

## Nabisco Speeds Production With Wireless Control

Kevin Moore  
Process Control Engineer  
Nabisco Process Controls

Eric P. Marske  
Customer Service Engineer  
Electronic Systems Technology, Inc.

If you look in any American kitchen, you are almost guaranteed to find product made from the bakeries of Nabisco™. With brand names that we all grew up with such as Oreos®, Ritz Crackers® and Fig Newtons®, Nabisco has become an American household name. The company is a financial success story as well. Sales figures close to 9 billion dollars in 1996, are no small cookies.

To maintain these large sales figures, the Nabisco Company must supply tremendous amounts of product to market in a timely manner. The volume of production demands that Nabisco be not only a name from our past, but they must also be a leader in automation solutions. Nabisco must use automation technology to support the high demands. The advancements made at the Chicago bakery are a small example of how applying innovative solutions to production problems can result in increased production speed and reduced overall costs.

The Chicago bakery is the world's largest bakery. The bakery has 21 ovens and 23 packaging lines covering 1.6 million square feet. They produce 320 million pounds of product in 36 product lines. Some of the raw materials used include 97 million pounds of flour (equivalent to 78,000 acres of wheat), 66 million pounds of sugar, 11 million chocolate drops, 8 million pounds of Fig paste, and 3.6 million pounds of peanut butter. The bakery employs approximately 2,200 people. The control system highlighted in this paper links the North bakery/warehouse and South bakery with an innovative wireless network. This control system uses the proven reliability of Allen Bradley™ programmable logic controllers (PLCs) and ESTeem™ Wireless Modems.

**The Process-**

The dough mixing operation in the South bakery utilizes many ingredients, several of which have a high viscosity. This transportation of materials must travel the 300 yards from the North bakery/warehouse to the South Bakery to begin the mixing operation (Figure 1).

North Bakery/Warehouse

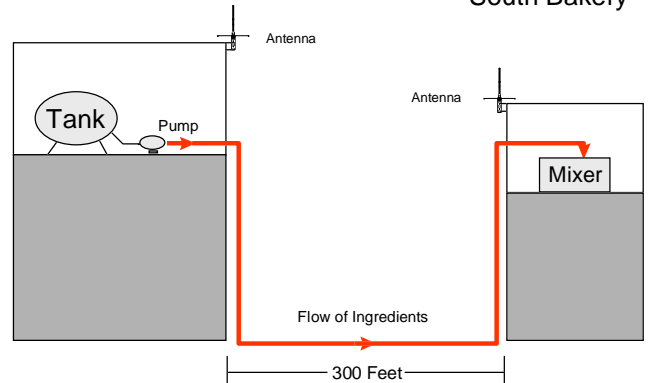


Figure 1: Bakery System Diagram

### The Problem-

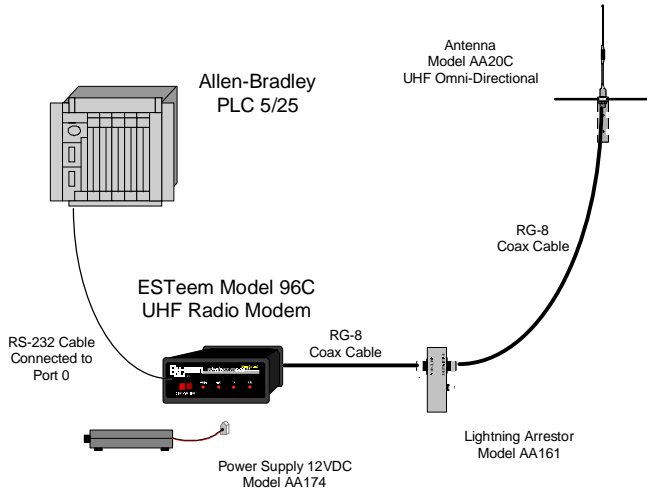
In order for the pump to begin pumping the ingredients, a pressure loss had to be sensed on the line. Due to the high viscosity and overall distance involved, a pressure loss would not be sensed until the flow of ingredients was near zero. Additional sensors would be required along the pipes to keep the flow of ingredients accurately moving or communication cables would have to be installed to link the programmable logic controllers (PLCs) at each facility. Additional wiring to incorporate additional sensors or tie in existing PLC controls was costly due to full conduit runs and additional hardware requirements.

### The Solution-

The solution was the installation of ESTeem wireless modems to provide communication for the two Allen Bradley PLCs. A command is now sent immediately to the North bakery PLC when the operator requests an ingredient in the South bakery. The pump begins to pump immediately when the request is made instead of waiting until the pressure drops. The delivery of the ingredients is much faster, saving time for the mixing operation.

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The North bakery (warehouse) uses an Allen-Bradley PLC 5/25 that communicates with the South bakery via an ESTeem Model 96C, UHF radio modem (Figure 2). The modem operates in the 450-470 MHz range and is connected to an omni-directional antenna mounted on the exterior of the building. The PLC controls and monitors ingredient tank levels, temperatures and valve control in addition to receiving and processing the requests for ingredients from the South bakery.



**Figure 2: North Bakery System Diagram**

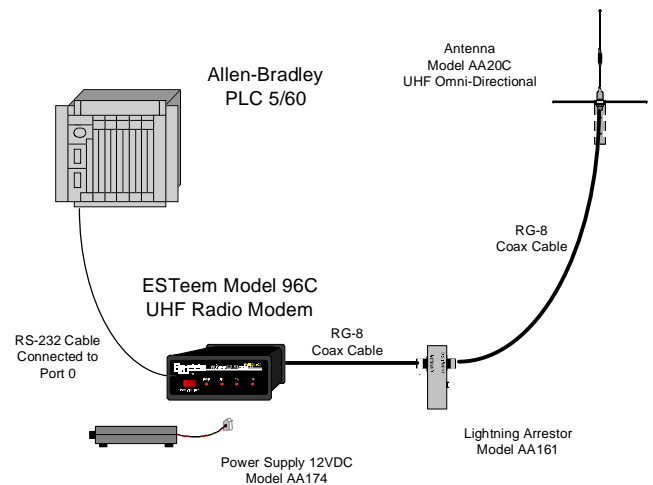
The South bakery uses an Allen-Bradley PLC 5/60 that is also connected to an ESTeem Model 96C radio modem (Figure 3). This bakery houses the mixer and sends requests to the North bakery with Allen-Bradley DF1 message instructions. This site uses an omni-directional antenna that is mounted on the exterior of the building.

Wireless communication between controllers has eliminated most of the wiring in the system. The installation of conduit and cable runs were not only very expensive but was an installation “nightmare” due to facility configuration and logistics. The money saved in eliminating new conduit runs and wire or installing additional sensors along the pipe has made the decision for a wireless system very cost effective. The faster delivery times in turn produce faster mixing operations. In the high volume world of food production, these changes amount to a tremendous overall cost savings.

The integration of ESTeem wireless modems in an Allen-Bradley hardware platform allowed quick integration and the overall success of the project. The ESTeem wireless modem has an integral Allen-Bradley, DF1 protocol driver in every modem. This protocol driver allows integration of radio technology to a control system seamless to the integrator. No additional programming commands are required in the controller for communication. Standard Allen-Bradley message blocks are transmitted through the on-board serial port (Port 0) of the PLC eliminating any additional hardware and providing the programmer with a familiar Data Highway communications network.

The primary system advantages found at the Chicago bakery are:

- Seamless integration of radio communications in an Allen-Bradley control system
- Cost savings on conduit runs and wiring
- Increase operational speeds with reduced system latency
- Reliable system performance
- Quick installation and setup



**Figure 3: South Bakery System Diagram**

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Nabisco's Chicago bakery is an excellent example of how using innovative technologies can increase production times while saving overall cost. This wireless control solution allowed a quick startup at greatly reduced costs due to reduction in labor and hardware. As long as Nabisco continues to implement the latest automation technology, like that seen at the Chicago bakery, our grandchildren too will assuredly enjoy their Oreos and milk after school.



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Ph: (509) 735-9092 Fax: (509) 783-5475