

**Record of Meeting  
JCCEM U.S./Russian Workshop on  
Tritium Decontamination Issues**

**December 11-12, 2000  
Miamisburg, Ohio**

**Russian Participants:**

Evgeny Krukov, MINATOM  
Igor Smirnov, Khlopin Radium Institute  
Alexander Pavlov, VNIPIET  
Viktor Tishkov, Khlopin Radium Institute  
Genrich Zakharchuk, VNIPIET  
Valery Shilov, VNIPIET

**U.S. Participants:**

Steve Bossart, DOE-NETL  
Dick Blauvelt, Waste Policy Institute  
Rick Provencher, DOE-MEMP  
Sam Cheng, DOE-MEMP  
Dick Neff, DOE-MEMP  
Douglas Maynor, DOE-OH  
James Johnson, DOE-MEMP  
Donald Krause, BWXTO  
John Gill, BWXTO  
Yung-Sung Cheng, Lovelace Respiratory Research Institute  
Ken Hofstetter, Savannah River Site  
Scott Dennerlein, Princeton Plasma Physics Laboratory  
Scott Willms, LANL  
Mark Mintz, LLNL  
Richard Castro, LANL  
Vince Maio, INEEL  
Mikhail Khankhasayev, Florida State University  
Mark Whitney, SAIC

**Interpreters:**

Tanya Albert, TEA  
Paul Grenier, TEA

**Activities:**

Richard Blauvelt (WPI) opened the workshop and outlined the major objectives, one of which was to identify DOE needs in R&D and deployment of new effective technologies which can accelerate decontamination and decommissioning of U.S. facilities and equipment contaminated by tritium.

Rick Provencher, Director DOE-MEMP, welcomed the participants on behalf of the Mound Facility, introduced the Mound workshop participants, and expressed the need for effective cooperation to speed up the Mound D&D efforts in tritium-related issues.

Richard Blauvelt made the first presentation of the workshop. His presentation reviewed some completed and ongoing Tritium D&D Projects in the DOE complex. The five DOE projects focused on the decontamination and decommissioning of:

- 232-F Tritium Extraction Facility at the Savannah River Site (SRS);
- Mound Tritium facilities;
- KMS Fusion at LLNL;
- TSTA at LANL; and,
- Tokomak Fusion Reactor at PPPL.

During discussions that followed this presentation, Evgeny Krukov (MINATOM), the head of the Russian delegation, stated that one of the main goals of the Russian delegation during the course of this workshop is to obtain a better understanding of DOE needs in tritium-related D&D activities.

Richard Castro (Material Science & Technology Division, LANL) presented a promising technology, the Cathodic-Arc Cleaning/Plasma Spraying Chamber, for decontamination of metallic surfaces. Potential capabilities of this technology were demonstrated in the video film shown during the presentation. The technology is designed for decontamination of thermonuclear reactors and it has been tested for application to a deuterium contaminated conducting surface. Deuterium is used as a surrogate for tritium. A direct application of the technology for decontamination of tritium contaminated surfaces has not yet been conducted. A potential use of the technology is the removal of actinides, radionuclides/transuranics.

This presentation was followed by extensive discussions by V. Shilov (VNIPIET), S. Bossart (DOE-NETL), M. Mintz (LLNL), R. Blauvelt (WPI), and E. Krukov (MINATOM). In his comments, Victor Shilov noted that an analogous technology was studied at VNIPIET about 15 years ago but it did not get funded for further development because it was not effective for industrial scale applications.

Yung Sung Cheng (Lovelace Respiratory Research Institute (LRR), Albuquerque, NM) presented a comprehensive discussion of tritium health effects and methods of air monitoring. V. Tishkov (KRI, St. Petersburg) mentioned that one of the leading Russian experts on tritium health effects is Professor Mikhail Bolonov (Institute of Hygiene, St. Petersburg).

Vince Maio (INEEL) discussed in detail one of the incineration methods, Catalytic Oxidation Process, which is designed for treatment of contaminated organic liquids. This technology can be used to remove organic components for tritiated liquid mixed waste. Dr. Maio also presented an overview of a large spectrum of other technologies that can be used for destruction of organics from mixed wastes. These technologies include chemical oxidation, dehalogenation, separation, and biological methods.

Igor Smirnov (KRI, St. Petersburg) presented the results of using a high temperature plasma-chemical process for management of organic radioactive waste. KRI has extensive experience using this technology. Two such systems are available at KRI. One is designed for laboratory experiments, and the second is the research plasma-chemical mockup. One of the advantages of this technology is that it can reduce greatly the consumption of air (by a factor of 4). This technology also can be used for treatment of tritiated liquid mixed waste. The discussions that followed showed a considerable amount of interest in possibly using the high temperature plasma-chemical process for the treatment of DOE liquid organic mixed wastes.

The current status of tritium contamination monitoring in the environment was presented by Kenneth Hofstetter (SRTC-WSRC). He described in detail the practical methods and detectors used to monitor tritium surface and ground water contamination at the Savannah River Site. He also described some real-time monitoring equipment developed to provide early warnings of tritium releases in liquid effluents at SRS.

Victor Tishkov (KRI) then presented an overview of the methods and equipment used in Russia to monitor tritium contamination/migration in the environment. He mentioned that tritium is used as an effective tracer of migration of radioactive contaminants, and presented the results of such monitoring activities conducted at several MINATOM sites, including the Siberian Chemical Combine and the Mining Chemical Combine. V. Tishkov also stated that deep injection of tritiated waste is considered a safe long-term method for disposition

Scott Willms (LANL) presented a comprehensive overview of US air detritiation systems. These systems are designed for the removal of tritium from the atmosphere of gloveboxes using an air system. There is a wide range of applications for oxidation/adsorption systems. However, the main disadvantage of these systems is the production of secondary wastes. A detailed description of the performance of the TSTA "Tritium Waste Treatment" system was presented, and its application to glovebox decontamination was discussed.

Mark Mintz (LLNL) concluded the first day with a presentation on the Tritium Scrubbing Cart System, developed in 1993-94 and demonstrated successfully at the Mound Facility in 1999. This system can be used for the decontamination of gloveboxes and one of its advantages is portability.

Dick Neff (DOE-MEMP) started the second day of the workshop with a presentation on Tritium Behavior/Treatment in Groundwater. He described the history of a tritium contamination problem at the DOE Mound Facility and the methods used to solve this problem. He underlined one issue that has not yet been resolved. This is the tritium contaminated area under the SW building that appears as tritium seeps on the hillside west of the plant. This building is scheduled to be demolished by 2002 and the soil beneath this building is planned to be removed and shipped to a burial site. The Mound Facility is looking for an alternative solution for decontamination of this area.

During the discussions that followed this presentation, Ken Hofstetter (SRS), Mark Mintz (LLNL), and Scott Willms (LANL) shared information on the current status of tritium groundwater monitoring and treatment at the Savannah River Site, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Brookhaven National Laboratory.

Victor Tishkov (KRI, Russia) focused his presentation on a description of Russian experience in deep geological injection of tritiated wastes. This method has been used for more than 30 years at the Siberian Chemical Combine (Seversk, Tomsk Region) and at the Mining Chemical Combine (Zheleznogorsk, Krasnoyarsk Region).

New technologies and methods for the monitoring of tritium content on surfaces and in oil or water were discussed by Scott Willms (LANL), Scott Dennerlein (PPPL), and Don Krause (BWXT). These methods may accelerate the survey of contaminated materials.

Scott Willms described the Tritiated Surface Monitoring Technology using PIN Diode that was developed by Sandia National Laboratory. This is a commercially available technology and it is considered an alternative to the baseline technology, which is based on liquid scintillation detectors. This technology can reduce both the time of recording/analyzing the data and the secondary waste stream produced by the traditional scintillation method.

Scott Dennerlein (PPPL) described two methods for monitoring surface activity, which were developed at the Princeton Plasma Physics Laboratory: the Iodine Chamber and a portable Liquid Scintillation Detector.

Don Krause (BWXT) provided an overview of the Mound LSDDP project for the demonstration of a new tritium monitoring method based on fiber optics technology. This method is being evaluated against the baseline technologies: scintillating counting and calorimetry counting. The results to date show that this technology makes it possible to effectively detect tritium contamination of oil substances. The method is feasible and accurate and it will help to determine tritium concentration in oil.

Igor Smirnov (KRI) presented a Sub- and Supercritical CO<sub>2</sub> Extraction Technology primarily designed for surface decontamination. The ideal areas of application of this method are small contaminated surfaces, tools, plastic, and clothes. The method also was tested at Mayak Production Association for decontamination of contaminated surfaces. The KRI has two laboratory-scale systems with a volume of 5ml and 1.5l. The equipment installed at the Krasnoyarsk plant has a volume of 150l. The average decontamination cycle time is about half an hour.

Scott Dennerlein (PPPL) presented a TechXtract liquid technology which has better DF than hydrogen peroxide and generates minimum secondary waste. In addition to metals, this technology can be used effectively for tritium decontamination of concrete and other porous surfaces. A demonstration of this technology is scheduled at LLNL in January,

2001. This technology will be evaluated against the baseline scabbling technology for decontamination of concrete.

Richard Blauvelt (WPI) presented technologies for tritiated waste solidification, in particular, tritiated oil solidification. Successful testing of these technologies has been done recently at Mound and other DOE sites. The solidified waste is placed into special containers for further disposition at burial sites. He also described the absorbent technologies that can be effectively applied for reducing water based wastes.

**During the workshop, the following DOE site needs in the area of tritium decontamination were identified:**

- The Mound Facility is looking for an alternative solution for decontamination of the tritium contaminated area under the SW building that appears as tritium seeps on the hillside west of the plant. This building is scheduled to be demolished by 2002.
- LANL has a need for technologies for the characterization of tritium processing components. Examples include catalyst beds, adsorption beds, and hydride beds (uranium tritide beds).
- LANL has a need for technologies for the characterization of highly-tritiated water.
- LANL expressed the need for tritiated water packaging technologies. The primary concern is adequately containing the pressure that will build up from radiolysis and decay.

**U.S. participants expressed interest in the following Russian technologies discussed during the Workshop:**

- High temperature plasma-chemical process that was developed at KRI for the treatment of liquid organic mixed wastes.
- Non-strippable coatings technology which are capable of suppressing tritium release from contaminated surfaces.
- Instrument that collects swipe samples with consistent pressure and surface area.
- Supercritical and subcritical carbon dioxide for ex-situ decontamination of small D&D debris, PPE, tools, etc.
- Russian coatings which change color to indicate relative level of radiation.
- Potential capabilities to adjust the electrochemical method, which was designed for the decontamination of plutonium gloveboxes, for decontamination of tritium gloveboxes.

**Action Items:**

1. The U.S. side will provide, through official JCCEM channels, more details on the DOE sites where the aforementioned Russian technologies may have applications. The correspondence will identify the sites and their specific problems and will solicit proposals from the Russian side.

