November 2006

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 Khursoy Ratyev 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 Saimoddinov, ages 8 and 9—and 5-year-old Pathiddin Ilhomoddinov from the village of Khost found a piece of UXO 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.

Table 1: Firearms returned between 1994 and 2006.

<table>
<thead>
<tr>
<th>Type of gun</th>
<th>Known</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalashnikov gun</td>
<td>9,101</td>
<td>1,042</td>
</tr>
<tr>
<td>Pistol</td>
<td>2,846</td>
<td></td>
</tr>
<tr>
<td>Rifa</td>
<td>3,070</td>
<td></td>
</tr>
<tr>
<td>Other types of guns</td>
<td>1,042</td>
<td></td>
</tr>
<tr>
<td>Hunting gun/ERW</td>
<td>9,006</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>28,865</td>
<td></td>
</tr>
</tbody>
</table>

In accordance with the agreement between the government of the Republic of Tajikistan and the Organization for Security and Co-operation in Europe, on 26 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 (77 tons) of ERW have been demolished as of 19 October 2006, and the work is ongoing.

Conclusion

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 destroy ERW efficiently and productively to provide safety for all.

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

This article presents the opportunities 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 programmes Western European Armament Group European Cooperation for the Long-Term in Defence and Western European Armament Group European Cooperation for the Long-Term in Defence and Protecting the Environment (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 Straup and Inés García Sánchez | NRAS DEMEX & NRAS Chemicontrol |
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 IMAS 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, downsizing 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 a 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 nitrates2 embedded in a cross-linked polymeric matrix3 with a higher melting point.

Mobile Ammunition Disposal Plant

In May 2006 N I R A S DEMEX published a report, Research and Development Technologies for Safe Disposal of Explosive Waste, 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 Chemement has designed and set up both large incinerators and small-scale, mobile incinerators for disposal of hazardous waste like projectiles, PCB, etc., such as the one shown in the right. NIRAS DEMEX and NIRAS Chemement have further been responsible for the design, construction and setup of a plant for ignition of liquid and solid waste 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 in 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 OB/OD 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 OB/OD.

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 constitutes an essential advantage. Obviously, small ammunition plants at the Danish Ammunition Arsenal, as a number of depots, and it is preferable to dispose of the ammunition on premises instead of transporting it to a central facility. For practical reasons, it is also preferable if the disposal unit can be shipped by road/sea transport.

Extraction of explosive material and preparation of explosive/water mixture. Explosive content is extracted from the shells by high-pressured water. The shell is then cleaned so the metals can be recycled, constituting a considerable income from the overall process. In regions where armed conflicts are still ongoing, shells should be transported to the country to prevent them from being re-leftened with explosives. The transport of ammunition shells is not problematic, as they are composed of non-explosive and non-hazardous materials. The extracted explosive material is mixed with water in such a proportion that the resulting mixture has some specific properties with respect to explosive capability. An important criterion is that the mixture shall not explode by shock or exposure to temperatures below 60 °C (140 F). The mixture is not considered explosive material, and can therefore be stored in dedicated vessels until disposal.

Incineration process. The explosive/water mixture is pumped into the primary incineration chamber, where a pilot flame ensures the mixture is ignited and the incineration process is initiated. The incineration speed is an important operation parameter, which is also controlled by the mixture composition. Too fast an incineration speed—e.g., too low an incineration temperature—could damage the equipment, or it could cause the flue-gases to plume. Too low an incineration speed—e.g., too much water in the mixture—might hinder the ignition of the mixture. Too fast an incineration speed—e.g., more than two seconds at 1,100 °C (2,012 F)—would also be met.

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

Flue-gas cleaning. A full flue-gas cleaning system is installed to minimize the emissions and ensure they comply with the legal requirements. It is expected the emissions will comply with the most rigorous EU emission requirements for incineration of hazardous waste. The main focus of the flue-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-gas.

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 Stockpile Destruction Programme of Afghanistan

The Afghanistan New Beginning Project launched the ammunition destruction project in December 2005, based on the Anti-Personnel Mines and Ammunition Stockpile Destruction Project.6 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 co-ordinated 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 cleaning operations.

The ammunition destruction project is a continuation of the Afghan Disarmament, Demobilisation and Reintegration Programme managed by ANRB. During the DRR 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
New strategy. The EU prepared a new strategy for ammunition management for the Afghan govern-
ment. Current demilitarisation practice by OB/O
may only be used up to 2007. Starting in 2007
demilitarisation of ammunition shall be performed in
an environmentally friendly way. By 2012 all unusable
and unwanted ammunition currently stored shall be
destroyed.

It is proposed that the demilitarisation should be per-
formed in accordance with the European Commission
principles of best available technologies not entailing
excessive cost, the ECC directives of waste management
and the International Mine Action Standards.10

Most likely a large proportion of the ammunition
that has been consolidated will turn out to be obso-
lete or unrecognizable stocks that must be destroyed.
However, ammunition stocks contain valuable ma-
terials that can be recovered. If innovative, environmen-
tally 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 fertilizers 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 sys-
tem should be analysed in detail, with the indirect
objectives of improving business activities and crean-
ing employment for the local Afghan population. An
industrial demilitarisation system could be estab-
lished in connection with the Temporary Ammunition
Consolidation Points, for example a mobile demilitarisation plant based
on closed incineration or similar technologies.

It is strongly recommended that opening/open detona-
tion of ammunition should not continue as a demilitarisation technique, due to the proven
environmental damage and inefficient use of resources.

Furthermore, it is monitored that UMO South-Eastern and Eastern
Europe Clearinghouse for the Control of Small Arms and Light Weapons has
considerable experience with demilitarisation technologies, and the publica-
tion “Guiding the Bullet” gives practical guidelines for the ammu-
nition stockpile management.

Capacity building. It is a priority for EC projects to build up local capac-
ity. 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 accompa-
nied by a plan for transfer of ownership from ANIBP to a local organisation and
by a specific exit plan for ANIBP, 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 organiza-
tions, 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
cooporation 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.

See Endnotes, page 109