

Disposal of Carbon from Chemical Agent Disposal Facilities

The preceding chapters of this report have indicated the sources, amounts, and properties of activated carbon; described how it is actually used and managed at chemical agent disposal facilities and other industrial operations; and discussed the chemical fate of the agents on the carbon. This chapter addresses disposal options for all of the used carbon (exposed and unexposed) from chemical agent disposal facilities, including methods that have been used or proposed by both closed and operating chemical agent disposal facilities. It also assesses the type of scientific support required for the disposal facilities to obtain regulatory approvals.

The central theme of this report is that the used activated carbon from chemical agent disposal facilities can be assigned to one of two categories: (1) carbon that has been exposed to chemical agent(s) in the course of its utilization ("exposed carbon") and (2) carbon that has not been so exposed ("unexposed carbon"). Analyses performed on samples of exposed carbon have confirmed that contamination with agents decreases over time because the agents react with the moisture adsorbed on the carbon and form degradation products via hydrolysis. However, the analytical evidence suggests that a small, parts-per-billion level of agent may always remain on the carbon after normally expected storage times following removal from service and storage.

PAST EXPERIENCE WITH DISPOSAL OF USED ACTIVATED CARBON

The first integrated chemical agent disposal facility was the Johnston Atoll Chemical Agent Disposal

System (JACADS), which used incineration technology and completed 10 years of disposal operations in 2000. In 2005, the Aberdeen Chemical Agent Disposal Facility (ABCDF), which used neutralization technology to destroy agent, was the first integrated disposal facility in the continental United States to complete agent disposal operations. JACADS and ABCDF have already disposed of their entire inventory of used carbon by incineration, the former on-site and the latter off-site. The Newport Chemical Agent Disposal Facility (NECDF), another facility that used neutralization, completed agent disposal operations in 2008. It had a regulatory permit allowing shipment of all of its exposed carbon as a listed secondary waste to a qualified treatment, storage, and disposal facility (TSDF) for incineration. NECDF was in the process of shipping its exposed carbon off-site as this report was being prepared. It has also shipped approximately 220,000 lb unexposed carbon to Calgon Carbon Corporation for reactivation and resale. The determination that this carbon had not been exposed to agent was based on generator knowledge. Further details of these disposal activities and their relevance to future carbon disposal at other facilities are provided below.

Incineration of Used Carbon at JACADS

The closure plan for JACADS required that all used carbon be incinerated on-site. This was accomplished by a process known as carbon micronization. The used carbon was first pulverized to a fine powder in a carbon micronization system (CMS) and then blown into the deactivation furnace system, where it was incinerated.

The Disposal Of Activated Carbon From Chemical Agent Disposal Facilities

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Disposal of Activated Carbon from Chemical Agent Disposal Facilities National Research Council, Division on Engineering and Physical Sciences, Board on Army Science and Technology, Committee to Examine the Disposal of Activated Carbon from the Heating, Ventilation, and Air Conditioning Systems at Chemical Agent Disposal Facilities, 2009-10-08 For the last two decades the United States has been destroying its entire stockpile of chemical agents At the facilities where these agents are being destroyed effluent gas streams pass through large activated carbon filters before venting to ensure that any residual trace vapors of chemical agents and other pollutants do not escape into the atmosphere in exceedance of regulatory limits All the carbon will have to be disposed of for final closure of these facilities to take place In March 2008 the Chemical Materials Agency asked the National Research Council to study evaluate and recommend the best methods for proper and safe disposal of the used carbon from the operational disposal facilities This volume examines various approaches to handling carbon waste streams from the four operating chemical agent disposal facilities The approaches that will be used at each facility will ultimately be chosen bearing in mind local regulatory practices facility design and operations and the characteristics of agent inventories along with other factors such as public involvement regarding facility operations The Disposal of Activated Carbon from Chemical Agent Disposal Facilities Committee to Examine the Disposal of Activated Carbon from the Heating Ventilation and Air Conditioning Systems at Chemical Agent Disposal Facilities, Board on Army Science and Technology, Division on Engineering and Physical Sciences, National Research Council, 2009-09-08 For the last two decades the United States has been destroying its entire stockpile of chemical agents At the facilities where these agents are being destroyed effluent gas streams pass through large activated carbon filters before venting to ensure that any residual trace vapors of chemical agents and other pollutants do not escape into the atmosphere in exceedance of regulatory limits All the carbon will have to be disposed of for final closure of these facilities to take place In March 2008 the Chemical Materials Agency asked the National Research Council to study evaluate and recommend the best methods for proper and safe disposal of the used carbon from the operational disposal facilities This volume examines various approaches to handling carbon waste streams from the four operating chemical agent disposal facilities The approaches that will be used at each facility will ultimately be chosen bearing in mind local regulatory practices facility design and operations and the characteristics of agent inventories along with other factors such as public involvement regarding facility operations **Disposal of Activated Carbon from Chemical Agent Disposal Facilities** National Research Council (U., 2009 **Carbon Filtration for Reducing Emissions from Chemical Agent Incineration** National Research Council, Division on Engineering and Physical Sciences, Commission on Engineering and Technical Systems, Committee on Review and Evaluation of the Army Chemical Stockpile Disposal Program, 1999-09-12 This report reviews the Army s evaluation of carbon filters for use in the baseline incineration PAS as well as the Army s change management process the Army s tool for evaluating major equipment and

operational changes to disposal facilities In preparing this report members of the Stockpile Committee evaluated exhaust gas emissions testing at the two operating baseline incineration systems JACADS and the TOCDF evaluated the development of the dilute SOPC carbon filter simulation model and evaluated the conceptual design of a modified PAS with an activated carbon filter The two major risk assessments conducted for each continental disposal site that use the baseline system namely 1 the quantitative risk assessment which evaluates the risks and consequences of accidental agent releases and 2 the health risk assessment which evaluates the potential effects of nonagent emissions on human health and the environment were also examined Integrated Design of Alternative Technologies for Bulk-Only Chemical Agent Disposal Facilities

National Research Council, Commission on Engineering and Technical Systems, Board on Army Science and Technology, Committee on Review and Evaluation of the Army Chemical Stockpile Disposal Program, 2000-06-19 The U S Army is pilot testing chemical hydrolysis as a method for destroying the chemical agents stockpiled at Aberdeen Maryland HD mustard agent and Newport Indiana VX nerve agent The chemical agents at both locations which are stored only in bulk ton containers will be hydrolyzed using aqueous sodium hydroxide for VX and water for HD at slightly below the boiling temperature of the solution The resulting hydrolysate at Aberdeen which will contain thiodiglycol as the primary reaction product will be treated by activated sludge biodegradation in sequencing batch reactors to oxidize organic constituents prior to discharge to an on site federally owned wastewater treatment facility The hydrolysate at Newport which will contain a thiol amine and methyl phosphonic acid as the major reaction products is not readily amenable to treatment by biodegradation Therefore organic constituents will be treated using supercritical water oxidation SCWO Integrated Design of Alternative Technologies for Bulk Only Chemical Agent Disposal Facilities focuses on the overarching issues in the process designs integrating individual processing steps including potential alternative configurations and process safety and reliability This report reviews the acquisition design packages ADPs for the ABCDF and NECDF prepared by Stone and Webster Engineering Company for the U S Army Assessment of Agent Monitoring Strategies for the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants National Research Council, Division on Engineering and Physical Sciences, Board on Army Science and Technology, Committee on Assessment of Agent Monitoring Strategies for the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants, 2012-10-21 January 2012 saw the completion of the U S Army s Chemical Materials Agency s CMA s task to destroy 90 percent of the nation s stockpile of chemical weapons CMA completed destruction of the chemical agents and associated weapons deployed overseas which were transported to Johnston Atoll southwest of Hawaii and demilitarized there The remaining 10 percent of the nation s chemical weapons stockpile is stored at two continental U S depots in Lexington Kentucky and Pueblo Colorado Their destruction has been assigned to a separate U S Army organization the Assembled Chemical Weapons Alternatives ACWA Element ACWA is currently constructing the last two chemical weapons disposal facilities the Pueblo and Blue Grass Chemical Agent Destruction Pilot Plants denoted

PCAPP and BGCAPP with weapons destruction activities scheduled to start in 2015 and 2020 respectively ACWA is charged with destroying the mustard agent stockpile at Pueblo and the nerve and mustard agent stockpile at Blue Grass without using the multiple incinerators and furnaces used at the five CMA demilitarization plants that dealt with assembled chemical weapons munitions containing both chemical agents and explosive propulsive components The two ACWA demilitarization facilities are congressionally mandated to employ noncombustion based chemical neutralization processes to destroy chemical agents In order to safely operate its disposal plants CMA developed methods and procedures to monitor chemical agent contamination of both secondary waste materials and plant structural components ACWA currently plans to adopt these methods and procedures for use at these facilities The Assessment of Agent Monitoring Strategies for the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants report also develops and describes a half dozen scenarios involving prospective ACWA secondary waste characterization process equipment maintenance and changeover activities and closure agent decontamination challenges where direct real time agent contamination measurements on surfaces or in porous bulk materials might allow more efficient and possibly safer operations if suitable analytical technology is available and affordable

Review of Chemical Agent Secondary Waste Disposal and Regulatory Requirements National Research Council, Division on Engineering and Physical Sciences, Board on Army Science and Technology, Committee on Review of Chemical Agent Secondary Waste Disposal and Regulatory Requirements, 2007-08-13 Under the direction of the U S Army's Chemical Materials Agency CMA and mandated by Congress the nation is destroying its chemical weapons stockpile Large quantities of secondary waste are being generated in the process and managing these wastes safely and effectively is a critical part of CMA's weapons disposal program To assist the CMA asked the NRC to examine the environmental and regulatory requirements that secondary waste treatment is subject to and to assess best practices by industry in meeting such requirements for similar facilities This book presents an overview of secondary wastes from chemical agent disposal facilities CDF a comparison of CDF and industry experience site specific analysis of major secondary waste issues an examination of closure wastes and findings and recommendations

Review of Secondary Waste Disposal Planning for the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants National Research Council, Division on Engineering and Physical Sciences, Board on Army Science and Technology, Committee to Review Secondary Waste Disposal and Regulatory Requirements for the Assembled Chemical Weapons Alternatives Program, 2008-11-14 The U S Army Program Manager for Assembled Chemical Weapons Alternatives PMACWA is charged with disposing of chemical weapons as stored at two sites Pueblo Colorado and Blue Grass Kentucky In accordance with congressional mandates technologies other than incineration are to be used if they are as safe and as cost effective The weapons are to be disposed of in compliance with the Chemical Weapons Convention Although an element of the U S Army the PMACWA is responsible to the Assistant Secretary of Defense for Acquisitions Technology and Logistics for completing this mission This book deals with the expected significant quantities

of secondary wastes that will be generated during operations of the facilities and their closure While there are only estimates for the waste quantities that will be generated they provide a good basis for planning and developing alternatives for waste disposal while the plants are still in the design phase Establishing efficient disposal options for the secondary wastes can enable more timely and cost effective operation and closure of the facilities

Assessment of Approaches for Using Process Safety Metrics at the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants National Research Council, Division on Engineering and Physical Sciences, Board on Army Science and Technology, Committee to Assess Process Safety Metrics for the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants, 2011-04-19 The Department of Defense through the Assembled Chemical Weapons Alternatives program is currently in the process of constructing two full scale pilot plants at the Pueblo Chemical Depot in Colorado and the Blue Grass Army Depot in Kentucky to destroy the last two remaining inventories of chemical weapons in the U S stockpile These two storage sites together account for about 10 percent of the original U S chemical agent stockpile that is in the process of being destroyed in accordance with the international Chemical Weapons Convention treaty Unlike their predecessors these facilities will use neutralization technologies to destroy agents contained within rockets projectiles and mortar rounds requiring the use of specially designed equipment As part of its focus on safe operation of the planned facilities the Program Manager for Assembled Chemical Weapons Alternatives asked the National Research Council NRC to conduct a study to offer guidance on the application of process safety metrics at the Pueblo Chemical Depot and Blue Grass Army Depot Process safety is a disciplined framework for managing the integrity of operating systems processes and personnel handling hazardous substances and operations by applying good design principles engineering and operating practices Process Safety Metrics at the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants discusses the use of leading and lagging process safety metrics that could provide feedback on the effectiveness of controls to mitigate risks and minimize consequences of potential incidents The book makes several recommendations that will facilitate the development and application of process safety metrics at both sites

Occupational Health and Workplace Monitoring at Chemical Agent Disposal Facilities National Research Council, Division on Engineering and Physical Sciences, Board on Army Science and Technology, Committee on Review and Evaluation of the Army Chemical Stockpile Disposal Program, 2001-01-01 In keeping with a congressional mandate Public Law 104 484 and the Chemical Weapons Convention the United States is currently destroying its chemical weapons stockpile The Army must ensure that the chemical demilitarization workforce is protected from the risks of exposure to hazardous chemicals during disposal operations and during and after facility closure Good industrial practices developed in the chemical and nuclear energy industries and other operations that involve the processing of hazardous materials include workplace monitoring of hazardous species and a systematic occupational health program for monitoring workers activities and health In this report the National Research Council Committee on Review and Evaluation of the Army Chemical Stockpile

Disposal Program examines the methods and systems used at JACADS and TOCDF the two operational facilities to monitor the concentrations of airborne and condensed phase chemical agents agent breakdown products and other substances of concern The committee also reviews the occupational health programs at these sites including their industrial hygiene and occupational medicine components Finally it evaluates the nature quality and utility of records of workplace chemical monitoring and occupational health programs

Environmental Health Perspectives ,2009-07 **Cumulated Index Medicus** ,2000 **Assessment of the Army Plan for the Pine Bluff Non-Stockpile Facility** National Research Council,Division on Engineering and Physical Sciences,Board on Army Science and Technology,Committee on Review and Assessment of the Army Non-Stockpile Chemical Materiel Demilitarization Program: Pine Bluff,2004-04-10 The U S Army is in the process of destroying its chemical weapons stockpile and related non stockpile chemical materiel At the request of the Army the National Research Council NRC has published a number of studies over the last 16 years providing scientific and technical advice on that disposal effort For this study the NRC was asked to assess the design of the facility at the Pine Bluff Arkansas Arsenal intended to dispose of a large amount of non stockpile materiel including 1250 recovered old chemical weapons This is the first of a series of studies directed at reviewing and assessing the Product Manager for Non Stockpile Chemical Materiel initiatives for destruction of this materiel The report provides the results of the Pine Bluff assessment It includes a description of the Pine Bluff facility a discussion of worker and public safety management issues regulatory permitting and public involvement and the role of alternative destruction technologies currently residing at the facility

Dangerous Properties of Industrial Materials Report ,1988 **Selected Water Resources Abstracts** ,1976

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Toxicological Profile for 4,4'-methylenebis-(2- Chloroaniline)(MBOCA) ,1994

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