KEYNOTE SPEAKER

DECONTAMINATION OF AMMUNITION MANUFACTURING PLANT AT ELEFSIS GREECE

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The closure of ammunition manufacturing plants and the decontamination of their infrastructure buildings, equipment, lands, and waters, in order to be reused for urban or industrial development, requires the application of a safe, efficient, in situ, scalable, and environmentally friendly technology. Although the most favored method of treatment of energetic hazardous waste has been open burning and open detonation (OBOD), there is a growing need worldwide for transition to environmentally friendly alternative technologies. In recent years the application of a chemical reduction-based treatment technology has been demonstrated to be an efficient, safe, in situ, scalable, and flexible method.

This work demonstrates the efficacy of a chemical treatment method based on reduction chemistry that successfully decontaminates solid surfaces contaminated with primary and secondary explosive materials. The sulfur-based chemical reductants are commercialized under the trademark MuniRem®. Primary and secondary explosives were used in the tests described in this presentation. Specifically, Lead Azide, Lead Styphnate, and Tetrazene as primary explosives, and TNT, Tetryl, RDX, HMX, PETN, NC, and NG as the secondary explosives were neutralized and destroyed in a safe and efficient manner with respect to the environment. The destruction of energetic molecules was achieved by using the MuniRem reagents that were applied either in spay of aqueous solutions or in powders, for the decontamination of soils, wall surfaces, equipment, waters, or bulk energetic materials.

This reduction technology employs the dithionite reagent that causes a safe, efficient, mild, and controllable decomposition of the energetic molecules via several fast free radical reactions. The reaction products are mainly the gases N_2, NH_3, NO_2, SO_2, CO_2 and minor sulfur salts Na_2SO_4, Na_2CO_3 and K_2SO_4.

Two types of experiments were performed on site using a mobile analytical chemical laboratory. Initially, decomposition experiments were done in known quantities of energetic molecules in solution or in soil samples to determine the optimum conditions for the destruction of the different energetic molecules. In addition, chemical analysis experiments were performed in spiked soil, surface and water samples, prior and after their decontamination with MuniRem treatment, in order to verify the destruction of energetic molecules. Sampling of soils, surfaces, waters was accomplished using certified protocols, and the chemical analysis was performed using HPLC-PDA chromatography and the USEPA 8330B method for explosives. The optimum conditions for the efficient (>99%) destruction of the afore mentioned explosive materials were determined by using the different MuniRem reagents either in laboratory scale or in field applications.