

Drive & Motion **Solutions**

*More Drive & Motion **Solutions** by Industry/Application*

Industry: Chemical/Plastics/Automotive

Application: Packaging/Filling

Motion Control of Vector Motors Drives Filling Stations

U.S. Chemical and Plastics is known throughout the automotive and marine industries for its body repair and refinishing products. USC resins, putties, sealers, fillers, cleansers and other compounds are used primarily by professionals, but a wide array of the company's products are used by do-it-yourself auto and boat enthusiasts as well. In every case, the products come in containers that must be filled, quart and gallon cans, drums, and 24 oz. tubes.

At its headquarters and main plant in Massillon, Ohio, USC had been filling its containers using an auger pump and AC motor, which started and stopped by timed I/O switching from a PLC. The containers were overfilled and manually weighed for accuracy, as USC's policy is to never provide customers with less product than stated on the label.

Two operators were required at each filling station for this process, in part to manually top off containers and clean spilled product, since filling accuracy was often off by five percent. In an attempt at better control, a motor-mounted brake was added to one of its more difficult stations, but USC was still unsatisfied with its metered pump control. USC decided to consult its automation and electronic controls distributor and system integrator, which recommended a "Motion Made Easy" solution—true vector motor positioning control.

Several variables had to be taken into account to solve USC's problem, in this case, on an auto body filler filling station, which consisted of a conveyor and auger pump. Various body filler formulations were dispensed from this station, each with its own density and viscosity, so product profiles were created for each product. Some of the products are sold by volume while others are sold based on weight. Another variable to account for was the fact climate changes affect the density and viscosity of these products with warmer temperatures making product flow easier and colder temperatures making the product flow sluggishly.

To obtain accurate filling, the HMI was set up to allow the operator to select the product and container size, and then enter the product's current density as measured by USC's lab. The "Motion Made Easy" servo controls could then make the proper index move of the pump's screw to accurately fill the containers. A jog control was also provided for manual filling.



Accurate filling and cost savings are achieved using the Unidrive SP and the SM-EZMotion module for true vector motor motion control at U.S. Chemical.

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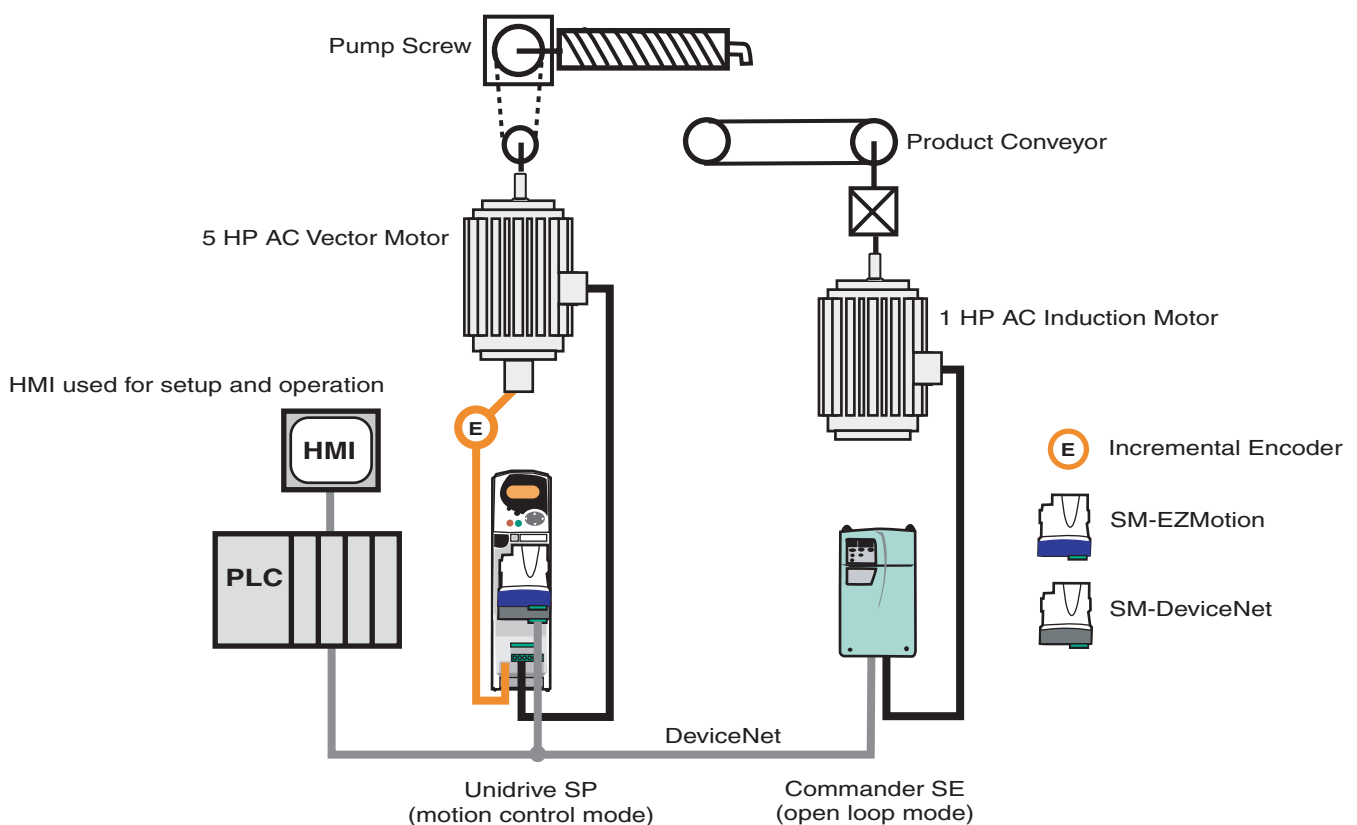
The Unidrive SP from Control Techniques was selected to control the auger pump to provide a precise and consistent volume of material per filling. Ease of use and significant savings were at the core of the solution. Using an SM-EZMotion module with the drive allows for quick and easy programming of the application with free PowerTools Pro Windows™ software. More importantly, the SM-EZMotion module enables precise positioning control of vector motors as opposed to more expensive brushless servo motors, which it also can control. A 5 HP vector motor equipped with an incremental encoder was used on the auger pump. The Unidrive SP also was equipped with an SM-DeviceNet module for fieldbus communication. Both “zero-space” modules reside in the drive.

The Commander SE, a general purpose AC drive from Control Techniques, was used to drive the conveyor’s 1HP induction motor with its speed reference provided via the DeviceNet fieldbus. (See Single Line below.)

The controls have resulted in a filling accuracy of better than $\pm 1\%$ compared to the previously obtained $\pm 5\%$. The process now only requires one operator.

According to Dennis J. Brown, P.E., Director of Engineering and Operations at U.S. Chemical, this vector control solution from Control Techniques is now being used on a geared pump with index table (see photo), and may be employed on other filling stations and applications in their other plants in the United States. ■

“Body Ice” Filling Station with Pump Screw and Conveyor



One Drive Gives you a “Motion Made Easy” Solution for either Servomotors or Closed Loop Vector motors

The success of “Motion Made Easy” servo systems and software from Emerson Control Techniques is based on the ease, speed and choices in writing control instructions for axis-and-a-half applications. Packaging machine builders in particular appreciate the simplicity of a system that can be up and running quickly, and the free, easy-to-use, Windows™-based software that allows their customers take full control of the application.



The SM-EZMotion module brings “Motion Made Easy” to the Unidrive SP “Solutions Platform.” Because the Unidrive SP is a universal AC/Servo drive, mounting an SM-EZMotion module inside the drive allows the “Motion Made Easy” PowerTools Pro software to control both servomotors and vector motors, in closed-loop mode.

This “Motion Made Easy” solution enables machine builders to use one drive system and software program to build machines using servomotors, closed-loop vector motors, or both. Vector motors are particularly cost effective on axes with high inertia loads and higher horsepower requirements, costing much less than brushless servomotors. Using a closed-loop vector motor in an application can also remove an expensive gearbox and reduce susceptibility to load disturbances.

Although above 5HP, closed-loop vector motors become increasingly more affordable than brushless servomotors, there are other factors to consider. Closed-loop vector motors are much greater in size than brushless servomotors. Closed-loop vector motors also have reduced performance capacity, with cycle rates of about 30 per minute, as opposed to a high-performance servomotor.

The Unidrive SP and the SM-EZMotion module provide machine builders with yet more flexibility in designing machines to meet the needs of their customers. The Unidrive SP and the SM-EZMotion can accept input from nearly any feedback device, including resolver feedback, incremental encoders, quadrature encoders, sign-cosign encoders, and absolute positioning (Hiperface, EnDat, SSI) encoders. Motor selection is similarly simple, with a wide range of motors pre-configured in

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the software, with a facility for easily incorporating custom motors in a solution. Fieldbus options include DeviceNet, Profibus, CANopen and others.

Programming with PowerTools Pro is an easy, and at most, a five-step process: Hardware, Setup, I/O Setup, Motion, and Programs. PowerTools Pro gives machine builders all the tools needed for complete motion control: programmable limit switches, indexing, homing, jogging, queuing, user-defined variables, high-speed position capture, electronic gearing, multiple profile summation, S-curve acceleration and deceleration ramps, program multitasking and synchronized motion. The intuitive display and familiar Windows™ conventions, like drag and drop, point and click, and fill-in-the-blank dialog boxes make creating applications a quick and simple task.

Programs developed with PowerTools Pro for Control Techniques MDS and EN servo drives equipped with FM-3 and FM-4 modules are inter-changeable with programs developed for the Unidrive SP with an SM-EZMotion module.

The highly flexible, feature-laden Unidrive SP from Control Techniques utilizes Solution Modules to tailor a drive to specific application requirements. The drive operates in either servo, V/Hz, open-loop vector, closed-loop vector, or can be paired to provide a regen solution. Up to three SM's can be fitted beneath the Unidrive SP's cover for expanded I/O, fieldbus communications options, and/or application co-processing, such as provided by the SM-EZMotion. Five sizes of the Unidrive SP are currently available in voltages of 230/460/575/690VAC to provide up to 125HP. ■

Emerson Control Techniques, part of Emerson Industrial Automation, is a world leader in the design, manufacture and support of AC, DC, variable speed and Servo drive systems. Control Techniques combines extensive industry experience, modular drive design, powerful technology and advanced toolkits to provide complete industrial automation solutions. The company has a long history of market leadership, having introduced Unidrive AC, the first bipolar transistor, and Mentor II DC, the first fully digital DC drive. Emerson Control Techniques is headquartered in Eden Prairie, MN. Emerson Industrial Automation is a business group of Emerson. For more information, visit www.emersonct.com.
