Neutralization Followed by Biotreatment Process

The Program Executive Office, Assembled Chemical Weapons Alternatives, the U.S. Army Pueblo Chemical Depot and the surrounding communities worked together to select neutralization followed by biotreatment to destroy the chemical weapons stored at the depot.

The process of neutralization followed by biotreatment at the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) uses hot water to neutralize the chemical agent, effectively destroying the mustard agent molecules. The resulting hydrolysate is mostly water and thiodiglycol, a common industrial chemical that is readily biodegradable. Ordinary sewage treatment bacteria, or microbes, consume the organics in the hydrolysate.

Step One: Removing the Energetics

Robotic equipment removes the weapon's energetic components, including the fuze and the burster. Removing these parts first, makes the remaining processes safer. The energetics are shipped and destroyed in the Static Detonation Chamber (SDC), in Anniston, Alabama.

Step Two: Removing the Mustard Agent

Once the energetic components are removed, the weapon body containing chemical agent is processed. To remove the agent, the body is robotically accessed, and then the agent is washed out with pressurized water.

Step Three: Neutralization of Mustard Agent

The mustard agent is mixed with hot water and a caustic solution. The product from this process is called hydrolysate and has a high pH requiring acid to be added to reduce the pH to neutral, making it suitable for digestion by the microbes used in biotreatment, which is the next step.

Step Four: Biotreatment

The hydrolysate generated in step three will go through the biotreatment process, which consists of large tanks containing microbes that digest and further break down the solution.

Water released from the process will be recycled, leaving various salts and biosludge. Biosludge, which is made up of microbe waste products and other bacterial matter, will be filtered to remove water and disposed of at off site, permitted Treatment, Storage and Disposal Facilities (TSDF).

Pueblo Chemical Stockpile Outreach Office
104 W. B St. Pueblo, Colorado 81003
(719) 546-0400 • puebloutreach@iem.com

Pueblo Chemical Agent-Destruction Pilot Plant Public Affairs
(719) 549-4959

U.S. Army Pueblo Chemical Depot Public Affairs
(719) 549-4135

Step Five: Disposing of Metal Parts

The final step is treating the weapon's metal parts. Although the metal parts were cleansed of energetics and agent in step one and step two, they still may contain traces of energetics and agent, and need to be decontaminated to a higher level. To reach this level of decontamination, the metal parts will be heated to 1,000 degrees Fahrenheit for 15 minutes. The metal is then recycled.

PCAPP Static Detonation Chamber

Some secondary wastes will also result from the processing of problematic munitions that are unable to go through the main destruction plant. Some of these wastes, which will include both solid and liquid products coming from PCAPP's SDCs, will be stored in either a less than 90-day hazardous waste accumulation area, or a permitted storage area, pending shipment to permitted TSDFs for further treatment and/or ultimate destruction.

PCAPP Process Diagram