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Converting Army Waste to Fuel: Mobile Integrated Sustainable Energy Recovery

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This technology could change the logistics of solid waste management in the Army. Successful completion of the Mobile Integrated Sustainable Energy Recovery (MISER) project will lead to dramatic logistics changes. Where petroleum is now used to fuel generators, waste may be used in the future, substantially reducing solid waste disposal and transportation requirements.

This technology may be relevant for other services and civil agencies. Many of the specifications of the technology being developed may also suit the civilian sector. For example, MISER will be relatively lightweight, small, simple, and easy to operate. These specifications should be useful for anyone wanting to convert waste to fuel—in remote areas, in small businesses, and in municipalities.

In 2003, the Defense Advanced Research Projects Agency (DARPA) and Natick Soldier Center initiated the MISER project to explore waste-to-energy conversion technologies in the Army. This project seeks a viable method for converting Army waste to energy in the operational environment. Although available technologies convert waste materials into energy, this project hinges on designing those that meet the specific needs of the Army, such as portability, efficiency, operability, and durability. The project focuses on the Army, but it has widespread potential: waste-to-energy conversion technology may be viable in other military services, as well as in the civilian world.

The first part of our research consisted of analyzing the typical waste in an operational environment, evaluating five proposed waste-to-energy conversion technologies, and recommending the most viable. The second was developing an economic model that can be used to determine the relative payoff of converting waste to fuel in the operational environment, taking into account the various costs. The third, and most recent, is developing an acquisition strategy for MISER and working to publicize the current status of the project. Successful completion of this project will likely yield exciting developments in the field of solid waste management, and it is vital to keep the solid waste community informed of MISER developments.

The study, *An Analysis of the Energy Potential of Waste in the Field*, identified the makeup of waste in an operating theater, analyzed the logistics of waste disposal and fuel supply, estimated the value of a process for converting waste into fuel, and assessed the military usefulness of technologies being developed to make such conversion possible. We found that 87 percent of the waste—mostly wood, cardboard, plastic, and food—in an operational environment is potentially convertible into fuel. We calculated that each deployed soldier generates an average of 7.2 pounds of convertible solid waste per day.

We also analyzed several economic factors. The estimated cost of disposal in a Middle East operating environment ranges from $62 to $903 per ton, greatly varying because the range of distance waste is transported. The estimated savings from converting waste to fuel ranges from $129 to $287 per soldier per month. From our analysis, we determined that a useful waste-to-fuel process must be efficient and fast, reliable and simple, defensible against enemy action, and able to produce fuels to minimum military specifications.

Criteria for technology development: *The following specifications are required for a waste-to-fuel process to be useful to the military:*

- Mobility
- Scalability
- Adequate rate of fuel production
- Efficiency with regard to fuel produced per ton of waste
- Appropriate level of quality of fuel produced
- Reliability of equipment
- Operator technical requirements
- Low vulnerability during combat operations
- No residual waste
- Capability to convert hazardous waste.

DARPA is currently pursuing the following technologies: production of polymer structures, pyrolysis, solid oxide fuel cells and supercritical water technologies. Industry should stay up to date with program developments, and become more aware of the specific needs of the military and consider DoD a viable client for new technologies.

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