makes for ease of routine maintenance, surveillances, and calibrations by RCO. TAM sensitivity is equivalent to the large and bulky Kanne chambers. All of the TAMs are integrated into the facility computer systems and can be remotely read and operated from various locations. As in the TFMCP, an operator can override automatic sampling to open or close sample points to meet particular needs.

The past six years have seen many changes in the configuration of the Tritium Facilities. The RCO staff of 44 technicians, managers, and health physicists has been constantly busy with the multiple challenges presented by almost simultaneously starting and deactivating facilities. Additionally, RCO personnel have consistently met the ongoing, day-to-day radiation protection needs of five other production facilities, two of which operate around the clock. Throughout this period of transition, RCO has been recognized as a vital part of the Tritium Facilities team as SRS continues to provide for the nation's defense into the 21st century.

---



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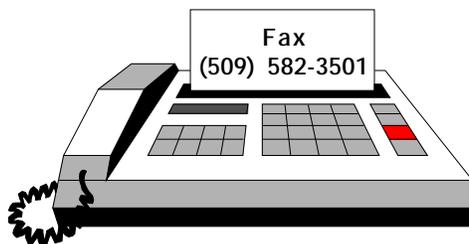
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