A Novel Approach for Evaluating Cost Effective Decontamination Options for Remediating a Radiologically Contaminated Site

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US EPA
Site originally owned/operated by Picker X-ray from 1959 to 1979

Facility manufactured teletherapy and radiography machines

Licensed by the Nuclear Regulatory Commission (NRC) to possess

- > 300,000 curies of Cobalt-60
- > 160,000 curies of Cesium-137
- 2,200 curies of depleted uranium
Problem

- Determine offsite Co-60 migration
  - soils
  - groundwater
  - sewers
- Determine fire/explosion threats
- Break-ins
- Extent of building contamination
- City of Cleveland request;
  - Offsite contamination
  - Request for a 5 sq block radiation survey
Problem

- Indoor areas characterized using gamma ray imaging
- Shielded (4” Pb) to focus the Compton field of view in the forward direction
- Capable of estimating amount of radioactivity, area of contamination, and radionuclide identification
This Compton image looking into the Hot Cell was used to estimate the residual activity. Quantitative analysis of these data indicate ~60 mCi of $^{60}\text{Co}$ activity within the Hot Cell.
Collaboration

Background → Problem → Collaboration → Solution → R&D
Collaboration

- Region 5 requested assistance from EPA’s National Homeland Security Research Center (NHSRC)
- Both Region 5 and NHSRC collaboratively developed a spreadsheet tool for evaluating decon options
- Gamma ray images were projected onto a 3D model for estimating surface area and surface contamination
Solution: AMS Tool

- Method extracts 3D contamination profile from 2D characterization imagery
- Custom decon methods can be applied to multiple hot spots
- Tool estimates removal thickness based on assumed Co concrete penetration profile
- Estimates resource demand, waste, activity, & removal costs
Solution: AMS Tool
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Description: This sheet provides a framework for estimating the distribution of a contaminant. The model is based on field-collected data and can be applied to identify hotspots for remediation.

Flow Labels:
- Flow Name
- Flow Description
- Flow Activity
- Flow Duration

Results Summary:
- Total Impacted Area
- Total Activity
- Total Waste

About:
- Summary of AMS Tool Analysis
- Additional Information

Room Location:
- Basement
- B1
- B2
- B3
- B4
- B5
- B6
- Equipment
- Training
- Discharge
- Refill

Table Technology:
- Technology Name
- Technology Description
- Technology Efficiency

Results by Room:
- Room Description
- Initial Activity
- Waste Volume
- Waste Activity
- Waste Disposal
- Labor
- Remediation Costs

Graphs and Charts:
- Activity Breakdown
- Waste Management
- Remediation Progress

Note: This tool is intended for large-scale projects and requires detailed site-specific data for accurate results.
Conclusion

- Provided EPA Region 5 with viable cleanup options and associated resource demand
- Results used by US EPA and Ohio EPA to support litigation efforts
- Highlights the need for stakeholder engagement and the importance of applied research and solutions
- This effort sparked a previously unexplored area of R&D
Background → Problem → Collaboration → Solution → R&D
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Questions?

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