

General Motion Control Application Using PC-Based CNC

An automotive parts manufacturer, Meridian Automotive Systems, in Lenoir, North Carolina, found that the AB8200 control on its Robotics Inc glue-dispensing (EMA) machine was becoming difficult to maintain. The high production machine does a limited number of different parts, the load floor plastic panels for a Ford Taurus station wagon; each part required the application of glue along a specific contour. The plastic parts come off a 2500-ton Williams White compression molding press. After the glue application, the two individual parts are electromagnetically bonded (EMA) on another machine. A control integrator in the area, Larry Daube, of Daube Engineering in Hickory, North Carolina, replaced that old CNC with a new **MACHINEMATE** CNC.

The **MACHINEMATE** CNC was used for the control retrofit because the job was much simpler to do and less expensive than using a PLC with motion control. The motion control software is already done in the CNC and the complete PC-based CNC package is less expensive than that for a PLC with motion control and its IO, a color display, a floppy disk drive, etc.

Most of the time, the operator does not even know the machine has a CNC on it. He simply selects the run of part 1 or 2 (i.e., to the left or right, from the front of the machine) or both and pushes cycle start. The machine automatically applies the glue to the part(s) that are in the fixture(s).

The gluing machine has two linear axes for moving the plastic panels under the glue head. The application of the glue is controlled by outputs from the control. The machine, with its two linear axes and glue head, is shown at the right.



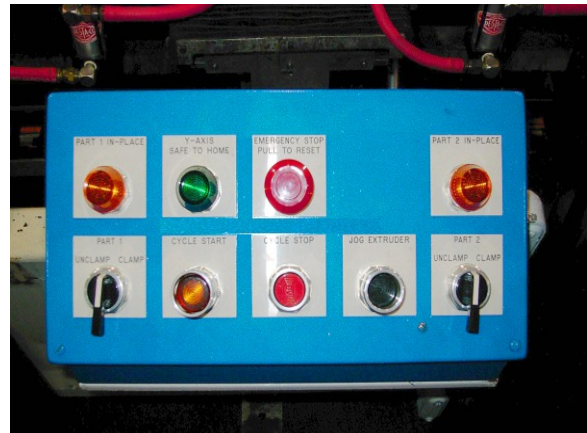
This customer decided to use the **MACHINEMATE** CNC control for this retrofit because of the capabilities that the PC-based CNC brought to the application, in addition to the lower cost. For example, they had trouble with the old control's bubble memory; the PC hard disk is a very reliable technology for file storage. The programmed path for the glue dispensing operation is easily defined with a standard RS274 part program containing G and M codes. If new parts or changes in the design of the current parts are ever needed at this machine, the **MACHINEMATE** CNC offers the advantage of simply entering a new part program rather than causing extensive motion program changes for the PLC motion controller.

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The gluing machine had solid construction with no mechanical problems to resolve. During the course of the retrofit, the machine was completely rewired and the new AC servo motors (supplied by **MACHINEMATE**, INC) were installed. The only mechanical work done to the machine was the fabrication of the servo motor adapters.

To expedite the control exchange, Larry did the CNC configuration, the new control cabinet wiring and checkout in his office. The retrofit was scheduled during a Christmas shutdown.

Larry Daube designed a simple operator panel for the machine. The operator had several basic operations to perform. Depending on whether a part was loaded on the left or right fixture, the appropriate 'part in place' switch indicated whether the gluing cycle would be run on that part. The activation of the cycle start push button, in conjunction with the two part switches, would result in either both parts being run or just the one part. This operator panel is shown to the right.



Larry Daube mounted the **MACHINEMATE** MM1 control on the door of the machine's control cabinet. A small number of push buttons were required for the machine on the cabinet.

The CNC control uses a keyboard only when performing maintenance activities; it is not needed during normal machine operations. Larry provided one near the control. The control cabinet is shown to the left, with the CNC mounted on the door (the floppy disk drive is visible on the lower right of the CNC operator panel).

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Larry installed the control IO and the two new SERCOS digital servo drives (supplied by **MACHINEMATE**, INC) in the new control cabinet; its inside is shown below. The CE industrial PC for the **MACHINEMATE** CNC is mounted on the back of the display unit; its stainless steel enclosure is visible on the back of the cabinet door. The two drives were mounted on the lower left of the back panel. The CNC IO module is visible at the lower right, on a DIN rail. The 24VDC power supply is visible at the top of the back panel. Terminal strips (along the left side of the back panel) made the electrical interconnect easier and quicker.



During the retrofit, Larry and associate Sam Williams stripped out the old control cabinet, wiring, conduit, cable carriers, air hose, switches and motors. They mounted the new control cabinet, ran new conduit and wire, installed new cable carriers, axis over-travel and home proximity switches, new motors, etc. The job took about seven days to do the control installation and then about two days to complete the debug and checkout.

The customer is pleased with the retrofit. The homing sequence is more automated than before and the operator panel is easy to use. Although the new **MACHINEMATE** control is capable of running at higher production rates than the original control, the process is limited by the glue dispenser and the existing mechanics.

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Larry Daube has been involved in industrial automation for 25 years. He has been doing machine retrofits, primarily PLC's, since 1998. This was his first CNC retrofit. A picture of Larry with the control is to the right.



The individuals and companies mentioned in this article.

Larry Daube
Daube Engineering
5690 Gold Creek Bay
Hickory, NC 28601
Phone: (828) 324-5646
Fax: (828) 324-5646
Email: daubengr@charter.net

MACHINEMATE, INC
100 W. Larsen Drive
Fond du Lac, WI 54937
Phone: (920) 907-0001
Fax: (920) 907-0181
Email: info@machinemate.com
Web: <http://www.machinemate.com>

Meridian Automotive Systems
Lenoir Operations
601 Hibriten Drive SW
Lenoir, NC 28654
Phone: (828) 754-8441

Meridian Automotive Systems–Lenoir Operations manufactures structural plastic components and assemblies for the automotive industry. Their capabilities include SMC and Azdel compression molding and thermoplastic injection molding.