

An Innovative Mobile Hot Cell with Remote Handling Capabilities

Radioactive sources are used around the world to support life-improving and lifesaving industries. However, if found in the hands of terrorists and terrorist supporting organizations, these sources could be used to harm people and the environment. This paper will discuss the overall design, transportation configuration, deployment features, required equipment, personnel, and device interfaces of an innovative mobile hot cell with remote handling capabilities. This new hot cell design will provide facilities that have limited radioactive materials handling infrastructure the means of securing their radioactive sources by consolidating and packaging for end-of-life management in a secure and safe environment. The design and advanced features of this hot cell can be deployed in remote locations; will improve the basic assembly, operation, and disassembly of a mobile system; and provide a measurable improvement in security, through a reduction in deployment time and handling efficiencies, compared to current mobile hot cell designs. Improvements in assembly and disassembly are achieved by using prefabricated nesting biological shields that are placed around the inner hot cell only to a thickness necessary for the specific activity of the material being handled. Reconfigurable robotic arms and three-dimensional camera systems are used to improve the handling efficiencies within the hot cell compared to current mechanical manipulators and leaded glass or zinc bromide windows which cannot be reconfigured and offer limited visibility. As a result, these improvements can lower security risks associated with disused radioactive sources found in public industries by making it more likely local stakeholders invest in removing, consolidating, and packaging for end-of-life management. Two ways this might be achieved is by 1) reducing operational costs from staff time and equipment, thereby reducing the financial burden on stakeholders and increasing the likelihood material removals will occur, and 2) minimizing opportunities for bad actors to target a removal or consolidation operation by significantly decreasing the time it takes to complete the process from assembly to final transportation. In addition, with the use of remote handling and three-dimensional cameras, hot cell users can significantly lower radiation exposure by extending the interface distance between the operator and the hot cell. By reduced operation time at a single location, hot cell users can efficiently complete multiple removals and eliminate the need for frequent visits to the same location, which may decrease the risk for malicious tracking of repetitive operations. Finally, human operational error from fatigue due to repetitive tasks can also be reduced by pre-programming routine tasks.

The innovative design and advanced features of this new hot cell with remote handling and three-dimensional vision capabilities provide for an integrated but independent set of systems that can streamline logistics, allow for greater flexibility in use, such as equipment reconfiguration and mission modifications, and provide a capability to enhance the security of international source end-of-life management.

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