



US machine manufacturer KVAL reduces engineering costs with TwinCAT

Flexible and efficient door production even in small lot sizes

KVAL, Inc., based in Petaluma, California, is well-known for its high-quality door manufacturing machines. In order to offer its customers the most competitive solutions, KVAL began using state-of-the-art automation technology very early on; PC-based control from Beckhoff has been in use since 2010. The company values, among other features, the high level of reusability in the software modules and the wide variety of usable fieldbus and protocol standards.

With a broad range of machines, KVAL meets every conceivable customer requirement in the door manufacturing industry. "Whether the customer builds interior or exterior doors, we can customize our machines to precisely match their respective needs," says David Schneider, KVAL Software Developer.

Universal hardware and software platform for all machine types

The search for a control platform that integrates PLC, motion control, and HMI on a single control platform, as well as enabling the flexible adaptation of the machine to customer-specific applications, led KVAL to implement PC-based control technology from Beckhoff. "Our goal was to simplify the machine control architecture and enhance system communication. PC-based control technology does just that: as a universal hardware and software platform, it enables us to automate all our machines with the same control system, from the smallest to the largest and most complex machines," says David Schneider, in summary.

In the software developer's view, the use of TwinCAT as a uniform programming and runtime environment as well as the great flexibility in the choice of programming languages is a huge advantage. David Schneider continues: "TwinCAT offers high reusability of software code. Once programmed, a module can be reused on any applicable machine. That means we can build up a library of function blocks and essentially 'drop in' the code specific to a feeder system, a hinge router, or a door lock router in new projects. In this way, we are able to save significant engineering time."

"In addition, a major advantage of PC-based control technology is openness with regard to fieldbus and communication standards," David Schneider stresses. "Many of our implementations consist of a series of machines or extensive plants. Effective communication between the individual machines is paramount, regardless of the signal type inherent to each machine. EtherCAT provides a fast fieldbus system with a flexible topology, as well as various options

to connect our machines with other protocols via gateways and couplers. The software tools in TwinCAT add flexibility, abstracting the application from the network/protocol layer.”

Flexible solution for small lot sizes

With the Commander™ 3, KVAL has introduced the next generation of its successful machine series to the market. Equipped with PC-based control technology, the CNC machine is designed to provide versatile door and jamb hinge routing functionality. Geometries stored in the software for different hinges and the possibility of quick retooling when changing production lots make the Commander™ 3 particularly well-suited for small lot sizes. “Using the PC-based control platform, we can route any hinge radius, hinge depth, square corner chisel, piloted pre-drilled holes, beveled door edges and more, with a negligibly longer cycle time than for more limited routines. The winner in terms of performance, quality, and time savings is the customer,” according to David Schneider.

Scalable control platform: the price and performance are right

“The scalability of the Beckhoff control solution has allowed us, in the Commander™ 3, to create a machine tailored to smaller shops that need automation, but are unable to budget for larger machines,” David Schneider emphasizes. A Beckhoff CX2020 Embedded PC with TwinCAT NC I software for motion control and CNC serves as the integrated control platform for PLC and motion control. “In addition, the Windows OS provides us with the possibility of remote diagnostics and troubleshooting using standard tools and programs,” David Schneider explains.

Through the use of the high-performance AX5000 Servo Drives, KVAL requires only a standard Ethernet cable for the connection to the EtherCAT fieldbus. David Schneider also regards the wide voltage range of the EtherCAT drives as an advantage: “Since we sell machines designed for both 230 and 480 V AC, we previously had to include a bulky and expensive transformer into the bill of materials, or stock two different power level drives for each particular size. With the Beckhoff AX5000, we only need to stock a single drive type, drastically simplifying our designs and parts management, creating savings we then pass on to the customer.” Cost benefits also arise as a result of using servomotors from the AM8000 series equipped with One Cable Technology (OCT). Valuable commissioning time is saved, since the motor wiring and number of plug connectors are both reduced by 50 percent.

KVAL opted to use the EtherCAT I/O Terminals from the ES line, which feature a pluggable wiring level option for easy installation. “The fact that we send these machines all over the world restricts our ability to do on-site commissioning and maintenance ourselves. Due to the pluggable wiring feature, our customers are able to carry out routine maintenance themselves, with no special wiring knowledge required,” explains David Schneider.

Simplified development and commissioning

Building on the success of the Commander™ 3, KVAL has also converted its 990H – a high-performance 10-axis CNC routing machine – to PC-based control technology. “We were able to completely program, test, and ship the machines, including G-code routines, in just two months. The first machines were shipped to Australia, so simple commissioning and troubleshooting were all



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the more important,” David Schneider emphasizes. Not only that, KVAL was able to save a great deal of time due to the more flexible automated processes and simplified wiring. “In the past we needed two to four days to get the machine from wired to running – but still not fully tested. With the PC- and EtherCAT-based control, the entire process takes less than a day,” says the software expert. “Through the creation of automated test routines, we were able to dispense with the tedious manual processes that used to be necessary for this. Previous troubleshooting often required checking each axis and all the limit switches to find the issue. This takes place automatically via TwinCAT and is far more efficient.”

Further information:

www.kvalinc.com

www.beckhoffautomation.com