November 2006

**Industrial Ammunition Stockpile Recovery: Saving Energy and Resources and Protecting the Environment**

Erik Lauritzen  
*NIRAS DEMEX*

Mogens Straarup  
*NIRAS Chemcontrol*

Inés García Sánchez  
*NIRAS DEMEX*

Follow this and additional works at: https://commons.lib.jmu.edu/cisr-journal

Part of the Defense and Security Studies Commons, Emergency and Disaster Management Commons, Other Public Affairs, Public Policy and Public Administration Commons, and the Peace and Conflict Studies Commons

**Recommended Citation**
Available at: https://commons.lib.jmu.edu/cisr-journal/vol10/iss2/9

This Article is brought to you for free and open access by the Center for International Stabilization and Recovery at JMU Scholarly Commons. It has been accepted for inclusion in The Journal of Conventional Weapons Destruction by an authorized editor of JMU Scholarly Commons. For more information, please contact dc_admin@jmu.edu.
Industrial Ammunition Stockpile Recovery: Saving Energy and Resources and Protecting the Environment

This article presents the opportunity for the disposal of ammunition in an economically and environmentally feasible way, focusing on post-conflict disposal of larger stocks of ammunition with a special view to the ongoing Ammunition Stockpile Destruction Programme in Afghanistan managed by the Afghanistan New Beginning Programme. The contents of the article are based on the experiences gathered under the umbrella of the research and development programme Western European Armament Group European Cooperation for the Long-Term in Defence and European Union Instrument Financier pour l’Environnement (EU LIFE), together with a study carried out for NATO’s Maintenance and Supply Agency, followed by field studies on ammunition stockpile destruction in mine-action programmes.

by Erik K. Lauritzen, Mogens Straanum and Inês Garcia Sánchez | NIRAS DEMEX & NIRAS Chemcontrol |

Obsolete ammunition is a major problem in many countries, especially in war-torn countries like Afghanistan, Iraq, Sudan and Lebanon. To restore peace, it is imperative to dispose of the ammunition, as this will reduce the capabilities to continue the warfare. Explosive remnants of war are normally destroyed by open burning or open detonation (OB/OD) in suitable amounts according to national regulations or according to International Mine Action Standards 11.10 and 11.20. These methods create environmental problems, however, as huge quantities of metal fragments, dust and nitrogen oxides (NOx) are emitted to the environment.

Agenda for ERM and Ammunition Stockpile Disposal

As a result of the end of crisis and conflicts around the world, vast quantities of ammunition have been destroyed by OB/OD. They have come from a variety of sources, primarily:

- Excess stocks of military ammunition resulting from the ending of crises/conflicts
- Unexploded ordnance on former military training or gunnery ranges
- Mines and UXO remaining from military and some civil conflicts

The amount of ammunition in abandoned stockpiles in Iraq and Afghanistan comprises several hundred tonnes of various types of munitions.

In the wake of the recent conflicts in the Persian and Balkan areas, many questions have been raised about post-war effects, such as the environmental pollution caused by OB/OD of ammunition stockpiles. Kuwait has claimed compensation from the Iraqi government for severe damage of the desert environment caused by chemical pollution of sand and soil because of OB/OD disposal of abandoned Iraqi ammunition after the First Gulf War in 1991.

Today the international market for scrap metal is very favourable, and the prices of scrap iron and especially copper, stainless steel and aluminium are rising.

Recovery and recycling of explosives for industrial use has proven feasible. Recycled explosives from ammunition are not competitive with industrially manufactured explosives. However, explosive components might be incinerated for energy recovery or reclaimed for fertilizing or other chemical purposes.

The destruction of abandoned ammunition stocks in a post-conflict area, necessary logistics management and implementation of appropriate ammunition disposal procedures require a lot of human resources. The work related to ammunition-stockpile management is highly suitable for demobilization, demilitarization and reintegrations programmes.

Taking all environmental, economical and social benefits derived from the recovery of ammunition stockpiles into consideration, industrial ammunition stockpile recovery is far preferable to the currently applied, normal practice of OB/OD. However, further investigation and proof of concept is urgently needed.
Principles of Demilitarization and Ammunition Disposal

Demilitarization of ammunition can be performed in many ways. Different techniques and methods for demilitarization of ammunition are presented in FM 11-10. Figure 1 illustrates a general methodology for demilitarization. There are many phases to follow and steps that can be taken. Each phase is composed of a set of processes and many of the stages consist of a number of substeps. The most appropriate demilitarization process to be implemented will be dictated by a number of factors, such as available technology, environmental legislation, material conditions, commercial issues and safety regulations.

Munitions are inherently dangerous and the demilitarization process involves considerations about explosive safety and environmental risks. In particular, downgrading and treatment stages are the most critical, during which the explosive components are subjected to processes that can be hazardous depending on the working methods, sensitivity of the explosive components, etc.

In order to save resources and protect the environment, demilitarization processes must aim for minimal recycling and minimal waste disposal. Furthermore, the process must be as harmless as possible with respect to workers’ health and safety, and emissions into the atmosphere, soil and water.

Munitions are, with few exceptions, designed with focus on the use phase, and little or no thought is given during the design phase to the end of life stages when demilitarization is required. Consequently, demilitarization of munitions is often a more cost-intensive process than initial construction. Modern design of munitions is becoming more and more complex, and therefore demilitarization has to be more carefully considered at this initial stage.

With growing requirements for ammunition munitions, the energetic constraints are evolving and becoming more stringent. The use of explosives in ammunition is reducing, and the demand for non-explosive materials is increasing. The use of well-designed non-explosive materials is essential to the safe operation of the ammunition and to minimize the environmental impact.

Mobile Ammunition Disposal Plant

In May 2009, NIKADEMEX published a report, Research and Development Technologies for Safe Disposal of Explosive Weapons, which compiled the results of a project carried out under the EU LIFE programme. The project demonstrates by means of laboratory tests that it is possible to extract the explosive content from the ammunition shells, mix it with water and incinerate the resulting mixture without risk of explosion.

NIKADEMEX has designed and set up both large and small-scale, mobile incinerators for disposal of hazardous waste like pesticides, PCBs, etc., such as the one shown in the picture. NIKADEMEX and NIKADEMEX have further been responsible for the design, construction and setup of a plant for ignition at the Danish Ammunition Arsenal, as shown in the photo on the next page. The process ensures any remaining explosive material within the disposed ammunition items is burnt out and is done so in a way that guarantees safe handling and eventual recycling of the shells.

During the incineration process, it is possible to recover the generated energy and use the exhaust gases to ensure the emissions comply with the environmental requirements in the area. This technique is therefore preferable to O/R/D from an environmental perspective. Moreover, mobile incineration units can be established on-site and thus offer the same logistic advantages regarding local disposal of ammunition waste as the currently used DBR.

The extraction of the explosives from the ammunition shells and their incineration has only been tested on a laboratory scale. However, full-scale demonstration is under preparation.

Proposed Design for Mobile Ammunition Disposal Plant

Overall layout. Due to the safety risks associated with the transport of ammunition, having a relocatable or transportable facility for its safe disposal constitutes an essential advantage. The small ammunition at the Danish Ammunition Arsenal, as shown in the photo on the next page. The process ensures any remaining explosive material within the disposed ammunition items is burnt out and is done so in a way that guarantees safe handling and eventual recycling of the shells.
Project. The DISC project has Weapon Collection Teams that perform similar work to that of the previous DDR Mobile Disarmament Units. This ammunition the WCTs find will be handled within the ammunition destruction project. The project has been running since December 2004. The organisation of the ammunition destruction project is shown to the right in Figure 5. The Anti-Personnel and Ammunition Stockpile Destruction Programme under the supervision of the Ministry of Defence and Intersec and the National Department of Security are being surveyed, and the ammunition is classified into different categories:

1. Ammunition required by the Afghan National Army for service.
2. Ammunition that might be required for service of the ANA.
3. Ammunition to be destroyed, including APDS.

During the transfer of the ammunition from the cache, ANA transports the first two categories of ammunition together, and there is no registration of the specific types of ammunition belonging to each of the two categories.

ANPR transfers serviceable ammunition to temporary and permanent ammunition storage points called Temporary Ammunition Consolidation Points and Permanent Ammunition Supply Points, respectively. Two Ammunition Supply Points are placed in the Kabul area and another five elsewhere. The ASPs are mainly existing storage sites that have to be required and secured. They need to be cleared of UNO and the ammunition already stored has to be sorted. Some of the ASPs are ready, and ANA has started transporting ammunition to some of the prepared Ammunition Survey Teams.

Each of the eight Ammunition Survey Teams simultaneously undertakes the ammunition survey in multiple locations on a nationwide basis. ANPR conducts the transportation of serviceable ammunition to regional ammunition supply points with assistance from the U.S. company UXB International and ANA. ANA handles storage of the ammunition without support. Destruction of unnecessary ammunition (unsafe, unapplied and non-required) and APDS is conducted by implementing partners. The HALO Trust and UXB International, by means of open-air burning and bulk demolition.

The Ammunition Survey Teams are surveying ammunition caches. The ASTs also empty the ones not considered suitable for future storage. Unsafe, unwanted and illegal armaments, including unattended mines, are destroyed by implementing partners. The rest is moved to Temporary Ammunition Consolidation Points. The survey teams consist of one ANA Team Leader, one ANA Deputy Team Leader, one International Adviser, one Translator/Associate and four drivers. Each team has two trucks and two cars. Technical assistance is provided by HALO Trust personnel.

The actual destruction of ammunition is conducted by implementing partners including the HALO Trust, RENCOC Consulting Corporation and UXB International.

**Proposed Industrial Ammunition Disposal Programme for Afghanistan**

By the end of 2005 it was estimated that total stocks of abandoned ammunition in Afghanistan amounted to 50,000–80,000 tonnes (55,000–108,000 U.S. tons). Some of the ammunition was destroyed serviceable by the Afghan Army and had to be recovered, while the remaining stocks had to be demilitarized.

**New strategy.** The EU prepared a new strategy for ammunition management for the Afghanistan government. This demilitarization practice by UXB OD may only be used up to 2007. In 2007 demilitarization of ammunition shall be performed in an environmentally friendly way. By 2012 all serviceable and unwanted ammunition currently stored shall be denatured.

It is proposed that the demilitarisation should be performed in accordance with the European Commission principles of best available technologies net entailing excessive cost, the EU directives of waste management and the International Mine Action Standards.

Most likely a large proportion of the ammunition that has been consolidated will turn out to be obsolete or unserviceable stocks that must be destroyed. However, ammunition stocks contain valuable materials that can be recovered. If innovative, environmentally friendly demilitarisation techniques are proven to be cost-effective, then scrap metal and explosives could be recycled for commercial use. Energy and nitrogen-based compounds can be recovered from explosives to be used in fertilisers and scrap metal can be recovered from the casing materials. The present world prices for scrap metal are relatively high and it is therefore recommended that an industrial demilitarisation system should be analysed in detail, with the indirect objectives of improving business activities and creating employment for the local Afghan population. An industrial demilitarisation system could be established in connection with the Temporary Ammunition Consolidation Points, for example a mobile demilitarisation plant based on closed circuitry or similar technologies.

It is strongly recommended that open burning/open detonation of ammunition should not continue as a demilitarisation technique, due to the proven environmental damage and insufficient use of resources.

Furthermore, it is mentioned that the UNDP, the World Bank and the Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons has considerable experience with demilitarisation technologies, and the publication *Principles of Livelihood in the Bullet* gives practical guidelines for the ammunition stockpile management.

**Capacity building.** It is a priority for EC projects to build up local capacity. After one year of ammunition stocks destruction, an appropriate national capacity has been established. A capacity-building plan is supposed to be prepared with special focus on local ammunition technicians and leaders of Ammunition Survey Teams. Furthermore, the capacity-building plan should include a plan for transfer of ownership from ANPR to a local organisation and by a specific exit plan for ANPR, the international implementing partners and Technical Advisors.

It is assumed that the initial phase of the ammunition destruction programme will be implemented via cooperation between U.N. humanitarian organisations, international NGOs and other civil implementing partners on one side and the military society (including the Coalition Forces/International Security Assistance Forces), ANA, police, and security forces on the other side.

It has been proposed that industrial ammunition recovery might be transferred to commercial companies—possibly international companies in cooperation with local companies—in accordance with specific international procedures stipulated by the donor organisations. The contract must be based on industrial demilitarisation techniques in compliance with the above-mentioned requirements for health, safety, and environmental protection.

For additional references for this article, please visit http://journals.american.edu/journals/4.524.