



Hydrolysate Overview

The [Pueblo Chemical Agent-Destruction Pilot Plant](#), known as PCAPP, safely completed destruction of the declared U.S. chemical weapons stockpile formerly stored at the U.S. Army Pueblo Chemical Depot, now known as the U.S. Army Chemical Materials Activity-West, June 22, 2023. The stockpile consisted of blister agent (HT and HD, also known as mustard) in projectiles and mortar rounds.

Prior to destruction operations, the stockpile comprised 2,613 U.S. tons of weaponized mustard agent in 105mm and 155mm projectiles and 4.2-inch mortar rounds. The [Program Executive Office, Assembled Chemical Weapons Alternatives](#) (PEO ACWA) was responsible for completing stockpile destruction operations and is now focused on the safe and environmentally compliant closure of the plant.

The primary process used to destroy the chemical weapons stockpile was [neutralization followed by biotreatment](#). During this process, the chemical agent was drained and separated from the energetics, explosives and propellants. It was then mixed vigorously with hot water and sodium hydroxide which destroyed, or neutralized, it.

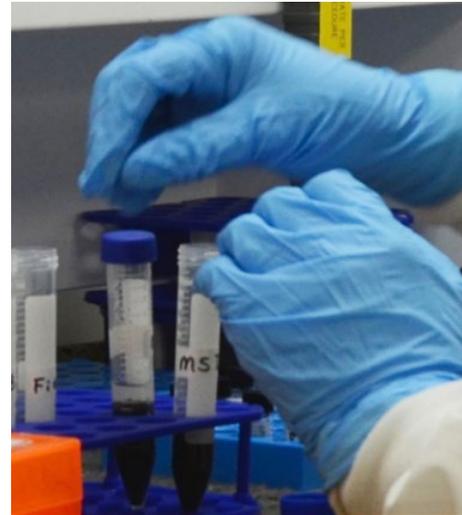
The resulting product from the neutralization was a caustic wastewater known as hydrolysate, which required further treatment and processing. It was mostly composed of water and thiodiglycol, a common industrial chemical that is readily biodegradable. Approximately 14 million gallons of hydrolysate were generated during destruction operations.

Hydrolysate is classified as hazardous waste under the [Resource Conservation and Recovery Act](#) as it may contain heavy metals and have corrosive properties. Mustard hydrolysate has a pH of approximately 10-12, making it comparable to commercial drain cleaner or bleach.

Treatment and Destruction of Hydrolysate

Following neutralization of the chemical agent, hydrolysate was verified to ensure complete chemical agent destruction. Because thiodiglycol is classified as a [Schedule 2](#) chemical, or precursor to a chemical agent, under the Chemical Weapons Convention, its complete destruction was required.

During the [biotreatment process](#), hydrolysate was fed into Immobilized Cell Bioreactors, or ICBs, to destroy the organic materials. In the ICBs, the hydrolysate was subjected to biological degradation, and water was recovered and reused in the destruction process.



A chemist analyzes mustard agent hydrolysate during destruction operations at the Pueblo Chemical Agent-Destruction Pilot Plant. Destruction was completed in 2023.

