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

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In March 1993, two brothers—Bahriddin and Nuriddin Eshonov, ages 18 and 17—found a piece of UXO and began to open it. This action resulted in an explosion and the brothers were both killed.

On 23 July 1993, 11-year-old Khusrav Rafiyev found an item of UXO and tried to burn it. The resulting explosion blinded the boy.

On 23 April 2005 two brothers—Salim and Mahmadali Saimuddinov, ages 8 and 9—and 5-year-old Pathiddin Ihotamoddinov from the village of Khost found a piece of T2O while they were gathering wood. They began to cut it with an axe which resulted in an explosion and all three of the boys were seriously injured.

In accordance with the agreement between the government of the Republic of Tajikistan and the Organization for Security and Co-operation in Europe dated 16 May 2005 and within the framework of the Programme of Small Arms and Light Weapons, an Explosive Demolition Centre was established within the Ministry of Defence. Its major objective is to facilitate the demolition of ERW. More than 70 metric tons of ERW have been demolished as of 19 October 2006, and the work is ongoing.

Taking the serious consequences of ERW into consideration, it is necessary to point out that the adoption of Protocol V by the international community and its entry into force has great importance for the safety of civilians. Of course, it significantly depends on the process of accession of the governments and the fulfillment of its provisions by State Parties. TMAC hopes the implementation of Protocol V allows all parties to take practical measures to demolish ERW efficiently and productively to provide safety for all. See Endnotes, page 109

In the wake of the recent conflicts in the Persian and Balkan areas, many questions have been raised about post-conflict issues, 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 not proven feasible. Recyclable explosives from ammunition are not competitive with industrially manufactured explosives. However, explosive compounds might be incinerated for energy recovery or reclaimed for fertilizing or other chemical purposes.

The distance 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 reintegration 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.

Table 1:

<table>
<thead>
<tr>
<th>Munition/Type</th>
<th>Amounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocket</td>
<td>27,700</td>
</tr>
<tr>
<td>Mortar</td>
<td>1,000</td>
</tr>
<tr>
<td>Grenades</td>
<td>2,000</td>
</tr>
<tr>
<td>Total</td>
<td>30,900</td>
</tr>
</tbody>
</table>

Note: The above amounts are based on the data provided by the Tajik authorities. The actual amounts may vary.
Principles of Demilitarisation and Ammunition Disposal

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

Munitions are inherently dangerous and the demilitarisation process involves considerations about explosive safety and environmental risks. In particular, dismantling 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, demilitarisation processes must aim for maximal recycling and minimal waste disposal. Furthermore, the processes 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 stage, when demilitarisation is required. Consequently, demilitarisation of munitions is often a more complex problem than initial construction. Modern design of munitions is becoming more and more complex, and therefore demilitarisation has to be more carefully considered at this initial stage. With growing requirements for insensitive munitions,1 the energetic constituents are evolving and becoming more difficult to deal with compared with traditional explosives, such as TNT. Munitions containing TNT can easily be melted out, since TNT’s melting point is lower than that of water, however, new filling compositions tend to be based on nitramines2 embedded in a cross-linked polymeric matrix3 with a higher melting point.

Mobile Ammunition Disposal Plant

In May 2006 Niras DEMEX published a report, Research and Development Technologies for Safe Disposal of Explosive Water, 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.

NIRAS Chemcon has designed and set up both large incinertors and small-scale, mobile incinertors for disposal of hazardous waste like pentites, PCB, etc., such as the one shown to the right. NIRAS DEMEX and NIRAS Chemcon have further been responsible for the design, construction and setup of a plant for ignition of feed 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 burned out and is done in so a way that guarantees safe handling and eventual recycling of the shells.

During the incineration of explosives, it is possible to recover the generated energy and clean the exhaust gases to the emissions comply with the environmental requirements in the area. This technique is therefore preferable to O/B/D in 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 O/B/D.

The extraction of the explosives from the ammunition shells and their incineration has only been tested on a laboratory scale, however. A full-scale demonstration test 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 confers an essential advantage. Cold feed 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 is burned out and is done in so a way that guarantees safe handling and eventual recycling of the shells.

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Energy recovery. A boiler is installed to recover the energy generated during the inincineration of the waste/explosive mixture and reuse it for, among others, heating purposes. The energy recovery supplies added income for the project.

Blue-gas cleaning. A full blue-gas cleaning system is installed to recover the emissions and ensure they comply with the legal requirements. It is expected the emissions will comply with the tightest EU emission requirements for incineration of hazardous waste. The main focus of the blue-gas cleaning system will be removal of dust and nitrogen oxides.

An emission-monitoring system will continuously ensure air emissions comply with the established legal requirement for the flue gases.

Control system. The incineration process is carefully controlled by a computer system to ensure safe and environmentally sound operation. In case of abnormal operation, the process will be stopped in a controlled manner.

Mechanical safety measures are incorporated to protect the equipment from damage in case of improper operation or unexpected events. A tentative sketch of the overall process is shown in Figure 2 below.

Ammunition Stackpile Destruction Programme of Afghanistan

The Afghan New Beginning Programme launched the ammunition destruction project in December 2005, based on the Anti-Personnel Mines and Ammunition Stockpile Destruction Project.4 Coalition Forces and the International Security Assistance Force in Afghanistan have conducted and continue to conduct the destruction of ammunition stockpiles in Afghanistan. However, this work is not coordinated with the United Nations Mine Action Centre for Afghanistan or ANRB and has sometimes resulted in failed bulk demolitions and the accidental displacement of ammunition, requiring time-consuming explosive ordnance disposal operations.

The ammunition destruction project is a continuation of the Afghan Disarmament, Demobilisation and Reintegration Programme managed by ANRB. During the DDR activities, a large amount of stockpiled ammunition was found and ANRB became aware of the need for ammunition stockpiles to be destroyed. Parallel to the ammunition destruction project, ANRB is also running the Disbandment of Irregular Armed Groups

1. Netz.8

2. Netz.8

3. Netz.8

4. Netz.8

Figure 1: Schematic illustration of the typical sequence of demilitarisation.

Figure 2: DEMEX/Chemcon simulated facility for mobile ammunition disposal plant. Ref: ANRB Anti-Personnel Mines and Ammunition Destruction Project Document, Annex 2.
Project. The DIAG project has Weapon Collection Teams that perform similar work to that of the posts DDR Mobile Disarmament Units. The 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 1.

The Anti-Personnel and Ammunition Stockpile Destruction Programme under the supervision of the Ministry of Defence and Interior and the National Department of Security are being surveyed, and the ammunition is classified into three categories:

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

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.

ANRP 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 planned in the Kabul area and another five elsewhere. The ASPs are mainly existing storage sites that have to be repaired and secured. They need to be cleared of UXO 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. ANRP 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 serviceable ammunition (unsafe, unserviceable and non-required) and APMs 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 ATFs also empty the ones not considered usable for future storage. Unsafe, unwanted and illegal ammunition, including antipersonnel 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 Advisor, 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, RONCO 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 50,000–100,000 tonnes (50,000–100,000 U.S. tons). Some of the ammunition was deemed serviceable by the Afghan Army and had to be recovered, while the remaining stocks had to be demilitarised.

New strategy. The EU prepared a new strategy for ammunition management for the Afghan government. Current demilitarisation practice by OB/OD may only be used up to 2007. Starting in 2007 demilitarisation of ammunition shall be performed in an environmentally friendly way. By 2012 all unserviceable and unwanted ammunition currently stored shall be destroyed.

It is proposed that the demilitarisation should be performed in accordance with the European Commission principles of best available technologies or enabling excessive cost, the EEC directives of waste management and the International Mine Action Standards (IMAS).

Most likely a large proportion of the ammunition that has been consolidated will turn out to be serviceable or unserviceable stocks that need to 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 steel 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 Destruction Points, for example a mobile demilitarisation plant based on closed incineration or similar technologies.

It is strongly recommended that an environmentally open or open demilitarisation of ammunition should not continue as a demilitarisation technique, due to the proven environmental damage and inefficient use of resources.

Furthermore, it is mentioned that the UREZ, South Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons has considerable experience with demilitarisation technologies, and the publication describes 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 stockpile 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 must be accompanied by a plan for transfer of ownership from ANRP to a local organisation and by a specific exit plan for ANRP, the international implementing partners and Technical Advisers.

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 Force), 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 practices in compliance with the above-mentioned requirements for health, safety and environmental protection.

For additional references for this article, please visit http://snipurl.com/15i4j.