

The Challenge of Syrian Chemical Weapons Demilitarization

Lenny Siegel

September, 2013

Globally, chemical weapons demilitarization has been difficult, slow, and costly, but with technologies that have been developed over the past two decades, the safe destruction of Syria's chemical weapons stockpile is feasible. While the diplomats work out the principles for sequestering and eliminating Syrian chemical warfare materiel, our government and others should be developing a strategy for safe, secure demilitarization. That work must begin now, not only because it will take time, but also because it is likely to raise issues that the diplomats will need to resolve.

In the eras before and after World War II, major powers disposed of their chemical weapons by burying them and dumping them in the ocean. Those may have been the best strategies for the time, but they have proven impermanent. In the U.S., "disposed" chemical rounds have been found in Delaware driveways built with clam shells dredged off the coast of New Jersey, and the Army is considering the excavation of trenches at the Redstone Arsenal in Alabama containing an estimated 90,000 intact chemical munitions and over 800,000 other chemical-agent-contaminated items. Today, in recognition of the potential use of chemical agent by non-state actors as well as the environmental health risks of chemical releases, more sophisticated approaches are required.

The U.S. has disposed of roughly 90% of its chemical weapons stockpile using both large incinerator complexes and a mix of neutralization technologies. Perhaps more important for the anticipated Syrian chemical demilitarization campaign, the U.S., Japan, and Europe have developed transportable systems for safely disposing of intact chemical munitions as well as other chemical warfare materiel. Four such technologies were evaluated recently in the 2012 National Academies report, "Remediation of Buried Chemical Warfare Materiel" (http://www.nap.edu/catalog.php?record_id=13419):



Explosive Destruction System as deployed in 2007

- The Explosive Destruction System, developed by the U.S.'s Sandia National Laboratories, uses explosive charges to split small numbers of munitions so the agent can be chemically neutralized.
- The Transportable Detonation Chamber (TDC), produced by an arm of CH2M Hill, also in the U.S., uses the "heat and pressure generated by an explosion," followed by extensive filtration, to destroy chemical agent.
- The Dynasafe Static Detonation Chamber, designed by a Swedish company in Germany, is a static kiln that processes munitions on a conveyor system without donor explosive charges.
- The DAVINCH (Detonation of Ammunition in a Vacuum Integrated Chamber), produced by Japan's Kobe Steel, is similar to the TDC, but it uses a vacuum to reduce noise, vibration, and blast pressure.

Each of these systems has its advantages and disadvantages, and some have required modifications in the field. They must be operated by skilled technicians. But all have been operated safely in the field.

In addition, the Army has recently developed the Field Deployable Hydrolysis System, a transportable neutralization system designed to convert large quantities of bulk chemical agent and precursors compounds into chemicals that cannot be used as weapons.

There is no public, definitive information about the Syrian stockpile, but it appears that it consists of large storage facilities that may also hold large containers of bulk agent and "precursor" chemicals, as well as small quantities of intact munitions deployed throughout the country. In the midst of a civil war, transporting identified chemical weapons from the field to large stockpile centers may be risky.

Furthermore, it is likely that the Syrian people, both supporters and opponents of the Assad regime, will object to chemical weapons being shipped to or through their communities, as they learn about their presence.

But the transportable destruction systems can be moved to areas where small quantities of munitions or bulk agent are located, used to destroy those weapons, and then transported to the next site. This rapid response will reduce the chance that rogue commanders or rebel units will obtain control over or even use these weapons.

As field destruction is underway, plans can be made to build larger destruction units at major facilities protected by international forces. Care should be taken to prevent the release of chemical agent and products of incomplete combustion such as dioxins, as well as to reduce the likelihood of system failure, but no one expects the volume of environmental paperwork associated with the U.S. destruction program.

In the long run it will be necessary to dismantle production facilities, destroy chemical feedstocks, and dispose of the waste generated by the munitions treatment systems. None of these tasks will be easy, but these facilities and materiel pose no immediate military threat.

The elimination of Syrian chemical warfare materiel will be challenging and costly, but it can be achieved safely and verifiably. The diplomats need to understand the cost and technical pitfalls, and they must be prepared to negotiate the participation of qualified foreign technicians.

Finally, I suggest therefore that the demilitarization process be transparent in real time, with cameras documenting key activities for either live or delayed streaming to the Internet. Such transparency will help establish confidence, globally as well as locally, that Syrian weapons are indeed being destroyed and that the disposal process is protecting, not threatening, the health and safety of the nearby population.