

Rockwell Automation distributed control system provides baking machine OEM with ongoing savings of 20% on installation cost for every machine

Australian OEM AutoBake has signed on Rockwell Automation as a strategic partner for its core business—the design and manufacture of the fully automated Serpentine™ baking systems. The use of NetLinx communications networks has led to savings of around US\$100,000 per year in hardwiring costs alone.

Background

Australian OEM AutoBake is a world-leading designer and manufacturer of continuous baking systems for commercial bakeries. Originally marketing its own baked products around Australia under the name 'Cookie Man', the company has shifted its focus over the past 20 years to the design and manufacture of baking machinery — starting with in-store cookie-making ovens, and now producing sophisticated baking systems that bake high volumes of products as diverse as horse biscuits and steamed puddings.

The innovative AutoBake Serpentine technology lies at the heart of the business. Utilizing a horizontal 'Serpentine' baking path, the AutoBake Serpentine is a fully-customized modular system that offers a compact and flexible alternative to traditional tunnel ovens. "One of our ovens can generally make a whole range of baked products — muffins, pastries, any type of cake, artisan breads — anything that will fit into a tray," says Paul Brennan, electrical engineer at AutoBake. "If someone approaches us and wants to make a specific product, we'll do our best to design a system to make it."

The company's largest market is currently the USA, with Asian and European markets also strong. "We've even sold five lines to Saudi Arabia," says Brennan. "Everyone in the world wants cup cakes!"

The Serpentine baking system typically incorporates a number of stages, such as in-line spraying of oil as a release agent, depositing of batter or dough, baking, cooling, and de-panning — plus any other ancillary stages on a per-product basis (such as injection of fillings). Each of these stages is fully automated and an integrated part of the process so that the entire line can be overseen by a single operator.

Challenge

According to Brennan, the AutoBake Serpentine baking system is often supplied to businesses with little or no prior experience of industrial automation technology; therefore the system needs to be as user-friendly as possible. This means straightforward operation and recipe handling, plus exceptional reliability of the control system.

The three main automation requirements associated with the AutoBake Serpentine relate to control of temperature, line speed, and monitoring of the tray position



at key process stages. While temperature is critical in terms of both baking and cooling — the oven can have up to ten controllable zones of baking — Brennan explains that achieving the required line speed and positioning are greater challenges.

"We need to know where every tray is at any given point — particularly for filling and de-panning," Brennan says. The trays move through the various zones within the oven on a conveyor system with



multiple motors that need to be synchronized in terms of speed. Synchronization is also required between different process steps — for example, between the baking and freezing stages, which requires transferring of the product after de-panning.

The de-panning process requires more complex motion control. Products are de-panned by the careful placement of a vacuum cup upon the surface of each individual item, which is then transferred as required.

Solution

AutoBake has long been using Rockwell Automation products and solutions for control of the Serpentine baking system. Allen-Bradley ControlLogix is used as the primary controller. “ControlLogix does everything, from end to end,” says Brennan. This includes logic and process control, both of which are required by the Serpentine.

ControlLogix sends start and stop signals to all integrated third-party equipment (such as filling trays), sets conveyor speed references via digital communications to multiple drives, monitors tray position along the conveyors via digital encoders, and handles temperature control in all baking zones. It also controls ancillary functions such as exhaust fans and the vacuum

generator, as well as monitoring humidity levels to determine when to open or close steam solenoids.

In the majority of cases, digital communications networks are used in the baking line, rather than hardwiring. ControlNet communications are

used to link up to three Allen-Bradley PanelView human machine interfaces (HMI) at various positions on the line. All production schedules are selected and managed by the touch-screen PanelView HMI, which stores all temperature, speed and position settings for every desired product. Flex I/O racks are also mounted remotely along the machine’s length. “The reason we use ControlNet is that we can plug in our laptops anywhere there’s a ControlNet device,” says Brennan. “We can program from just about anywhere on the line.”

The DeviceNet fieldbus network is used to integrate around six Allen-Bradley variable speed AC drives, photoelectric and proximity sensors, digital encoders, and indicator lights, and also provides an interface with a third-party robot in some systems.

In many systems, Rockwell Automation’s motion control strategy is adopted to achieve integrated motion control of the vacuum-based pick and place system for de-panning. This comprises an Allen-Bradley 1394 multi-axis servo drive connected via fibre optic communications to the ControlLogix integrated controller incorporating a SERIAL Real-time Communications System (SERCOS) interface.

Results

The ongoing savings to AutoBake due to use of Rockwell Automation’s integrated

architecture are of significant benefit to the OEM. Brennan explains that the extensive use of communications networks instead of hardwiring cuts down wiring time on every line by as much as 20%. “We don’t have to run a whole lot of wires back to a central board,” he says. “And it minimizes the inherent problem of wire damage.”

In addition, the company saves an estimated US\$8,000 per line in wiring costs. For a company that manufactures a large number of customized baking production lines per year this is a very significant saving.

At the end of the day, the Rockwell Automation control system ensures that AutoBake’s customers are provided with a fully automated Serpentine baking system, that can be overseen by a single operator, whose main function is to select recipes and respond to any alarms that might occur.

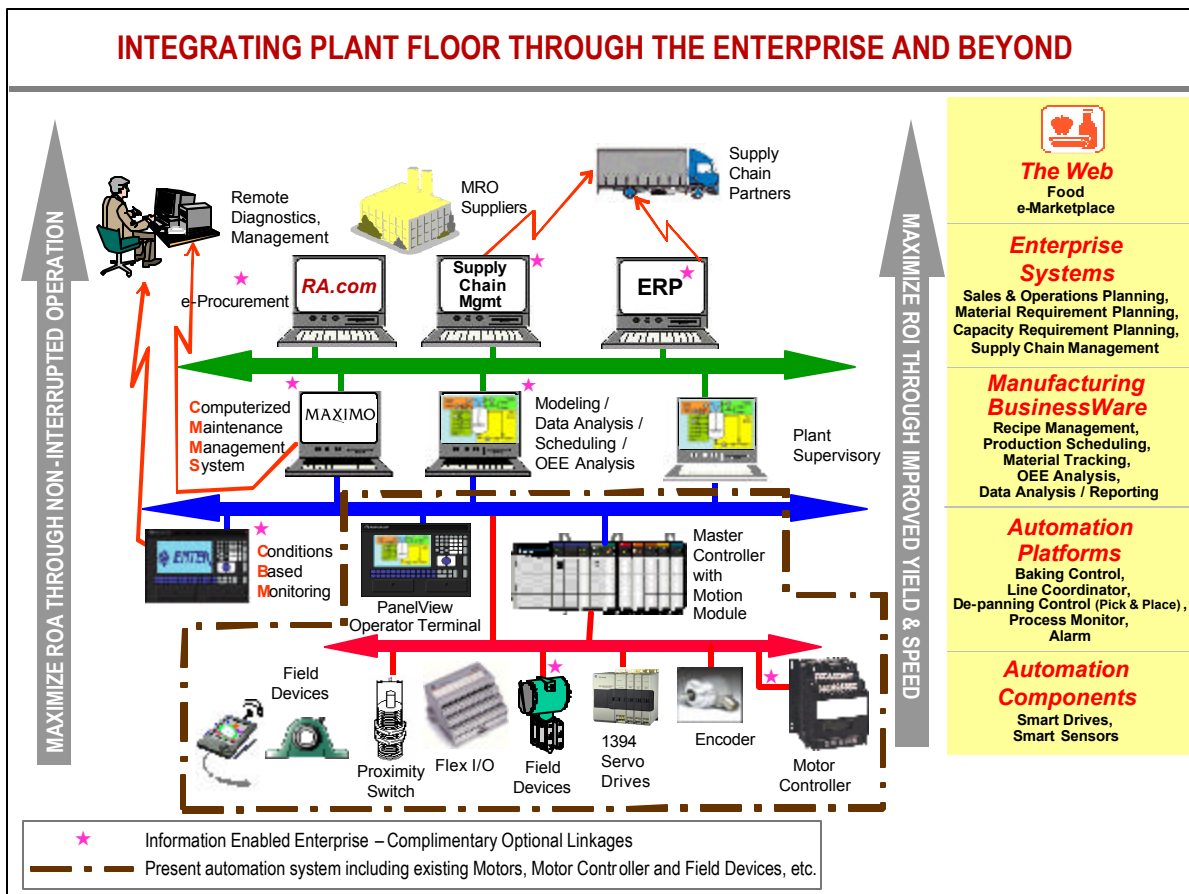
The collaboration between Rockwell Automation and AutoBake has allowed the OEM to keep at the forefront of technology. “Rockwell Automation products have continued to work very well,” says Amanda Hicks, marketing director for AutoBake. “We promote the Allen-Bradley control system as an integral part of our baking systems, and its complexity has grown with the company. It’s an integral part of our product.”

Brennan says that the modularity and distributed nature of the control system is a huge advantage. “It allows the lines to be completely pre-wired and tested in the factory, disassembled into modules, and then reassembled at the final destination to be operational within three days,” he says. This brings considerable savings in production down time for AutoBake’s customers.

The architecture below depicts Rockwell Automation's concept of an Information Enabled Enterprise. The area outlined

with a brown dash line represents the present automation level under discussion in this document. The remaining portion

illustrates a host of solutions that Rockwell Automation can provide today to integrate the plant floor to the enterprise and beyond.



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