

## Automated Roadway Debris Vacuum

*Outcome*— Develop a machine to efficiently collect litter and debris using a vacuum.

*Benefit* — Develop a commercially available machine that meets Caltrans needs for collecting litter and debris in hazardous locations such as the medians of freeways. Increase the efficiency and safety of maintenance operations.

AHMCT researchers developed a prototype machine, a dexterous manipulator, attached on a commercially available vacuum truck. AHMCT is supporting the testing and evaluation of the Vacall ARDVAC machine in Caltrans operations.

### Why We Are Pursuing This Research

The collection of litter and debris along roadsides is a continual challenge. Most roadway litter ends up along the roadside and is eventually spread by the wind. Litter collection is performed using manual labor and many areas are difficult to access without lane closures. Personnel are on foot and exposed to the hazards of traffic. Caltrans has been seeking safer and more efficient methods for the collection of litter and debris.



Figure 1 – A box of toilet paper spilled along busy Hwy 80. Soon to be scattered by the wind.

On the behalf of Caltrans, AHMCT has researched and developed a solution that is based on existing commercial vacuum trucks.

### What We Are Doing

AHMCT developed and integrated prototype hardware with existing technology to produce a tele-robotic litter removal system known as the ARDVAC. It is designed to operate in median divider areas, roadway shoulders, around guardrails, and on some embankments adjacent to roadways. It is capable of removing light debris such as paper, cups, aluminum cans, fast food packaging and select denser trash such as glass bottles, sections of rubber tires, surface soil and loose vegetation. The machine is controlled from within the safety of the vehicle’s cab, requires no on-site set-up, operates with controls of minimum complexity, and is a significant solution to the problem of roadway litter collection. Two of these machines are being fabricated for Caltrans by Vacall Industries in Ohio.



Figure 2 – The first commercially available ARDVAC being fabricated for Caltrans in Ohio in May 2007.

After development of the nozzle in 2001, AHMCT researchers continued concept development of several tools that will potentially be used for trimming of vegetation and removal of tumbleweeds.

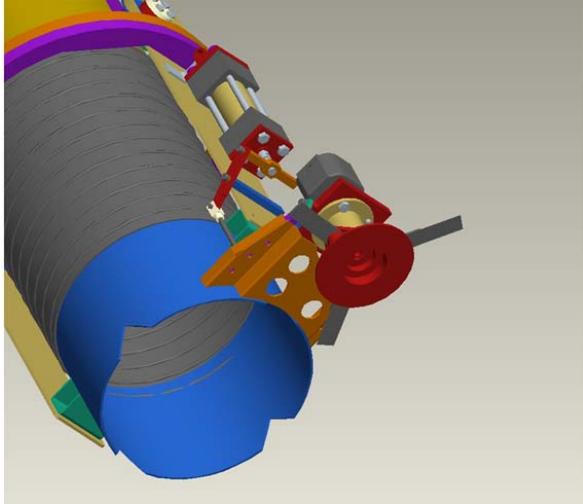


Figure 3 – Conceptual vegetation cutting tool on ARDVAC nozzle tip

Caltrans continues to have the opportunity to greatly influence the final configuration of the commercial machine.



Figure 4 – Original AHMCT prototype testing on UC Davis campus in year 2000.

It is anticipated that these machines will reduce operational costs. Based on increased speed of the operation, reduced labor and fewer injuries, each ARDVAC unit’s cost savings can be up to \$147,000 per year representing a 2.6 year payback on equipment cost. A 10 unit fleet of ARDVACs would potentially reduced annual Caltrans litter costs by \$1.5 million while improving Level of Service. These machines are expected to significantly benefit litter and debris removal efforts which are an annual cost of about \$50 million a year to Caltrans.

**Current Status**

AHMCT is committed to the technology transfer process and support of Caltrans efforts to integrate the ARDVAC machines into their fleet. The two first production machines are being completed by Vacall Industries for delivery in the summer of 2007. Upon delivery, AHMCT will assist in the testing and evaluation process with the Division of Research and Innovation.

**For Additional Information**

- Arvern Lofton (916) 324-2295, arvern\_lofton@dot.ca.gov, Caltrans Project Manager
- Steve Velinsky (530) 752-4166, savelinsky@ucdavis.edu, Principal investigator
- Wil White (530) 752-1455, wawhite@ucdavis.edu, Primary contact

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