

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



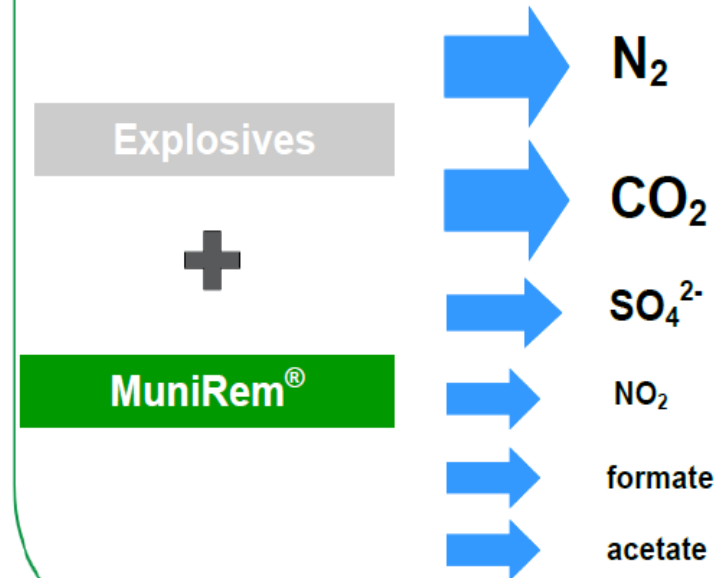
MuniRem® = Effective Chemical Remediation of Explosives and Munitions Constituents

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

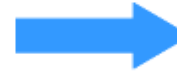


Reliable Green Technology for Remediation of Heavy Metals

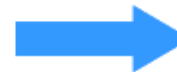
Heavy metals



MuniRem[®]



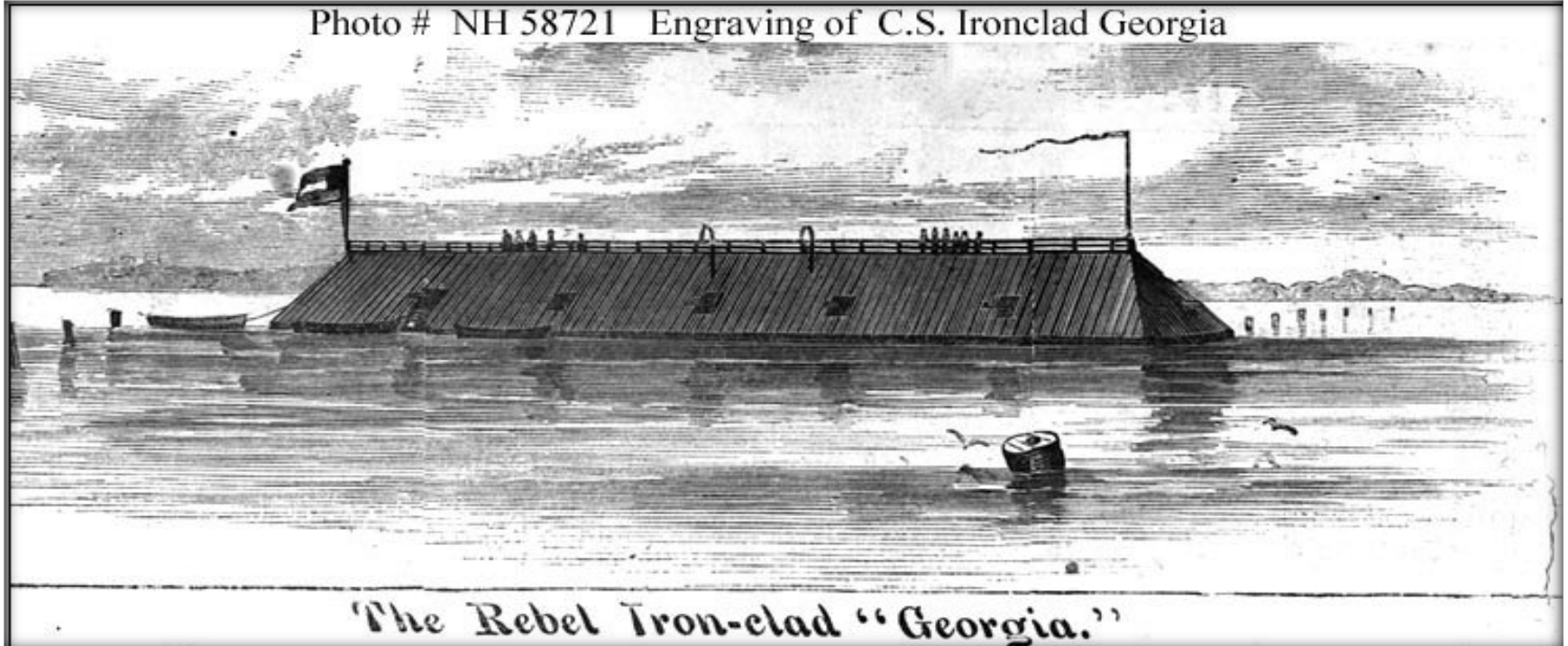
**Metal
Sulfide**



SO₄²⁻

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

Photo # NH 58721 Engraving of C.S. Ironclad 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



Deluge Head



Kettle Lid

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



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

Faster Land
Transfer
and

Can remediate soil and groundwater contaminated sites in weeks to months

Safer Green
Solution

Little danger to the user and surrounding community, no heat or waste products

Lower
Cost

Reduces time to completion, eliminates hazardous disposal costs

Questions Please?

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