Lightweight and Compostable Packaging for the Military

Sustainable Infrastructure
SI-1479

Background:

The U.S. Army, Air Force, Navy, and Marine Corps consume approximately 46.6 million operational rations each year, which generates 14,000 tons of packaging waste. Operational requirements for combat rations maintain that rations be air-droppable with a minimum 3-year shelf life at 80°F and 6-month shelf life at 100°F. To meet these requirements, rations must be packaged appropriately. Shipping containers fabricated from fiberboard and coated paper are necessary to safely transport and store food and other military items for all warfighters, including sailors on Navy vessels. Paper and fiberboard production, however, is a costly process, uses cellulose and hazardous chemicals, depletes natural resources, and creates hazardous waste. Conventional polyethylene-coated fiberboard, utilized when water and puncture resistance is needed, is neither compostable nor recyclable.

Objective:

The objective of this project is to reduce the weight of fiberboard and paperboard products used to package the Meals, Ready-To-Eat and Unitized Group Rations by developing new lightweight fiberboard, biodegradable polymer-coated fiberboard, and paperboard that can be converted to compost, a valuable byproduct. These environmentally friendly materials are expected to meet the operational performance requirements of combat rations.

Process/Technology Description:

Several technologies will be used in efforts to decrease the volume and weight of fiberboard used in military packaging. First, a novel biodegradable fiberboard will be developed using a bioadhesive and a filler (e.g., wood fibers, feathers, straw, cotton, kenaf fibers, and cheesecloth) to reduce either density or thickness of the board while maintaining necessary mechanical properties. Bioadhesives, which are excellent binders for biodegradable fiberboard, have already been applied to boxes as a sealant and meet American Society for Testing and Materials (ASTM) standards for packaging in dry, wet, and rain simulation tests. Conventional molding methods will be used to prepare composite panels for evaluation. Mechanical modulus, compressive strength, water resistance, thickness swelling, morphology, and thermal expansion will be evaluated. Second, a variety of biodegradable coatings applied to thinner fiberboard will be prepared and evaluated to further improve water and puncture resistance. The desirable biodegradable coating must provide the strength, toughness, and puncture resistance properties needed to offset the fiberboard thickness reduction. Coating formulations will be optimized, and coating trials, which involve varying the thickness of the layer on the fiberboard, will be performed. Composting trials will be ongoing throughout this project to determine how quickly the new coated paper and fiberboard formulations biodegrade and if these packaging materials, used in combination with other waste (food waste, grass clippings, leaves, bark, etc.), can generate a compost product that ultimately could be sold or given to local communities as a soil conditioner.

Waste generated feeding 300 troops with a single meal of Unitized Group Rations.

Expected Benefits:

The development of environmentally friendly packaging and the evolution of improved packaging concepts will significantly reduce the amount of solid waste generated by the military. Specifically, this project will (1) reduce fiberboard waste from combat rations; (2) transform residual packaging waste into compost, a valuable soil conditioner; and (3) contribute to simplified deployment procedures, reduced weight of supplies, and minimized environmental footprints. (Anticipated Project Completion - 2009)

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