PWM (Pulse Width Modulation) Application
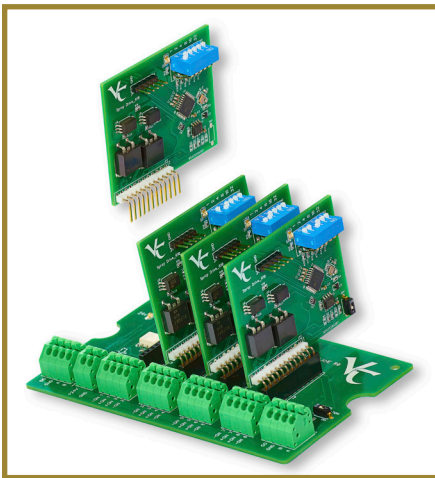
Axis Automation and the Horner Micro X7
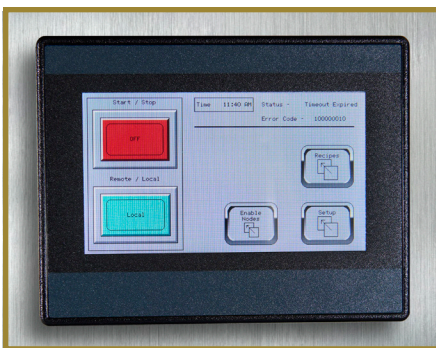
HORNER
AUTOMATION GROUP

axis automation®

Axis spray system

Individual nodes in Axis embedded hardware

Control panel shown with the Micro X5, which the project was started with

HISTORY

AXIS Automation has been in business for 40 years. They are in their 5th location, outgrowing the other 4 locations. They are currently located in Hartland, WI, just outside of Milwaukee. AXIS started as a Job Shop serving local businesses like Rayovac, Trek Bicycle, and Oscar Mayer. Seeing a real need for custom machines, they started building automation equipment and that quickly became a major part of their business. Around 20 years ago they started migrating into the automation for food processing and today, they focus exclusively on the food industry.

AXIS has used Horner products from the beginning and have always worked with Powermation to obtain and service those products. Horner provides a very compact package that is full-featured. There are many small pieces of automation equipment where the control cabinet ends up larger than the machine. Having a small footprint with an integral HMI helps keep the cabinet size in check.

CHALLENGE / OPPORTUNITY

Mike Frazier, Vice President at AXIS Automation, and his team have been working on a proprietary control system for PWM (Pulse Width Modulation) capable spray equipment that will be incorporated into their systems. While it made sense for several reasons, to do the embedded design and building of the individual nodes in the system, it did not make sense to do the HMI and automation logic when many platforms already exist. They chose the Horner OCS line of controllers because of all the peripherals and features built into their controllers.

AXIS' embedded hardware consists of individual cards (nodes) on a module backplane, making their system scalable and giving it a small footprint. Each node has a processor and a high-current switching device to eliminate the need for an external solid-state relay. Each gun is capable of operating at an independent frequency and duty cycle. Process parameters are uploaded to each node via Modbus RS485. Each node also has a digital input that is daisy-chained to all nodes through the backplane, and used for cycle start/stop. This makes the cycle initiation in real-time and not dependent on the RS485 network. Using just one output on the OCS will start and stop all spray guns that have been programmed with a recipe uploaded over Modbus. Using a digital output for cycle start/stop greatly reduces demands on the network and the associated program tasks. Mr. Frazier updates nodes only once every 500mS with recipe changes and never suffers a lag with cycle initiation.

PWM Spray Equipment

Horner X7 controller

Try WebMI and the Horner app for remote access

SOLUTION

Most, if not all, of the Horner OCS products would work for AXIS' needs. Smaller is better for cabinet size, but bigger is better for their customers' experience. Currently, they are utilizing the Micro X7 OCS for the front end of their spray equipment as well as controlling the rest of the components in their spray system. The X7 is a self-contained package with the PLC and HMI all in one. One of the features found on the OCS that comes in handy is the memory card slot that is fully functional and accessible in the program. Recipes are created and stored on the SD card. They are simple text files and can be easily backed up to a PC and edited offline with Microsoft Excel™ software. Their system currently addresses up to 32 guns, each gun having 5 setpoints/parameters. That means each recipe has 160 parameters. AXIS is providing up to 100 user-configurable recipes and barely uses any space on the SD card, while at the same time preserving PLC registers for other tasks.

Given that AXIS has built only a portion of the system hardware and implemented the Modbus protocol on bare metal (each node has an ARM processor), documentation is important. Mr. Frazier was able to find all of the necessary documentation on Horner's website to help with the development of their firmware. He found Horner's Modbus implementation to be complete and made it easy to get their hardware up and running. There are quite a few tools built into the OCS to help troubleshoot any issues and also to provide network status to the HMI in the final user application. On the few occasions that Mr. Frazier got stuck, Horner's Tech Support was there and always helpful.

Another benefit of the Horner PLC/HMI all-in-one, is the tight integration between them, giving you access to more information than most PLCs with a tethered HMI. One of the features that always stands out to Mr. Frazier is the ability to know in logic what screen is active. He often uses this feature to know when a setup screen is active. In logic, he will enable some "floating point" math or other logic necessary to calculate setpoints, etc., then disable that code upon exiting that screen. Eliminating processor-intensive code when not necessary is more than good practice, it's necessary to keep process loops tight.

TESTIMONIAL

"Horner offers an All-in-one, feature packed controller at an affordable price and provides solutions, not just hardware. By solutions, I mean support and accessibility to technical support. Free software is a big plus, it's not just our cost, it's the ability for a customer on the other side of the planet to get software and connect when needed."

~ Mike Frazier, AXIS Automation