



Case Study: J.A. King

System integrator reduces costs for ingredient batching, material handling, and mixing

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THE CHALLENGE

Whether it's making sure grains are stored without excess moisture, weighing raw materials for chemical production, or batching and mixing ingredients for baked goods, automation is key to better results.

System integrator J.A. King sees the benefits of automation every day. Founded in 1939, the company provides products and services to customers in a wide variety of fields, but customers' bottom-line needs are similar: reduce costs, improve quality and accuracy, and gain more business insight through data.

Based in North Carolina, and with multiple locations throughout the southeast and midwest, J.A. King specializes in precision measurement in automation and process control. From truck scales to calipers, from bulk bag handling to manual parts kitting systems, the company's expertise often leads them to customers still using manual processes.

A typical J.A. King customer, for example, performs batching manually using buttons and switches. An operator pushes a button to fill a hopper until the weight reaches a target, and then releases the button.

But a manual operation like this requires the operator's full attention for an extended period of time. In addition, it's subject to inaccuracies—variations that may affect product quality or cause raw material wastage.

The obvious answer is to engineer automated solutions to replace manual processes. With automation:

- Operators can start a process and then move on to other tasks.
- Measurements become more accurate and results more predictable.
- Products are uniform across different machines, different shifts, and different plants.
- Pre-programmed recipes let operators easily switch between products.
- More accurate raw material forecasting reduces waste.



- And historical data provides traceability for compliance and quality analysis.

REDUCING AUTOMATION COSTS

But PLC-driven automation can be prohibitively expensive. To engineer a control system to automate ingredient batching, including material handling and mixing, J.A. King decided to use a more cost-effective PC-driven solution.

One of their first steps was to find an automation supplier with both reliable hardware and inexpensive software drivers.

"Our introduction to Opto 22 came mainly through online research," says Joey Spruill, Senior Software Developer at J.A. King.



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“Opto 22’s industrial Ethernet I/O is known for its quality—it just keeps on working. And their free .NET OptoMMP SDK library gives us exactly what we need for programming.”

A typical batching solution

Spruill describes the company’s typical solution for multiple batching-type projects: “We use anywhere from one to three 16-slot SNAP PAC racks with SNAP PAC Ethernet I/O brains ([SNAP-PAC-EB1](#) or [SNAP-PAC-EB2](#)), installed in a tall cabinet enclosure.

“Typically one rack is dedicated to analog and digital inputs, with the other dedicated to digital outputs. All I/O connections are terminated in this cabinet using ABB terminal blocks.”

Inside the enclosure, the Ethernet I/O brains are connected to a 5-port Ethernet switch. The switch is also connected to a small PC enclosure, typically mounted in a different location than the I/O cabinet (for example, in an office). Both the I/O cabinet and PC enclosure are assembled at the main J.A. King facility in Whitsett, NC.

The PC, usually an Advantech fanless embedded PC, runs the custom process control and operator interface software that J.A. King has created.



Joey Spruill programs a custom application.



**J.A. King I/O cabinet for automated ingredient batching
Exterior (left) and interior (right), with Opto 22 Ethernet I/O**

Each of the customized blending and batching systems J.A. King’s engineering department builds is slightly different, and the engineers have built hundreds of them across many industries.

System monitoring

A touch screen connected to the PC provides an interface for local use. The I/O cabinet can also be connected to the facility network, allowing users in remote locations to run reports or monitor the system.

If the PC is online, J.A. King engineers can also perform remote troubleshooting and install updates.

This kind of solution is used in many locations for many types of batching applications.

I/O modules for measurement

Because ingredients in a process are typically measured by weight, Opto 22’s load cell input modules ([SNAP-AILC](#)) are used to read the load cell signals. Digital outputs control most material handling for belts, gates, valves, and so on.

“If one of the ingredients is water or another liquid,” notes Spruill, “we use meters to measure volume. This is typically

J.A. King's engineering department has built hundreds of customized blending and batching systems across many different industries. Each application is slightly different.

done with Badger meters, which output pulse signals per volume of material—for example, 10 pulses per gallon.”

Digital input modules like the [SNAP-IDC5](#) count these pulses using the SNAP-PAC-EB1 brain's counting feature, and then convert the count to volume in the PC software.

Customers are universally pleased with the cost and time savings J.A. King's automated batching systems provide. And the company is pleased with Opto 22's product reliability, open standards, and wide range of available I/O signal types.

For the future

“Opto22 products, including the SNAP PAC controllers and I/O, will continue to be a part of our design considerations for any new engineering projects, whether it's batching, mixing, or any other type of automation,” says Spruill.

“We also plan to make use of the newer REST APIs that come with SNAP PAC controllers and *groov*. Using REST and Node-RED, data produced by our systems can be easily integrated into larger facility collection and monitoring schemes.”

ABOUT J.A. KING

J.A. King is a precision measurement company with over 75 years of experience. Since its founding in 1939, the company's guiding values have always been character, integrity, and professionalism.

One of the top five independent providers in North America, J.A. King offers services and products for calibration, inspection and testing, automation, and systems integration. System integration services include automated batching systems, process instrumentation and control, programming, and engineering.

J.A. King serves customers in a wide variety of industries, including aerospace, chemical, consumer products, energy, life sciences, and food and beverage.

For more information, visit www.jaking.com.

ABOUT OPTO 22

Opto 22 was started in 1974 by a co-inventor of the solid-state relay (SSR), who discovered a way to make SSRs more reliable.

Opto 22 has consistently built products on open standards rather than on proprietary technologies. The company developed the red-white-yellow-black color-coding system for input/output (I/O) modules and the open Optomux® protocol, and pioneered Ethernet-based I/O.

In early 2013 Opto 22 introduced *groov*, an easy-to-use IoT tool for developing and viewing mobile operator interfaces—mobile apps to securely monitor and control virtually any automation system or equipment.

In addition to SSRs and *groov*, Opto 22 is best known for its [high-quality I/O](#) and [SNAP PAC programmable automation controllers](#), which include a RESTful API.

All Opto 22 products are manufactured and supported in the U.S.A.



Because the company builds and tests its own products, most solid-state SSRs and I/O modules are guaranteed for life.

The company is especially trusted for its continuing policy of providing free product support, free training, and free pre-sales engineering assistance.

For more information, visit opto22.com and groov.com or contact Opto 22 Pre-Sales Engineering:

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