

controldesign.com

control design

FOR MANUFACTURERS


TUNING IN
TO PID

ROBOTS
AND VISION

AUTOMATION
PROS

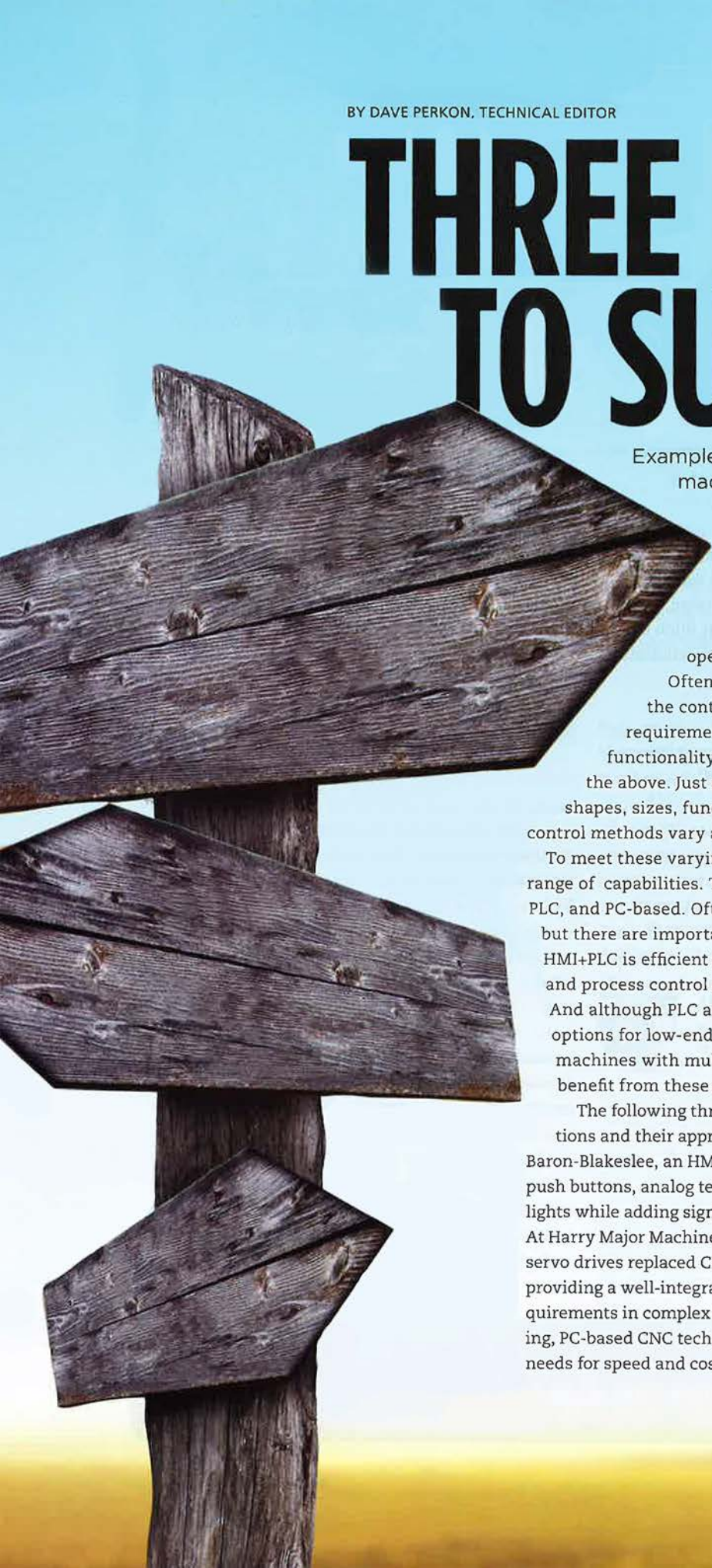
THREE PATHS TO SUCCESS

Examples of HMI+PLC, PLC
and PC-based machine
control to give you direction

 PutmanMedia®

Think Allied for
Automation & Control





BY DAVE PERKON, TECHNICAL EDITOR

THREE PATHS TO SUCCESS

Examples of HMI+PLC, PLC and PC-based machine control to give you direction

The controllers selected for industrial machines are critical to their successful operation, and there are many choices. Often, machine builders and OEMs chose the controllers to meet high-end performance requirements while others base their choice on functionality, cost, standardization needs or all the above. Just as industrial machines come in many shapes, sizes, functions and levels of complexity, their control methods vary as well.

To meet these varying needs, controller vendors offer a full range of capabilities. Three popular options are HMI+PLC, PLC, and PC-based. Often there is much overlap in capabilities, but there are important differences. While the integrated HMI+PLC is efficient and cost-effective for small machine and process control applications, it can't control everything. And although PLC and PC-based vendors have controller options for low-end automation needs, mid- to high-end machines with multi-axis motion-control requirements benefit from these more capable controllers.

The following three case studies highlight controller options and their appropriate use in real-world applications. At Baron-Blakeslee, an HMI+PLC combo replaced digital displays, push buttons, analog temperature controllers, relays and pilot lights while adding significant functionality to an OEM degreaser. At Harry Major Machine, an advanced PLC and related HMI and servo drives replaced CNC-based control of multi-axis gantries providing a well-integrated platform to meet performance requirements in complex motion applications. At Romeo Engineering, PC-based CNC technology was selected to match customers' needs for speed and cost in off-the-shelf cutting applications.

SMARTER, SMALLER VAPOR DEGREASING

By Mike Bacidore, editor in chief

AK-225 IS THE commercial name for a hydrochloro-fluorocarbon that was banned from production and import in the United States as of January 1, 2015. It was the key solvent used in vapor degreasing equipment. When Honeywell first commercialized Solstice PF in March 2014, it created an opportunity for Baron-Blakeslee (www.baronblakeslee.net) to design new machinery that could take advantage of this market development. And thus was born the Equinox 1 (www.youtube.com/watch?v=fDyrmQGw2nw).

On May 1, 2014, the South Coast Air Quality Management District (SCAQMD) in southern California granted an exemption to Solstice PF because, once AK-225 was phased out, there were no other choices for vapor degreasing. "There are a lot of parts out there that you cannot clean any other way," explains Patrick Oliver, international sales manager at Baron-Blakeslee in Williamstown, West Virginia. "Water is a pretty small molecule, but the hydrogen and oxygen atoms on adjacent water molecules interact with one another, so a group of water molecules act like one bigger molecule. Sometimes there are tight spaces that water cannot get into to clean, nor out of to dry. The Solstice PF does a good job of getting into tight capillary spaces." A lot of solvents are regulated, but Solstice PF is not considered to be a volatile organic compound (VOC).

"It all stems from the Solstice PF solvent, although the Equinox works with many other solvents, too, not just Solstice," explains Oliver. "The California market was driving this. When the AK-225 vapor degreasing solvent got phased out, they had to start using new solvents. You can't put the new solvent in an old machine because it will evaporate too quickly. We were one of the first companies to start designing equipment for Solstice PF. We had to redesign our machine, which turned into the Equinox. To put one of these machines on a benchtop, you have to squeeze a lot of components into a pretty small box."

The old system included digital displays, push buttons, analog temperature controllers, relays

and pilot lights. Attempting to retrofit existing degreasers to operate with Solstice PF is generally a bandage solution, and, if the solvent is constantly evaporating, that is costly. "This stuff boils at 66 °F, and it comes in a refrigerant cylinder," says Oliver. "If it's exposed to air, it's gone. Evaporation gets to be very expensive. We needed automation, but we just ran out of room to put all of the components in the little box. On the old machines, all of the electronics were in the front. The space behind there is very limited and restricted. There was no way to use the previously designed hoist."

Baron-Blakeslee found the solution to this problem in a controller from Maple Systems, an HMI+PLC combo with a 4.3-in, 480x272-pixel TFT color touchscreen display and three ports for plug-in I/O modules. The HMC7043A-M merges the functionality of an HMI and a PLC to yield an analog resistive touchscreen with 32-bit RISC CPU, 128 MB total memory and MAPware configuration software. It includes Ethernet, serial, USB host and USB client ports, as well as high-speed counters and ladder editor with instruction set, and it enables data logging and four-channel, real-time trending.

While the Maple Systems HMI+PLC combo was the primary technology that made the Equinox work, Baron-Blakeslee's Lab Kleen equipment was the original inspiration for the Equinox. "We had an external rodless air cylinder, which we controlled with a smart relay," explains Oliver. "You had to add an extra structure on the side and another separate electrical enclosure for the hoist. There was an e-stop and magnetic proximity switches. One of the real features of the Equinox is thermal management. You have to control the thermal input. We redesigned the cabinet, and we put all of the heat on one side and all of the cold on the other side. It's got a little compressor and a condenser and a pump. The cabinet got wider. If we were to use the Lab Kleen hoist, that would make it even bigger."

Mach 1

The first Equinox had push-button control and no automation (Figure 1). "Automation is important with Solstice PF degreasing processes because precise control of the process is essential for solvent conservation," says Oliver. "Part baskets are lowered into and out of the degreaser with speeds below 3 ft/min. Parts are first immersed in liquid solvent, which is filtered, and may feature ultrasonics to enhance cleaning, and then are paused in a zone of saturated solvent vapor to permit parts to drain and dry as condensation ceases. The dwell times in each zone must be programmable, and different program recipes must be stored to allow operators to process a variety of part types in predetermined, optimized cleaning cycles."

Baron-Blakeslee's use of the Maple Systems controller on the EQ1 was motivated by the fact that it had to add a programmable lift to the Equinox for efficient, repeatable, predictable processing with the Solstice PF solvent. "We simply ran out of space to add extra push buttons and components in the EQ1 package, and we discovered that the Maple Systems controller would allow us to integrate all the features we needed with the lift, plus many more, while maintaining the packaging objectives of this particular product line, to be a benchtop vapor degreaser," explains Oliver (Figure 2).

Baron-Blakeslee switched from a Leeson motor to a Baldor dc motor in the back of the cabinet behind the process tank of the Equinox. "Guards go around the pulley and cable assembly to the hoist," says Oliver. "You look inside the cabinet, and there's a lot of stuff in that little box."

When redesigning the vapor degreasing machine, Baron-Blakeslee looked at a variety of ways to upgrade, while keeping the footprint the same. "We looked at putting a box on top of the cabinet to hold a touchscreen HMI," says Oliver. "We were using Zytron analog temperature controllers on the old model. We tried to



EQUINOX SILVER

Figure 1: The first Equinox had push-button control and no automation.

stick within the same dimensional envelope, but the existing control components made it impossible to achieve that goal."

Decades in the making

With more than 80 years of experience in designing and building industrial cleaning equipment, Baron-Blakeslee has been through its share of machine iterations. "We're a conservative company," says Oliver. "For us to change our controllers is not a consideration we take lightly." The Equinox was a change in machine design, and 20 systems are currently in place. It has spurred a push to standardize much of Baron-Blakeslee's equipment on a single control system.

"We're going to put the Maple Systems controller on all of the M Series going forward," says Oliver. "We can add material handling to these machines. We can load the hoist to the program. The motivation here is to standardize a control system across all of our lines. We've made the decision to put this controller on everything we can. We couldn't have done this 10 years. We were using Allen-Bradley MicroLogix and AutomationDirect touchscreens. To integrate this same control package with those would have cost 10 times as much, just in purchased parts, which we'd have to pass along to the customer. We have several people doing programming. The Maple Systems controller was very easy to

EQUINOX

Figure 2: The Equinox was a change in machine design, and 20 systems are currently in place.



program and integrate. They have a really innovative perspective on the market.”

Baron-Blakeslee’s PCH material-handling system, however, won’t be changing. “It still has the Allen-Bradley controls and AutomationDirect touchscreen,” says Oliver. “The Maple Systems controller does not have an isolated output card because of the way the dc motors are wired.”

But the Equinox will herald the dawn of smarter, smaller equipment at Baron-Blakeslee. It plugs into 120-V, single-phase outlet, just like a computer does, and it offers quite a bit of computing options. “The Maple Systems controller has simplified troubleshooting,” explains Oliver. “There’s an alarm history. We had none of this with our old system. We can trend temperatures, too. It also gave us password protection of certain settings. An operator of the old machine could just open the cabinet and change settings. Now it requires passwords. The Maple Systems controller we use has got Ethernet connectivity.”

The future’s so bright

Standardization on the Maple Systems controller also has allowed Baron-Blakeslee to develop new equipment and bring it to customers more quickly. “We’re making a distillation system we call the Nano,” says Oliver. It runs 2 gal/hr and puts the distilled, clean Solstice PF back in the machine. We’re looking to put the Maple Systems controller on that. We’re a UL shop. With the Maple Systems controller, it’s an opportunity to bring new products to the market faster, offer more features, streamline troubleshooting and maintain packaging. It did more for us than we ever expected it would.”

Because Baron-Blakeslee is a very traditional and conservative company, its departure from relay logic might be seen as risky. “There’s nothing wrong with that,” says Oliver. “But we’re moving forward. For us, it was initiated as a matter of necessity. And we keep looking at what other things we can do with it.”