



## U.S. ARMY CHEMICAL MATERIALS AGENCY

# Chemical Weapons Disposal:

## *Understanding scheduled downtime at disposal facilities*

### Introduction

The U.S. Army Chemical Materials Agency (CMA) is responsible for protecting and safely storing the nation's aging chemical weapons, while working toward the effective recovery, treatment and ultimate elimination of the nation's chemical warfare materiel and to enhance national security.

Aging chemical weapons, many created during World War II, Korean and Cold War eras are safely stored in eight secured sites within the continental United States. The weapons pose risks to our nation and those communities surrounding the storage sites, the longer they remain in storage. These risks include ones posed by natural events, i.e., earthquakes, lightning and tornadoes, weapon degradation and the threat of terrorist attack. CMA has been charged by Congress to eliminate this risk to our nation using approved

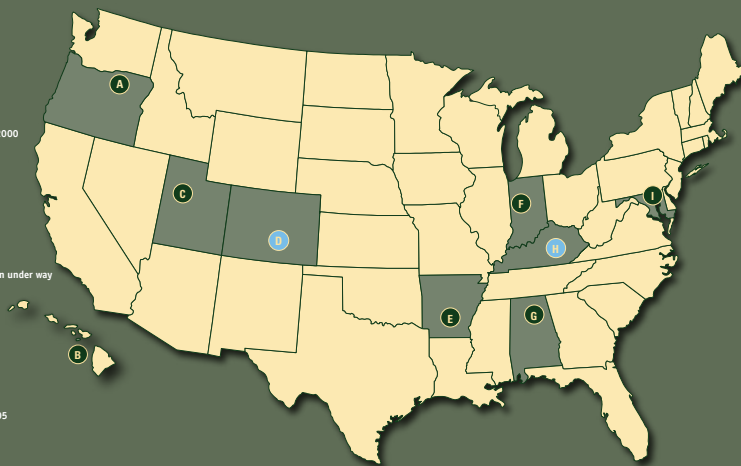
disposal technologies. These technologies are part of on-site disposal facilities designed to destroy chemical weapons in a safe and environmentally friendly manner.

Facilities are designed with engineering controls and safeguards to ensure the protection of workers, the public and environment. Once a facility begins destroying chemical agent, it will stop operations periodically for pre-scheduled preventative maintenance, and/or preparations for destroying a new type of munition [a 100-pound spray tank vs. an 8-inch projectile] or a different kind of chemical agent.

Preventive maintenance and preparation for destroying a new type of munition or a different chemical agent are important aspects of CMA's mission to safely and effectively eliminate chemical weapons.

### U.S. Chemical Agent and Munitions Stockpiles

- A** **Umatilla Chemical Depot, Ore.**  
Percentage of original stockpile: 12%  
Umatilla Chemical Agent Disposal Facility  
Technology: Incineration - began disposal 2004
- B** **Johnston Atoll**  
Percentage of original stockpile: 6%<sup>1,2</sup>  
Johnston Atoll Chemical Agent Disposal System  
Technology: Incineration - completed disposal 2000
- C** **Deseret Chemical Depot, Utah**  
Percentage of original stockpile: 44%<sup>1</sup>  
Tooele Chemical Agent Disposal Facility  
Technology: Incineration - began disposal 1996
- D** **Pueblo Chemical Depot, Colo.\***  
Percentage of original stockpile: 8%<sup>1</sup>  
Pueblo Chemical Agent Destruction Pilot Plant  
Technology: Neutralization - design/construction under way
- E** **Pine Bluff Arsenal, Ark.**  
Percentage of original stockpile: 12%<sup>1</sup>  
Pine Bluff Chemical Agent Disposal Facility  
Technology: Incineration - began disposal 2005
- F** **Newport Chemical Depot, Ind.**  
Percentage of original stockpile: 4%<sup>1</sup>  
Newport Chemical Agent Disposal Facility  
Technology: Neutralization - began disposal 2005
- G** **Anniston Army Depot, Ala.**  
Percentage of original stockpile: 7%<sup>1</sup>  
Anniston Chemical Agent Disposal Facility  
Technology: Incineration - began disposal 2003
- H** **Blue Grass Army Depot, Ky.\***  
Percentage of original stockpile: 2%<sup>1</sup>  
Blue Grass Chemical Agent Destruction Pilot Plant  
Technology: Neutralization - design/construction under way
- I** **Aberdeen Proving Ground, Md.**  
Percentage of original stockpile: 5%<sup>1</sup>  
Aberdeen Chemical Agent Disposal Facility  
Technology: Neutralization - completed disposal 2005



**Key**  
<sup>1</sup> Approximate percentage of U.S. stockpile  
<sup>2</sup> 100 percent of the Aberdeen Proving Ground, Md. and Johnston Atoll stockpile has been destroyed  
<sup>\*</sup> The Colorado and Kentucky chemical stockpile destruction programs are managed by the Department of Defense's Assembled Chemical Weapons Alternatives program.

For more information, contact the CMA Public Affairs Office at (410) 436-3629 (800) 488-0648

# Report Documentation Page

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## Chemical Weapons Disposal:

*Understanding scheduled downtime at disposal facilities (continued)*



*Preventive maintenance reduces equipment breakdowns and repairs and ensures safer, efficient operations.*

### **Preventive maintenance— maximizing safety**

Approved preventive maintenance programs at each CMA disposal site achieve the same function as preventive maintenance and service programs for cars—they keep disposal facilities operating safely and efficiently. Preventive maintenance helps minimize unplanned and expensive breakdowns and repairs.

Chemical agent disposal facilities have equipment and systems that allow personnel to determine, maintain and control operational conditions while the facility is operating. To perform proper preventive maintenance, it is sometimes necessary to shut down portions (in some instances all) of the facility to check and service equipment. Because of CMA's commitment to safety, preventive maintenance is planned in the operating schedule of each disposal facility.

Standard, routine inspections and regular replacement of worn parts and equipment keep facilities operating safely. In fact, based on U.S. Occupational Safety and Health Administration safety statistics, workers at CMA's six disposal sites are as safe as workers in public libraries. Regular calibration of monitoring equipment and

testing of control equipment help ensure the efficient operation of the facilities, reducing operating costs and keeping emissions to the environment safely within the permit and regulatory limits.

### **Munition campaign and agent changeovers**

Like a car that is modified to meet certain operating conditions, such as driving in snow, disposal facilities go through specific processes and modifications when munitions must change and/or a different chemical agent needs to be destroyed.

A change in munitions are required when chemical agents are stored in more than one type of weapon such as rockets, land mines, spray tanks, projectiles, mortars or large steel storage cylinders called ton containers. Some munitions, like various sizes of projectiles or spray tanks and ton containers, are dismantled using the same process lines and furnaces, with minor modifications to the equipment and furnaces. Other munitions use totally separate process lines and different furnaces, while some munitions use a mix of the same and separate process lines and/or furnaces.

Only CMA's disposal facilities that utilize incineration technology have multiple types of chemical agents and multiple munition types to destroy. Those four sites will go through munition campaign changes and agent changeover phases. CMA's Johnston Atoll Chemical Agent Disposal System (JACADS) was the first facility to go through munition campaign changes and agent changeovers before completing its disposal mission in Nov. 2000. Lessons learned from experiences at JACADS, plus CMA's Tooele facility, have been shared with other incineration or alternative technology disposal sites to help ensure safe changeovers. Further, highly trained, skilled and committed employees, who were part

## Chemical Weapons Disposal:

### *Understanding scheduled downtime at disposal facilities (continued)*

of these processes at JACADS, are now working at other facilities, ensuring that those lessons are applied to operations.

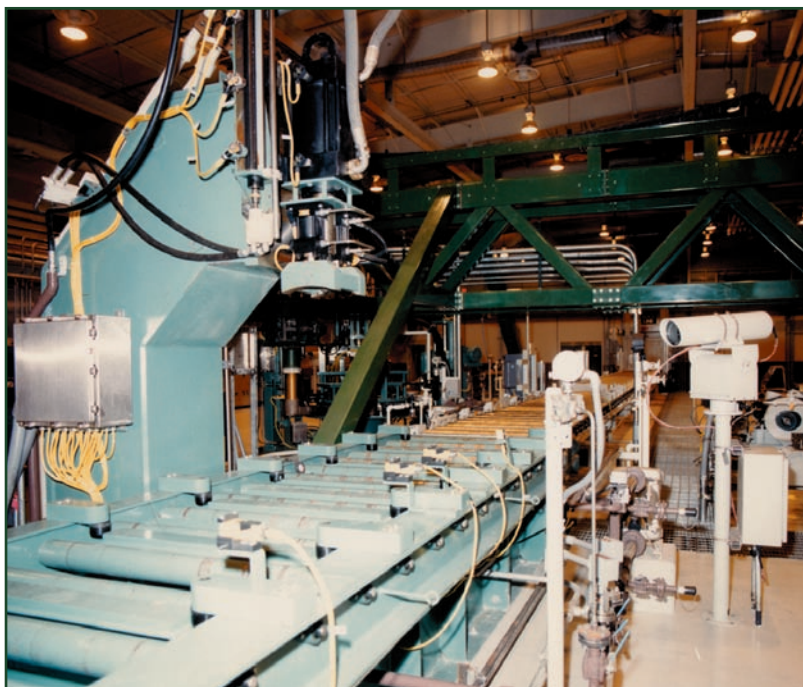
#### **Changing munitions campaigns**

Just as cars must be prepared for changes in use, CMA workers must make preparations for the new munition type to be processed. For example, a rocket is processed in the explosive containment room on the rocket shear machine, with the liquid agent drained and sent to the liquid incinerator and the rocket pieces sent to the deactivation furnace. A projectile containing an explosive device is processed in the same room as the rocket in order to remove its explosives, but on a projectile-mortar disassembly machine. Explosives from the projectile are destroyed in the deactivation furnace and the liquid agent is destroyed in the liquid incinerator, but the projectile's steel casing is thermally decontaminated in the metal parts furnace. In addition, draining liquid agent from rockets and projectiles is accomplished in different areas of the plant using different equipment.

To prepare for different munition types, highly trained, certified CMA workers modify existing equipment or install new equipment according to permit and regulatory requirements. Procedures are updated, checked and double-checked. Computer codes for control systems are updated. As equipment and process lines are converted or upgraded, they are tested using practice munitions to ensure they function properly. Each piece of equipment is tested first individually, and then the entire process is tested to ensure safety and efficiency. This extensive work is very important because all of these processes are fully programmed. Once a munition is unloaded from its storage site, the disposal process is accomplished mostly by automation.

#### **Chemical agent changeovers**

A significant portion of the operation schedule at a chemical weapons disposal facility involves agent changeover. Agent changeover is similar to munitions campaign changes but includes decontaminating toxic process areas and recalibrating and certifying agent monitors and monitoring processes.



Before destroying a new or different agent, a thorough decontamination is performed in the toxic areas of the plant to allow personnel to work safely in those areas. Once decontamination has been achieved to the desired levels, the chemical agent monitors are calibrated, tested and certified for the new agent type. In addition, changes are made in support areas. For example, operators are trained in destroying the new agent type and operating procedures are reviewed.

*To prepare for the destruction of different munition types, equipment and process lines are often modified.*



## Chemical Weapons Disposal:

### *Understanding scheduled downtime at disposal facilities (continued)*

Since the liquid agent itself is a major portion of the fuel used to run the furnaces, agent changeover is similar in some aspects to converting a car from running on gasoline to burning propane. To convert a car to run on propane, changes to the carburetion and ignition systems are required. Similarly, adjustments need to be made to the furnaces to ensure that the different agents burn safely and efficiently at approved appropriate temperatures and flow rates.

After all these changeover activities, the disposal facility is not yet ready to destroy the new agent type. One last activity remains. Once preparations are complete, the disposal facility is tested and “test driven,” a process known as systemization. This ensures that all of the equipment and processes function safely in accordance with the facility’s operational permit. Systemization culminates with a series of trial burns. First the furnaces are tested using surrogate chemicals that are safer than the chemical agent while being of equal or greater difficulty to destroy. If the furnaces achieve a safe level of destruction for these “surrogates,” a series of trial burns using actual chemical agent is performed.

All of the trial burns are overseen by the U.S. Environmental Protection Agency and state permit regulators. Only after CMA is certain the facility functions properly and approval

is received from the state’s permitting and regulatory agency does the facility start agent disposal operations. The start of operations is slow and deliberate to ensure safe destruction. Safety of the workers, the communities and the environment is always of paramount importance.

Because of the amount of work and time involved with agent changeover, disposal facilities will usually process and destroy all munitions of a single agent type before switching to another agent. This minimizes the number of times agent changeover is required and keeps the destruction schedule for a site as safe and short as possible.

### **Conclusion**

Disposing of chemical agent weapons or munitions is highly technical with a large number of pieces of machinery, equipment, monitors and controls and many process steps used to dismantle munitions, drain and destroy agent and treat and dispose of resulting wastes. With an effective preventive maintenance program in place at each site, and following tried and approved practices for munition campaign changes and agent changeovers, CMA is helping ensure the safe completion of the destruction of the United States stockpile of chemical agents and weapons—leading the way to a safer tomorrow.