Evaluation of Powder Coating Technology for Small-Arms Bullet Tip Identification

Statement of Need
Small-caliber ammunition is produced at the Lake City Army Ammunition Plant (LCAAP) located in Independence, Missouri. The ammunition is color coded for identification purposes by spray coating or dipping bullet tips in high volatile organic compound (VOC) paint. There are several inherent problems currently associated with this coating process. For example, methyl chloroform, or acetone, is used to clean the surface of the bullet prior to painting; furthermore, spray application of the coating is only 5–10 percent efficient, and dip application is subject to problems due to ambient conditions. Both painting processes involve the use of hazardous materials and the release of VOCs and ozone depleting chemicals (ODCs) to the environment. Additionally, waste streams must be treated as toxic waste.

Identified Alternatives
Powder coating has been effectively employed in commercial industry and is a mature technology. Initial development of this technology for use in high-speed manufacturing has proven to be successful in eliminating toxic wastes and VOC emissions, reducing operating costs, and providing a durable coating.

Demonstration and Justification
The National Defense Center for Environmental Excellence (NDCEE) is working with LCAAP and Tank-Automotive and Armaments Command-Army Armament Research, Development, and Engineering Center (TACOM-ARDEC) to demonstrate the feasibility of powder coating small-caliber ammunition and to design and install a system. A Preliminary Hazard Analysis has been performed by the NDCEE, LCAAP, and TACOM-ARDEC indicating that the process does not pose any unreasonable risks and would fit within current process requirements. Current efforts are focused on optimizing the powder type, application methods, and powder-cure specifications.

Powder coating has the potential to eliminate VOC and ODC emissions and worker exposure to hazardous materials. In addition, powder coating will eliminate the hazardous waste stream from the painting operation. The elimination of this hazardous waste stream will reduce operating costs. By eliminating air emissions, the requirement for an expensive VOC control system can be avoided.

Implementation
The Preliminary Hazard Analysis has shown that the process is safe to use within the existing manufacturing facilities and that it does not pose any unreasonable risks. Current efforts are focused on determining the feasibility of applying powder to and curing the powder on small-caliber bullet tips at a high production rate. Should testing and prototype equipment perform as required, design specifications will be produced that will allow LCAAP to proceed with installation of a powder coat system.

Follow-Up
The NDCEE continues to work with the Department of Defense to validate powder coating as an alternative application to replace the process of painting ammunition tips. The technology that is being developed under this effort may be considered for use in the support of other high-volume coating applications.

NDCEE