Background:
Federal and local regulations resulting from the Clean Air Act restrict the amount of Volatile Organic Compound (VOC) emissions allowed during the application of protective coatings. Chemical Agent Resistant Coatings (CARC), which are used for painting military vehicles, have a VOC content of 3.5 pounds per gallon. Current annual usage nationwide is estimated to be 3.0 million gallons per year. As additional states enact more stringent VOC regulations, fewer facilities will be able to use existing CARC formulations.

Objective:
This project (PP-1056) is developing a low-VOC CARC system suitable for use on military equipment by all Services in all aspects of application, stripping and disposal. The primary focus is to reduce the VOC content of the polyurethane topcoat from 3.5 to 1.8 pounds per gallon.

Summary of Process/Technology:
The technical approach for the reformulation work has been to focus on high performance, water reducible (WR) polyurethane binder systems that have the potential for chemical agent resistance and meet the performance requirements of the Army, Air Force, and Marines. Candidate polymers were obtained from raw material suppliers, screened for live agent resistance, and formulated into camouflage topcoats. The approach to the stripping work is to focus on evaluation of currently used methods of removal to optimize the processes for de-painting and disposal of the CARC developed under this project. Selected technologies are being tested to determine the applicability to strip the new CARC as applied to a variety of substrates (aluminum, steel, fiberglass).

Benefit:
A water-reducible CARC with a VOC content of 1.8 pounds per gallon will eliminate at least four million pounds of VOC emissions per year. Water-reducible CARC coatings also will have a longer life cycle due to their enhanced durability and weathering properties. By complying with VOC regulatory levels, there will be no need to install expensive pollution abatement equipment, and violations and consequent fines at maintenance depots, air logistics centers, and equipment manufacturers will be avoided. Total equipment cost avoidance of $60 million and annual operating costs of $3 million are predicted at 12 facilities.

Accomplishments:
Candidate polymers were obtained from raw material suppliers, screened for live agent resistance, formulated into camouflage topcoats, and tested in conventional spray delivery systems. For operational use, applicability to a variety of substrates was determined, and emphasis was placed on non-chemical means of paint stripping to minimize environmental impacts and disposal costs. As a result, the Army Research Laboratory successfully has developed and patented a water-reducible CARC which has passed all agent tests for the colors green, brown, black, and desert tan. This project was completed in FY99.

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