

Automated Roadway Pavement Marker Placement System

Highways for LIFE Technology Partnerships 2009 Award \$405,560



U.S. Department of Transportation
Federal Highway Administration

HIGHWAYS FOR LIFE
Accelerating Innovation for the American Driving Experience.

Contact Information

FHWA, Highways for Life
Technology Partnerships Program
Julie Zirlin, 202-366-9105
www.fhwa.dot.gov/hfl

Stay Alert Safety Services
Jim Babcock, 336-993-2828
www.stayaletsafety.com

Need for Innovation

Manual installation of raised roadway pavement markers is time-consuming and one of the most dangerous activities in the industry. Traffic delays and vehicle crashes at work zones have resulted in significant economic consequences. Automating the process can reduce congestion by requiring less stoppage on roadways and achieve cost savings from reduced labor and accelerated installation time.

Project Overview

Stay Alert Safety Services refined the four sub-systems of the automated roadway pavement marker placement system which automates the installation of raised pavement markers on roadways. Field tests demonstrated that the system reduced labor hours, installation time and risk of worker injury. Field tests also showed that the number of markers placed equals or is better than the manual placement method. The final report and a video is available at www.fhwa.dot.gov/hfl/partnerships/marker.cfm

Project Team

Stay Alert Safety Services
Detail Technologies
North Carolina DOT



1

Versatile

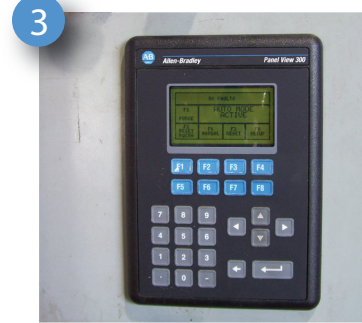
This unit will fit on most flat bed stake trucks and has the ability to be adjusted to different heights of the bed.



2

Travel Position

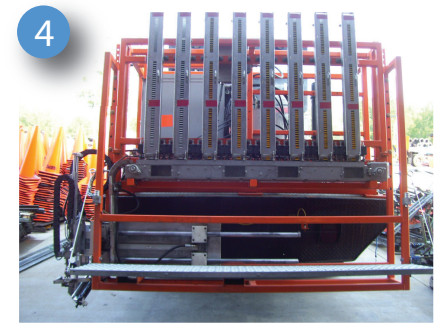
To assure safe travel, the unit has a hinge system that allows for it to be winched upward to a safe ground clearance position for mobilization purposes.



3

The Brains

The Allen Bradley control is the brain for all the sensors, valves and motions for the machine. It is very user friendly and allows for a visual aid in testing and trouble shooting.



4

Magazine Racks

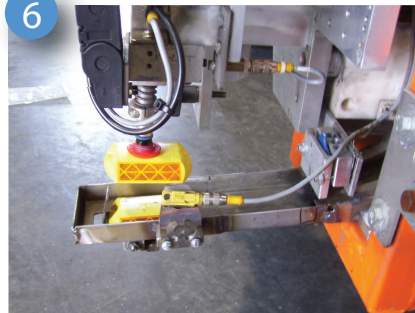
There are eight magazines with the ability to hold over 500 RPM'S. It allows for two different type/color markers that can be switched by the operator. Each has a different sensor to indicate if markers are present. Once empty the sensor tells the system to move to the next one.



5

Hydraulic System

Each magazine has a hydraulic cylinder that actuates back and forth to allow for one marker at a time to drop from the magazine. It is controlled by a series of electronic valves that interface with the Allen Bradley control.



6

Marker Chute and Nest

After the marker has landed in the "Nest" a suction cup driven by a sensor is ready to be moved to the installation position.



7

Pendant

This pendant is a wireless control panel that is operated by the driver from inside of the applicator or a secondary vehicle and is powered by the cigarette lighter. It comes with an automatic and manual mode.



8

Installation

As the applicator vehicle nears the point of installation the operator engages the system and as the suction cup lifts the marker into place the bituminous is placed onto the surface seconds before the RPM is placed. Once installed it returns back to the nest.

Turn over to see more details.

Automated Roadway Pavement Marker Placement System



1 Versatile

This unit will fit on most flat bed stake trucks and has the ability to be adjusted to different heights of the bed.



2 Travel Position

Travel Position

To assure safe travel, the unit has a hinge system that allows for it to be winched upward to a safe ground clearance position.



3 The Brains

The Brains

The Allen Bradley control is the brain for all the sensors, valves and motions of the machine. It is very user friendly and allows for a visual aid in testing and trouble shooting. This control is the other side of the wireless pendant and allows them to talk to each other.



4 Magazine Racks

Magazine Racks

There are eight magazines with the ability to hold over 500 markers at a time. In the system they are divided into 2 & 6 rows to allow for two separate color markers if needed and can be switched as needed by the operator/driver. Each magazine has its own sensor to recognize if there are markers present. Once one magazine empties the sensor tells the control to move to the next full magazine and so forth. These magazines can easily be re-loaded by one person in a matter of minutes.



5 Hydraulic System

Hydraulic System

Each magazine has a hydraulic cylinder that actuates back and forth to allow for one marker at a time to drop from the magazine. This hydraulic system is controlled by a series of electronic valves that are interfaced with the Allen Bradley control. These hydraulic lines have quick disconnects so the magazine sub-assembly can be removed easily for storage.



6 Marker Chute and Nest

Marker Chute and Nest

The marker comes down a chute and lands in a specially designed nest that prepares the marker to be picked up with the suction cup and then ready for the operator to move it into position for placement. There is a sensor that identifies that the marker has made it to the nesting position and allows the operation to continue. If the marker does not land in the nest properly the machine will not advance and the control panel will identify the problem.



7 Pendant

Pendant

This is a wireless control panel that the driver operates from inside the vehicle. The power is supplied to it with a plug that goes into the cigarette lighter. It has an automatic and manual mode. The operator/driver can control all movement and placement of the glue and marker. There is additional ability to abort the cycle, keep the glue line purged as needed and an emergency stop. There is an additional power port at the control panel. With the wireless ability, the pendant can be operated from inside the main vehicle, next to the machine for testing and troubleshooting or from a secondary vehicle following the main vehicle.



8 Installation

Installation

As the vehicle and machine travel down the road the driver stops near the position that the marker is needed. The operator manipulates the suction cup held marker and attached glue tip into position and pushes one button that then automatically places the correct amount of glue and the marker in place. It then will automatically travel back to a home position and retrieve the next marker.