# *High Explosives and Security Issues in the Republic of Korea*

## *Presentation Summary*

Inho Kim, Ph.D.

Dr. Kim opens with a brief explanation of the two principal cornerstones of South Korea's Agency for Defense Development (ADD), where he serves as the Director of its High-Energy Density Technology Directorate. During the agency's creation in 1970, then South Korean president Park Chung-hee designated ADD as the "cornerstone of national defense." Given this guidance, the Directorate focused its efforts in the next 40 years in towards various indigenous high explosives for utilization in conventional weapons and platforms. In 2010, President Lee Myung-bak announced the agency's second cornerstone – the "creativity challenge," calling on ADD to transform itself and broaden its functions in the decades ahead. In this context, the High Energy Density Technology Directorate put forth a roadmap that focuses research and development (R&D) efforts on, among others, "defense green technology" and anti-terrorism technology. Dr. Kim proceeds to discuss details of these two priorities. He first expounds on two areas of research in defense green technology – nitrogen clusters and the development of demilitarization technology, and then goes on to elaborate on ADD's research on anti-terrorism technology.

Recent scientific breakthroughs related to nitrogen clusters derived from nitrogen in the air lends cautious optimism to the possibility that nitrogen clusters could be a next-generation energy material as well as a source of "green fuel." Dr. Kim posits that clusters could replace fossil fuel in the future and will have uses in ammunition and warheads, adding that it might take 20-30 years of R&D before clusters can achieve full utility. ADD houses a research center dedicated to green energy materials, including R&D on nitrogen clusters, but Dr. Kim says that international cooperation can further accelerate research progress. Currently, ADD is involved in two international cooperation projects in high energy density materials. The first is with the U.S. Army's Armament Research, Development and Engineering Center. The focus of this 10-year joint effort is low carbon, nitrogen-rich green explosives research. The second collaborative project on energy materials research is with the Swedish Defence Research Agency (FOI), one of Europe's leading research institutes in defense and security.

The development of demilitarization technology is ADD's answer to the problem of accumulating stockpiles of obsolete munitions (figure 1, p. 120). Dr. Kim points out that storage facilities for these munitions are running out fast. Munitions disposal through open burning or open detonation are increasingly becoming less viable because apart from the danger that obsolete munitions pose, these methods cause environmental pollution (e.g., heavy metal concentration in the soil and the circulation of toxic gases). He also mentions increasing calls for the recycling of resources as an important consideration in finding eco-friendly solutions for obsolete munitions.

Dr. Kim believes that the development of demilitarization technology is one of the best ways to participate in the defense green race while also in accord with the pursuit of a clean environment. He points to South Korea's joint partnership with the U.S. in the construction of a demilitarization facility for convention munitions as an ideal situation that responds to South Korean defense and environmental concerns while engaging in international collaboration. In this case, the U.S. provides the equipment and technology for the melt-out facility, while South Korea provides the buildings, manpower and support facilities.

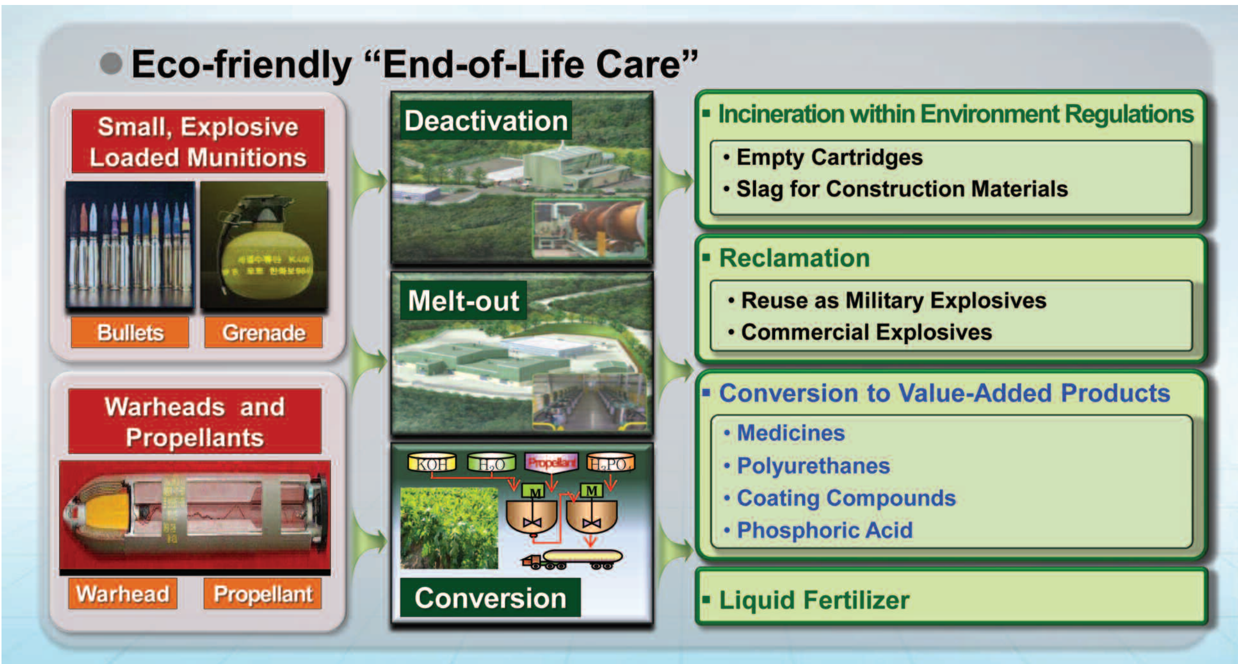


**FIGURE 1** Demilitarization of Conventional Munitions

The terrorist groups' use of improvised explosive devices (IEDs) is a serious, worldwide security issue. For this reason, there is a high demand for IED detection and counter-IED technologies. He explains that explosive detection technologies are classified into two large groups – bulk detection and traces detection. Bulk detection technology is a technique to find the image of the bulk explosives utilizing various methods such as neutron techniques, nuclear quadruple resonance, X-ray diffraction imaging, millimeter-wave imaging, terahertz imaging and laser techniques. Trace detection technology is a technique to detect small amounts of vapors or molecules of explosive materials utilizing various methods such as chemiluminescence, mass spectroscopy, ion mobility spectroscopy, electrochemical methods and micro mechanical sensors.

Dr. Kim cites the 2010 sinking of the Cheonan, a South Korean war ship, to illustrate the key points of his presentation. First, it demonstrates how ADD's 40-year R&D efforts in high explosives including underwater explosives prepared them to conduct a thorough scientific analysis of the incident. The investigation's conclusion attributes the sinking to an explosion of 250 kg of aluminized underwater high explosives that occurred at a point three meters left from the keel in the port side in depths between six to nine meters. Second, the incident underscores the importance of international cooperation in science and technology. The assistance that the multinational team provided to the South Korean team in various aspects of the investigation proved invaluable. Their presence and role also lent objectivity to the findings of the investigation. Dr. Kim points out that reliable analysis of explosion damages requires various test and evaluation technologies and a lot of experience on high explosives-related phenomena. It is also time consuming and very expensive to get the database. So a corollary lesson on international cooperation from the Cheonan sinking is the need for increased information-sharing of the damage analysis database among countries. And third, the sinking via high explosives suggests the strong possibility that future acts of terrorism can utilize new types of high explosives. Thus R&D on detection technologies must keep pace with the emergence of new high energy density materials. In addition, the incident points to the need for stronger international regulations regarding the use of tag materials in high explosives and the creation of an international agreement to control high explosives including its raw materials.