Case Studies of Rapid Chemical Destruction of Bulk and Residual Energetics

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Outline

- MuniRem Technology
- Case Study 1: On-Site inerting of recovered underwater munitions from Confederate States Ship (CSS) Georgia
- Case Study 2: Decontamination of equipment and building
- Case Study #3: Decontamination of scrap metal and bomb casings in support of demilitarization operations
- Conclusion
MuniRem Technology

Voted 2010 Better World Technology
MuniRem® = Effective Chemical Remediation of Explosives and Munitions Constituents

Explosives & Chemical Agents, Organics

- Mustard (CWA)
- HMX / RDX / TNT
- DNTs / ADNTs
- NBs / NDMA
- Nitrocellulose
- PBX
- PCBs
- PETN
- Reactive Aluminum
- Others

 Reliable Green Technology for Remediation of Explosives

Explosives + MuniRem® →

- N₂
- CO₂
- SO₄²⁻
- NO₂
- formate
- acetate
Reliable Green Technology for Remediation of Heavy Metals

Heavy metals + MuniRem® → Metal Sulfide

SO₄²⁻
Case Study #1: On-Site inerting of recovered underwater munitions from Confederate States Ship (CSS) Georgia
CSS Georgia Background

• Ironclad gunboat built for the Confederacy in 1862

• Completed Vessel was too heavy

• CSS Georgia spent her life as a floating battery in what is now the north edge of the Savannah Harbor navigation channel

• CSSG scuttled by Confederate troops on December 24, 1864

• Recovery of CSS Georgia and its munitions part of Savannah Port Expansion Project.
Breaching of Recovered Projectiles
Total projectiles inerted = 170
Neutralization of the Breached Munitions

- After 150 years explosives still well preserved
- Explosives washout using MuniRem solution
- Explosives neutralized
- Fuzes safely removed and inerted
- Munitions certified by SUXOS as safe
- Characterization and disposal of non-hazardous waste
Case Study #1 Summary

• 170 Civil war munitions inerted on-site

• Munitions transferred to U.S. Army Corps

• Munitions preserved for historical purposes

• No hazardous waste produced

• Largest on-site neutralization of recovered underwater Confederate munitions
Case Study #2: Decontamination of a Munitions Demilitarization Building

- Explosives on walls, fixtures and equipment sprayed with MuniRem solution
- MuniRem rapidly destroyed the explosives
- Unlike steam, no explosives recrystallization observed after two weeks
- MuniRem resolves recrystallization problem after steam decontamination
- Results was non-hazardous waste suitable for treatment in standard sewage treatment facilities
Case Study #2: Equipment and Building Decontamination

Situation:

• Melter/Flaker machine contained bulk H-6 (TNT, RDX, AL, Binder) explosives

• Large crystallized chunks of H-6 on equipment

• Wall surfaces and miscellaneous materials contaminated with explosives

• Lead paint chips mixed in with explosives

• Unusually low winter temperatures with freezing rain
Case Study #2: Equipment and Building Decontamination
Hallway and Bulk Explosives on Equipment
MuniRem as a Safer Solution for Recovery and Neutralization of H6 Explosives in Equipment and Building

- MuniRem solution achieved:
  - Instant destruction of small explosives pieces in-situ
  - Safe recovery of large explosives pieces
  - Neutralization of recovered explosives in reaction tanks
  - Safe disassembly of equipment and decontamination
Neutralization of H6 Explosives Recovered from Equipment and Building

- Small explosives pieces destroyed in-place using MuniRem spray
- Large H-6 chunks safely removed using MuniRem spray
- >900 lbs recovered and neutralized in MuniRem solution
- Equipment safely disassembled and decontaminated
Former Munitions Production Plant
Neutralization of aged TNT in Building Pipes
Application of MuniRem to Neutralize Crystallized TNT in Building Pipes at a Former Army Ammunition Plant in Australia

The 150 mm pipe (discharge end) before neutralization

Inside of the explosive hazard pipe before treatment

Inside of the explosive hazard pipe after treatment
Case Study #3: MuniRem in Support of Demilitarization

Wet picric acid recovered from explosive D projectiles

Rapid decontamination of halved bomb casings before and after MuniRem® treatment
MuniRem Application at a Demilitarization Plant in SE Asia

Picric crystals (yellow)  Rust (bright orange)  30mins MuniRem® bath  No visible traces of energetics  Original bare metal surface

Picric crystals (yellow)  MuniRem® spray down

24 hours post-MuniRem®
MuniRem Summary
Advantages of MuniRem® solution

- MuniRem is faster, safer, more cost-effective and green.
- MuniRem directly benefits customer through lower remediation costs and less impact (time and $).
- MuniRem is a safer and low-cost alternative to steam decontamination.
Questions Please?

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