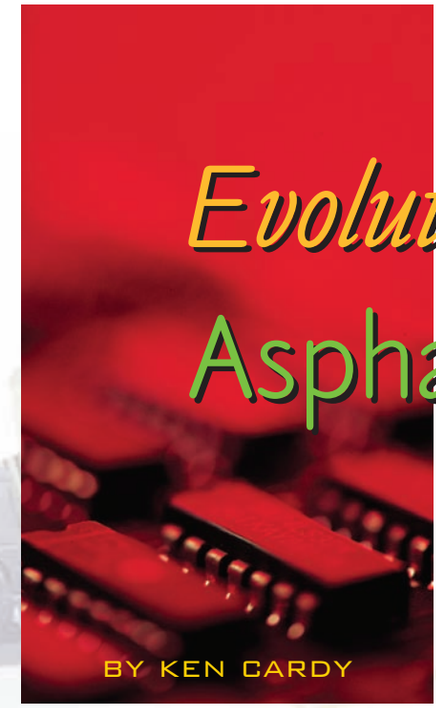

Evolution of Asphalt Plant Automation

BY KEN CARDY

Today, plant automation plays many roles in a hot mix asphalt producer's enterprise. Plant automation must support real-time management decisions by providing up-to-the-minute company-wide data, accessible from anywhere.

Plant automation must allow management personnel to control business data in real time, while allowing operators to concentrate on running plants. It must mold itself to fit the unique business processes of the producer without requiring the custom programming that has stunted the agility of past systems.

Prior to 1970

Early asphalt plant automation was entirely electromechanical. This meant the controls for the plant were based on what is known as relay logic.

These controls were composed of relay switches which, being mechanical, wore out quickly. The switches were very susceptible to heat, dust, moisture and other natural elements, making them unreliable. Early controls were very large and required a lot of control-room space. They were extremely heavy and not portable. Although these machines were cumbersome by today's standards, they did increase productivity by speeding up the mixing/loading process.

The 1970s

With the advent of transistor and integrated circuit technology, controls became entirely electronic instead of electromechanical. Physically, integrated circuits were much smaller than relay switches. The integrated circuits were also faster, but the biggest advantage was their reliability. They used no moving parts and were therefore immune to the mechanical (moving) problems encountered with relay switches.

EPROM-Based Asphalt Batching System, circa 1977

During this time, memory in the controls became economically feasible. Cassette tapes became a popular choice for memory because of their capability to store information indefinitely. However, the tapes were very susceptible to dust, dirt and moisture.

In 1974, the first microprocessor-based control was installed on an asphalt plant. This year also marked the first time that cassette tapes were bypassed in favor of another type of memory storage— floppy disks. The disks were much faster than tapes but, like tapes, they were susceptible to environmental damage.

EPROM

In 1977, two new types of memory, known as Erasable Programmable Read Only Memory (EPROM) and Read Only Memory (ROM), were introduced. These types of memory were impervious to dust, dirt, heat and even coffee spills. EPROMs were also extremely fast.

In this era, control systems also became much smaller and could fit on a tabletop desk. As integrated circuits grew smaller

and smaller, dedicated systems added more and more capacity without increasing the physical size of the controls.

The 1980s

The ’80s brought about the personal computer revolution, and in 1984 the first PC was used to control an asphalt plant. Computers were everywhere and the ability to interface the office with the plant was a logical step to eliminate handwritten administrative functions. Prior to building the communication interface between office and plant computers, information generated at the plant had to be re-entered into the office computer. This was often time-consuming, expensive and prone to error.

Background communications to the plants were introduced in 1989. Background means that another task can be occurring and be invisible to the plant operator. More specifically, the plant operator could be running the asphalt plant with all of its requirements, and at the same time the office could call in and update files, retrieve data or generate reports. Office tasks became completely invisible to the plant operators and did not interfere with their work.

Multi-tasking environments were also introduced to the industry during this period. This technique allows many tasks to occur virtually simultaneously. For example, operators could simultaneously mix material in the batch tower, load material out of the silos and access the database files without performance degradation.

The 1990s

Memory constraints were no longer a concern in the early ’90s. With the rapid technology advancements in the PC industry, producers could easily store information about customers, products and thousands of trucks.

Graphical user interface (GUI) for control of an asphalt plant

Microsoft Windows® paved the way for the first graphical user interface to be introduced for control of an asphalt plant. The use of animated pictures and “live” graphs to depict real-time trends aided operators in quick problem detection and response.

While radio frequency identification technology had been around for some time, the mid-’90s saw the asphalt industry utilize this technology to solve truck management issues. Truck waiting times were monitored,

both at the plant as well as at the paving site, and analysis tools helped reduce cycle times and minimize truck usage.

Plant to Office Communication

Up to this point, plant to office communication had been limited to crude file exchanges in which most systems were merely capable of sending a file of tickets back to the office at the end of the day. Some systems could also accept replacements of entire data files from the office. But, in 1997, the first online gateway between office and plants was introduced to provide seamless, real-time integration of plant production data with office accounting and management information systems.

Multiple plants could all be in sync with the headquarters. Office personnel had the ability to access company-wide production and operational data to manage logistics, answer customer questions and plan production.

The New Millennium and Beyond...

In 2002, the first asphalt automation system with highly configurable software was introduced to the industry. For years, custom requests meant custom programming at the producer's expense. Now, software has been introduced that can be configured to meet the exacting requirements of the users without programmer involvement. Producers have the ability to mold the system to their unique business processes. This includes the ability to add data fields, lay out printing on delivery tickets, add or modify reports, add special logic, create their own pricing schemes, etc.

Whereas custom software had the effect of locking producers out of new versions, the configurable and modular design of today's software allows users to receive new releases and features.

New office software utilizes open database architecture, such as open database connectivity, to allow seamless integration with virtually any office application. Customer and job changes are automatically broadcast to all plants and transactions are automatically retrieved and invoiced.

The technological advancements in automation and plant to office integration have brought about many changes to our industry. Thankfully, they have all been integral in helping producers to improve quality, maximize productivity, provide valuable management information and realize greater profits.

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