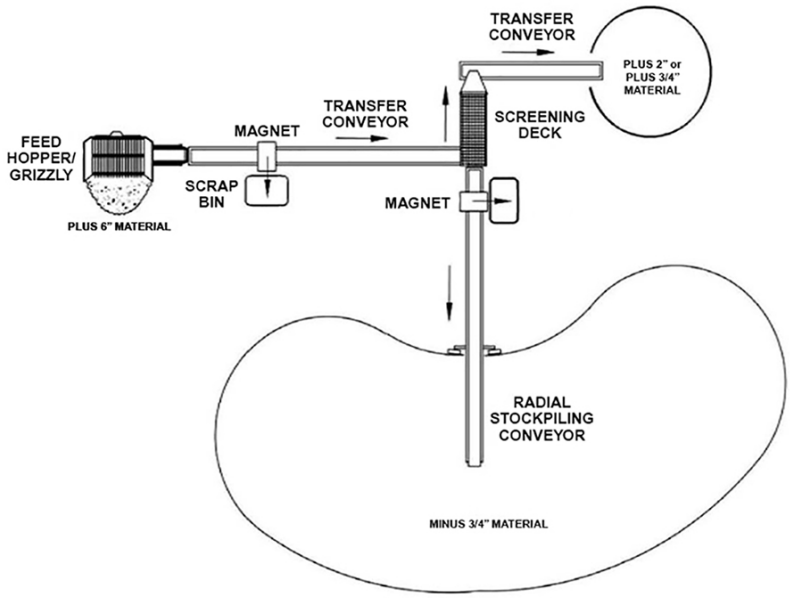
MEC Screening

On this page:

Schematic



Screening Operations Schematic (Source: BRAC)

Introduction

Munitions of explosive concern (MEC) screening is a physical and mechanical process that is used in conjunction with soil excavation. Once the soil has been excavated and transported to the processing area, it is then processed through a series of screening devices and conveyors to produce segregated soils of different size fractions. Screens are sized to trap different items at various points in the process and to allow non-MEC materials (e.g., soil) to move through the system with minimal handling. Soils are known as "waste streams" and can be either clean or contaminated based upon the chemicals (or other constituents such as radioactive materials).

Other Technology Names

Sifting

Description

Excavation and screening technology can be used when high densities of munitions and other ferrous material are present (ITRC, 2006). However, it may only be performed after analysis of the blast and fragmentation characteristics of the anticipated munitions types, and it is determined that an adequate safety distance and shielding can be provided to operators, equipment, and non-essential site personnel. Shields or barricades are used to protect workers against hazardous fragments. If minimal required distances and adequate shielding cannot be provided, then remote controlled mass excavation and screening can be considered.

To begin the process, excavators remove large quantities of soil potentially containing MEC and place it into hoppers. The hopper feeds are screened for various size materials. Each screen is intended to filter objects larger than the screen opening (ITRC, 2006). Within the process stream, the use of conveyors to move and to help control the large volume of soil is needed for a successful screening operation. Another item that can be used to assist in locating and removing MEC during this operation is to use magnetic separators on the conveyor belts to separate the ferrous items from the soil streams. For example, rollers can be placed at the end of the conveyor to direct the ferrous items away from the soil piles. Observation of these activities is conducted by personnel qualified in accordance with DoD Explosives Safety Board (DDESB) TP18 from

one or more protected positions under the Unexploded Ordnance (UXO) Safety Officer's supervision.

Two types of soil screens commonly used in the MEC screening process are shakers and trommels. Shakers are square in shape and physically shake the soil loose, and trommels are long, round tubes that rotate to loosen and divide the soils into waste streams. Screen sizes are reduced as the material is conveyed through the MEC separation process. The last screen must preclude the smallest MEC from getting through (e.g., ¾-inch screen required if 20-mm projectile is the smallest MEC item of concern) (RITS, 2007).

Seed items are used as part of the quality control (QC) process to verify that the screening operation can remove detectable items from the excavated material. Seed items are chosen to represent the types and size of MEC expected to be found at a site (e.g., pipe). During screening operations blind seed items (BSIs) are placed in the excavation spoils and bucket of equipment loading the hopper. If all seeds are not accounted for in the finds, a root cause analyses is performed and necessary adjustments and corrective actions are conducted (U.S. Army, 2008).

Development and Implementation Status

The following checklist provides a summary of the development and implementation status of MEC screening technology:

☐ At the laboratory/bench scale and shows promise

☐ In pilot studies

☒ At full scale

☐ To remediate an entire site (source and plume)

☐ To remediate a source only

☐ As part of a technology train

☐ As the final remedy at multiple sites

☐To successfully attain cleanup goals in multiple sites

MEC screening technology is available through the following vendors:

☐Commercially available nationwide

☒Commercially available through limited vendors because of licensing or specialized equipment

☐Research organizations and academia

Applicability

Contaminant Class Applicability Rating for MEC Screening

(Rating codes: ● Demonstrated Effectiveness, ◐ Limited Effectiveness, ○ No Demonstrated Effectiveness, I/D Insufficient Data, and N/A Not Applicable)

Nonhalogenated VOC	Halogenated VOC	Nonhalogenated SVOC	Halogenated SVOC	Fuels	Inorganics	Radionuclides	Munitions	Emerging Contaminants
N/A	N/A	N/A	N/A	N/A	N/A	◐	●	I/D

MEC screening is a technique that is typically used to remove MEC from soil at munitions response sites. In addition to MEC, screening technologies have also been used to remove radiological items (e.g., marine markers) from soil.

Cost

The MEC screening process typically consists of a feed hopper, magnet, conveyor to transfer material, and screens. The primary labor associated with using MEC screening includes transportation of excavated soil to the MEC

screening equipment, observation of the MEC screening process, disposal of MEC and other materials separated from soil, and the return of screened soil to the excavation area. Major cost drivers include:

Upfront Costs

- Screening equipment procurement, mobilization, setup (typically subcontracted).
- Site location (transportation of excavation and screening equipment).
- Volume of MEC-contaminated soil to be excavated and screened.
- Armor necessary to protect workers.

Operation and Maintenance Costs

- Storage of MEC.
- Fuel costs to run MEC screening operation.
- Cleaning out and disposing of residual waste and returning screened soil to excavation.
- Equipment maintenance.

The list above highlights those cost dependencies specific to MEC screening. Click here for a general discussion on costing which includes definitions and repetitive costs for remediation technologies. A project-specific cost estimate can be obtained using an integrated cost-estimating application such as RACER® or consulting with a subject matter expert.

Duration

Operation of MEC screening equipment typically is limited to the length of time to complete a removal action at a munitions response site. The amount of soil that can be excavated and screened each day depends on the site characteristics (e.g., topography, soil type) and available equipment. The length of time to complete a removal action is dependent on the following conditions:

- Removal depth
- Size of site
- MEC density and distribution
- Metal density
- Soil type

- Climate (i.e., temperature, winds, and rain).

Implementability Considerations

The following are key considerations associated with implementing MEC screening:

- When the maximum particle size in the waste stream is smaller than the smallest MEC item in the excavation area, it is very easy to spot check this stream and then return it as backfill to the excavation area with little if any manual contact with the soil. If MEC is present in the smallest sized waste stream, a smaller screen will need to be added to the MEC screening process.
- The process is complex and requires skilled operators and management personnel.
- Effectiveness of the process can be degraded by cohesive soils and excessive root mass.
- It is a high maintenance activity that requires considerable time and cost for refueling, cleaning, and general maintenance activities.
- Requires protected location for quality and safety personnel observing operations.
- Is typically more cost effective in areas with high densities of military munitions at depths of less than 0.5 m.

Resources

DDESB. **Technical Paper 18. Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel (2016) (PDF)** (45 pp, 619 KB)
This technical paper provides the minimum qualification standards for personnel conducting UXO-related operations in support of the of the DoD.

ITRC. **Survey of Munitions Response Technologies (2006) (PDF)**
(88 pp, 5.34 MB)
This document provides an overview of the technologies used for munitions response action, and evaluates their performance capabilities.

NAVFAC RITS. **Munitions Response Program Removal Technologies (2007) (PDF)** (58 pp, 2.0 MB)
This presentation discusses the available munitions removal technologies

including manual removal, mechanized removal, remotely-operated, dredging operations, and explosive soil removal technologies.

U.S. Army. **Standard Operating Procedure for Mechanical Soil Sifting, Seaside Munitions Response Area, Former Fort Ord, Monterey County, California (2008) (PDF)** (55 pp, 4.63 MB)
This standard operating procedure provides the minimum procedures and safety and health requirements applicable to the conduct of mechanical soil sifting operations in the Seaside Munitions Response Area.

EPA. **Munitions Response Guidelines OSWER Directive 9200.1-101 (2010) (PDF)** (33 pp, 456 KB)
These guidelines provide a framework to EPA Regional offices overseeing responses involving MEC and munitions constituents at locations other than operational ranges where explosives hazards or environmental contamination are known or suspected to be present.

USACE. **Technical Guidance for Military Munitions Response Actions Engineer Manual EM 200-1-15 (2015) (PDF)** (443 pp, 12.7 MB)
This manual provides the USACE Project Delivery Team with the processes for executing the technical aspects of munitions response projects.