



Gas, Gas Masks, and Smelly Clothing: The Unsung Heroes of the Chemical Warfare Service During World War II

By Colonel Robert Walk

When we hear about the mission of the Chemical Warfare Service (CWS) during World War II, history often covers the contributions of the chemical mortar battalions. While the battalions played an important part in the history of the CWS, it is also important to remember the forgotten heroes—the personnel who dealt with gas, gas masks, and smelly clothing. This article will discuss the makeup and expansion of the CWS during World War II.

Background

Prior to World War II, the CWS focused on delivery methods for chemical agents and the protection of U.S. forces from enemy uses of chemical warfare. The CWS had two regiments, and leaders expected to fill those regiments with additional personnel gained from mobilizations. During this time, mortars were only used to deliver chemical agents (not high explosives). Unit smoke operations did not yet exist. In 1939, there were 917 Chemical Soldiers in the Active Army—a small component of the total force.

After World War II began, the CWS grew in size and mission. By December 1941, there were 6,584 Chemical Soldiers. With the added responsibilities of providing incendiaries and fire bombs for the Army Air Forces and operating smoke generators, the mission of the CWS continued to grow. When Army officials realized the benefit of using the 4.2-inch mortar to provide direct support to the infantry, high explosives and smoke were added to the chemical mortar mission. By July 1945, the CWS had 64,968 Soldiers assigned. As a result, a variety of units were created to incorporate the additional personnel and added mission requirements, including—

- Three types of Chemical battalions:
 - Mortar.
 - Smoke generator.
 - Service.

- Twelve types of Chemical companies:
 - Mortar.
 - Smoke generator.
 - Aviation (air operations, depot, and maintenance).
 - Depot and base depot.
 - Maintenance.
 - Decontamination.
 - Processing.
 - Composite.
 - Service.
 - General service.
 - Laboratory.
- Chemical composite, service, and general-service platoons.

Much of the work these units performed was not glorious, but it was necessary. The Soldiers worked hard, but they received little recognition and few campaign credits. The two numbered CWS units with the longest time overseas were the 42d Chemical Laboratory Company and the 10th Chemical Service Company. In March 1942, the 10th Chemical Service Company deployed to the Southwest Pacific Area (SWPA) (as the 10th Chemical Maintenance Company) for 54 months, but its members only received one campaign credit. The 42d Chemical Laboratory Company (who, at the start of World War II, was known as the 3d Chemical Laboratory Company) spent nearly 50 months overseas in the SWPA and mid-Pacific regions supporting our forces without participating in any major campaigns. In contrast, the 82d Chemical Mortar Battalion spent 47 months in the SWPA but received three campaign credits.

Chemical Mortar Battalions

The largest units of Chemical Soldiers, the Chemical mortar battalions, dispensed high-explosive and 4.2-inch mortar fire on the enemy. These units formed the mailed fist of the CWS.

The initial organization of the Chemical mortar battalions (Table of Organization and Equipment [TOE] 3-25) included a headquarters, a headquarters company, a medical detachment, and four weapons companies. The total number of 4.2-inch chemical mortars was 12 per company (48 per battalion). Each battalion was assigned 1,010 Soldiers—36 officers, 1 warrant officer, and 973 enlisted men. The battalion structure was later decreased to 622 Soldiers (with 48 mortars) and finally adjusted to 672 (with 36 mortars). A total of 25 battalions were activated and used during the war. There were also four separate Chemical mortar companies that saw significant service during the war, one of which surrendered when the Philippines fell in 1942.

Chemical Smoke Generator Battalions

Chemical smoke generator battalions were organized as a headquarters to control smoke operations in a given area. Organized under TOE 3-266S, the battalions could operate three to eight companies in a localized area. Unlike the Chemical mortar battalions, Chemical smoke generator battalions consisted of headquarters and headquarters detachments only, with no organic companies attached. The earliest activations were in theaters of operations (not the United States), the first being in Italy in May 1944. Used most heavily in Europe and in the Mediterranean, smoke battalions controlled screening operations at ports

and in forward areas. There were seven Chemical smoke generator battalions activated during World War II.

Chemical Composite and Service Battalions

As the war progressed, the need to properly command and control CWS units in the theaters of operations became a priority. In 1944, two Chemical composite battalions were formed in the Pacific to command the Chemical units there. In 1945, these units were renamed Chemical service battalions. Later, two Chemical smoke generator battalions stationed in Europe were converted to Chemical service battalions to control miscellaneous CWS units there.

Chemical Decontamination Companies

The Chemical decontamination company was designed to operate in terrain and rear area decontamination operations in the event of a massive or persistent-agent attack. These operations were known as third-echelon (or facility) decontamination operations and were performed by trained and equipped personnel. Second-echelon equipment decontamination operations were performed by unit additional-duty decontamination teams. Secondary unit missions included establishing field bathing facilities and assisting with firefighting and vehicle washing operations (using an organic truck-mounted, power-driven decontamination apparatus). The operator performed first-echelon decontamination operations on equipment.

Fifteen Chemical decontamination companies saw significant service during World War II. The companies were organized in four platoons, with three decontamination teams to each platoon. Each platoon could operate independently or as part of a larger unit. Units performed



A Chemical decontamination unit conducts operations.



A decontamination squad poses (1941).

decontamination operations using the M3- or M4-series power-driven decontamination apparatus (a 400-gallon wooden tank mounted on a standard truck chassis) or the M1- or M2-series hand-operated decontamination apparatus filled with noncorrosive decontaminating agent. Units also performed hand dissemination of super tropical bleach (alone or mixed with earth).

Decontamination methods used to clear terrain included incineration operations (burning the contaminated area) or slurry or dry-bleach applications. Terrain incineration was considered the best method due to the low personnel requirement to conduct operations. As is standard in current decontamination operations, Chemical Soldiers only decontaminated what was necessary and left the rest to break down naturally. Decontamination targets included roads, airfields, buildings, vehicles, and equipment. The M3- and M4-series decontamination apparatuses also provided shower facilities for Soldiers.

Chemical Depot Companies

Chemical depot companies provided supply support to the field Army. This unglamorous task consisted primarily of issuing chemical supplies, but it also included performing salvage operations and filling chemical munitions. These units generally established depots in the corps rear area and supply points further forward. Aviation Chemical depot companies were organized similarly but were allocated to U.S. Army Air Forces. Twenty each Chemical depot and Chemical depot (aviation) companies saw significant wartime service during World War II.

These units began the war under TOE 3-67 with an authorized strength of 184 Soldiers and ended the war with 155 Soldiers (assigned to a headquarters unit and three service platoons). Each service platoon included ammunition, toxic gas, general supply, and administrative

sections. The service platoons were modular in nature and could be detached for service on specific missions in the forward area of operations or pooled to operate one large depot.

Chemical Base Depot Companies

Chemical base depot companies operated base chemical depots and chemical sections of larger base depots. Chemical base depots were located in the communications zone, far to the rear of the battle. All Chemical base depot companies were originally activated as Chemical depot companies but were renamed to reflect their location for conducting operations. The company size remained the same and included a depot headquarters, a company headquarters, a stock control unit, and a storage unit. The storage unit had three teams: ammunition, gas (chemical agents), and general supply. Sixteen Chemical base depot companies saw significant service during World War II.

Chemical Laboratory Companies

Chemical laboratory companies analyzed and evaluated enemy chemical warfare agents and determined the best methods for protection, identification, and decontamination operations. Additionally, they maintained CWS supplies to ensure that chemical warfare agents were serviceable and adequate. Company personnel also served as chemical technical-intelligence experts for theater commanders.

Chemical laboratory companies were theoretically mobile, but with 10 tons of laboratory equipment, they generally operated from one location. They were organized into a company headquarters, an analytical



Soldiers from a Chemical depot company handle mustard gas (HS).



A Soldier works in a chemical laboratory.

section (to perform inorganic analyses), an organic section (to identify chemical agents), a chemical engineering section (to construct and maintain the laboratory), and an intelligence section (to evaluate and interpret reports). The unit even included a glassblower!

Although originally authorized 86 Soldiers (14 officers and 72 enlisted men), the number of personnel in Chemical laboratory companies dropped to 58 (8 officers and 50 enlisted) in 1944, with emphasis placed on recruiting personnel with technical experience in chemistry or chemical engineering. In the Pacific Theater, personnel assigned to these companies distinguished themselves as independent thinkers and innovators by providing needed supplies and technical support to warfighters. Seven Chemical laboratory companies saw service during World War II.

Chemical Maintenance Companies

Chemical maintenance companies were designed to perform third-echelon (general support) and fourth-echelon (depot level) maintenance on all CWS equipment. Although maintenance personnel normally operated in the rear, this was not always the case. To keep the chemical mortars in operation, at least one company sent a detachment forward to provide direct support to Chemical mortar battalions. In the Mediterranean, adaptive Soldiers in Chemical maintenance companies rebuilt captured maintenance facilities to produce the parts needed for equipment repairs. In the Pacific, Chemical maintenance Soldiers waterproofed filters for amphibious assaults and explored options to use flamethrowers in the hot, wet Pacific environment. These units were originally created under TOE 3-47 with a strength of 123 Soldiers (4 officers

and 119 enlisted men) and divided into headquarters, repair, and salvage platoons. By the end of the war, there were approximately 93 personnel in the headquarters gas mask repair and equipment repair platoons. Chemical maintenance companies (aviation) were organized similarly, but were allocated to U.S. Army Air Forces. A total of 5 Chemical maintenance companies (aviation) and 20 Chemical maintenance companies operated during World War II.

Chemical Processing Companies

The primary mission of Chemical processing companies was to keep permeable protective clothing serviceable and available for issue. Originally called *Chemical Company (Impregnating)*, the name was changed in 1942. The standard chemical-protective ensemble during World War II was cotton, two-piece underwear; gloves; socks; hood; coverall; leggings; and cotton gloves (for use under the protective gloves). Every piece of clothing was impregnated with solution to protect the wearer against droplets of blister agent. The lovely odor that resulted gave rise to the “smelly clothing” moniker of the companies. Additionally, the discomfort of



Soldiers from the 12th Chemical Company perform mask repairs in North Africa.



Soldiers march in protective masks (1941).

wearing the long underwear in the hot, wet environment of the Southwest Pacific had to be experienced to be appreciated. Nevertheless, the use of impregnated underwear continued until the 1980s (with the use of the M3 toxicological-agent protective [TAP] suit for depot and chemical-agent handling operations).

But what was clothing impregnation? The impregnation process was much like laundering clothing. In fact, many units provided support by laundering clothing when not treating chemical-protective gear. Additional secondary missions for these companies included supporting the theater Chemical officer with dry-cleaning, waterproofing, dyeing (often with camouflage patterns), fireproofing, mildew proofing, mothproofing (wool was used extensively in military clothing during World War II), insect repellent treatment, delousing, and sterilizing. Preparing for chemical warfare defense was so important that 39 Chemical processing companies were in service during World War II.

To perform chemical processing, the companies (organized under TOE 3-77) were aligned in two platoons totaling 146 personnel. Each platoon used the M1 (solvent) or the M2 (water) process to impregnate 500 to 830 uniforms a day. The more effective impregnation process used solvent (acetylene tetrachloride); but, even during World War II, the solvent was considered toxic and required special handling. The clothing was prepared (items such as tags or insignia were removed), impregnated, centrifuged (to remove excess solution), dried, folded, bundled in lots, and tested. Lots that failed testing were processed multiple times.

Chemical Smoke Generator Companies

Chemical smoke generator companies provided screening smoke for areas 1 to 1 1/2 miles wide and several miles long on a 24-hour basis. Organized under TOE 3-267, the companies had a headquarters platoon, an operations platoon, and six squads each. The total personnel strength was 4 officers and 131 enlisted

men. Forty Chemical smoke generator companies saw significant service during World War II.

The first lightweight, mechanical smoke generator reliable enough to be fielded to the Army was the M1. Twenty-four M1s were assigned to each smoke generator company, and a squad was assigned to operate each generator. The M1 weighed 3,000 pounds and fit on the back of a 2 1/2-ton truck (for land operations) or a DUKW amphibious vehicle (for water operations).¹ Fog oil was added to the built-in tank to create a smoke screen, but the system burned about 100 gallons of oil an hour and the tank was not equipped to draw from an external source. The M1 was best used where it could be driven and parked, limiting its use on the front lines. And there were issues with its weight, bulk, and reliability, so intrepid engineers continued their work and developed the M2.

For the field Soldier, the M2 mechanical smoke generator was heaven-sent. The M2 weighed 172 pounds (making it man-portable), drew fog oil from an external source (a ubiquitous 55-gallon drum), consumed fog oil at about 50 gallons per hour, and started faster. Each operations squad operated two M2s, and the company had a total of 50 units (48 in the operations platoon and 2 in the company headquarters). Additionally, the portability of the M2 allowed for use on the front lines and increased the viability of the companies.

Initially, smoke was used to screen ports and logistical facilities, reducing the ability of the Axis powers to observe and disrupt operations through aerial interdiction. Due to the portability of the M2, smoke generator companies were used to conceal main supply routes and assault troops crossing rivers. Unfortunately, as a harbinger to the



Soldiers from the 161st Smoke Generator Company perform operations in Seine, France.



A Soldier from the 809th Chemical Company displays a gas mask in England.

current situation in Iraq, many Chemical smoke generator companies were used in other missions, especially trucking, after the reduction of the Luftwaffe in Europe.

Chemical Company (Air Operations)

The primary mission of the Chemical Company (Air Operations) was to receive, store, prepare, load, and arm chemical warfare munitions (gas, smoke, and incendiary) for delivery by aircraft. This might include operating a chemical ammunition (Class V) storage dump. A total of 54 Chemical companies (air operations) were activated during World War II, making them the largest consumer of Chemical Soldiers outside the Chemical mortar battalions. These units were assigned to Air Force wings, with one platoon per squadron, depending on the mission load. There was a greater demand for these units in the Pacific theaters of operation than in the European theaters due to the nature of the missions.

Under TOE 3-457, Chemical companies (air operations) were organized into four platoons and a distribution point, each capable of acting independently. The platoons included Soldier filling teams used to fill chemical bombs (persistent and nonpersistent). The distribution point, which consisted of 19 Soldiers, including decontamination apparatus and toxic-gas handlers, maintained Class V chemical dumps. During World War II, these units were used extensively to fill napalm and smoke tanks and prepare incendiary cluster bombs and chemical weapons for use (particularly in the Pacific theater of operations).

Chemical Composite, Service, and General-Service Companies

The primary missions of the Chemical composite, service, and general-service companies were to operate chemical supply points, provide maintenance of chemical warfare equipment, operate field laboratories, provide clothing impregnation capability in the field, and provide decontamination operations as needed. These units were originally designated as Chemical composite companies and later as Chemical service companies.

Originally organized under TOE 3-277, the Chemical composite, service, and general-service companies were authorized 200 Soldiers and provided multiple capabilities. In July 1943, TOE 3-500, Chemical Service Organization, was adopted, creating the opportunity to organize units of multiple sizes that were capable of performing all chemical services (depot, laboratory, maintenance, processing, and decontamination operations). The new modular organization allowed commanders to staff units according to specific missions. The team types were identified by the following letter designations:

- A** = Administrative
- B** = Chemical maintenance
- C** = Chemical depot
- D** = Chemical decontamination
- E** = Chemical processing
- F** = Chemical laboratory

A letter designation was also used to identify the size of units. An A team was the smallest organization, and a C team was the largest. This flexible organization and modular design identification is still in use today (as in chemical, biological, radiological, and nuclear [CBRN] staff elements [JA and JB]).



Soldiers from the 140th Chemical Service Company perform decontamination operations on nerve agent tabun (GA) in Germany in 1945.

Chemical Composite, Service, and General-Service Platoons

There were 29 separate Chemical service platoons in the CWS during World War II. Some platoons were theater-created separate detachments, organized from other Chemical companies, while others were tailored units that were created based on TOE 3-500.

Discussion

What was the largest component of the CWS during World War II? Based on sheer numbers, it was the Chemical mortar battalions. However, the battalions comprised less than one-third of the total CWS strength during the war. Twenty percent of the CWS was providing direct support to the Army Air Forces with storage, maintenance, and supplies for the aerial delivery of chemical materials, including incendiaries and flame weapons. Smoke operations equaled about 10 percent of CWS missions. The majority of remaining CWS units performed missions focused on the storage and maintenance of chemical warfare supplies and equipment and combat support to infantry troops on the front line. These assorted Chemical units providing the gas, gas masks, and smelly clothing were truly the unsung heroes of the CWS.

Conclusion

The CWS was more than just Chemical mortar battalions. As the size and scope of the CWS grew during World War II, the unit composition changed to meet the needs of the Army. From the humble beginnings of delivering and defending our country against chemical warfare, the CWS expanded to include smoke operations, incendiary and flame operations, and direct infantry support (with the use of the 4.2-inch mortar). Chemical Soldiers existed to support the force and enable victory (as they do today). All of these units are part of the heritage of the Chemical Corps and are worthy of study and remembrance. ●●●

Endnote:

¹ DUKW is an Army acronym that indicates when this amphibious vehicle was designed (D) (in 1942), for what purpose (U) (utility and amphibious operations), and equipped with (K) (front-wheel drive), and (W) (two rear-drive axles).



Soldiers from the 29th Chemical Company perform a vehicle decontamination.

References:

- Field Manual (FM) 3-20 (Tentative), *4.2-Inch Chemical Mortar Battalion*, October 1946.
- CWS FM 3-25, *The Chemical Laboratory Company*, 13 November 1942.
- FM 3-25, *Chemical Laboratory Company*, 3 August 1944.
- FM 3-30, *Chemical Processing Company (Theater of Operations)*, 2 March 1944.
- FM 3-50, *Large Area Smoke Screening*, 24 March 1944.
- FM 3-55 (Tentative), *Chemical Service Organization*, December 1947.
- FM 3-60 (Tentative), *Chemical Maintenance Company*, January 1948.
- FM 3-65, *Chemical Depot Company*, 1 December 1944.
- FM 3-66, *Chemical Base Depot Company*, 11 July 1945.
- FM 3-70, *Chemical Decontamination Company*, 1 September 1944.
- FM 3-75, *Chemical Company Air Operations*, 30 July 1946.
- Brooks E. Kleber and Dale Birdsell, "The United States Army in World War II, the Technical Services, the Chemical Warfare Service: Chemicals in Combat," Office of the Chief of Military History, U.S. Army, Washington, D.C., 1966.
- Leo P. Brophy and George J.B. Fisher, "The United States Army in World War II, the Technical Services, the Chemical Warfare Service: Organizing for War," Office of the Chief of Military History, U.S. Army, Washington, D.C., 1959.
- The Chemical Corps Association, "The Chemical Warfare Service in World War II", a Report of Accomplishments, Reinhold Publishing Company, New York, 1948.

Colonel Walk is the Deputy Assistant Commandant for the U.S. Army Reserve, U.S. Army Chemical School, Fort Leonard Wood, Missouri.

U.S. Army Chemical School Web Site

Do you need up-to-date information about chemical career management, courses, equipment, doctrine, and training development? All of this information and more is available at the U.S. Army Chemical School Web site. Visit <<http://www.wood.army.mil/usacmls/>> to check out this great resource.