

Role of PLC in Your Oven Operations

In modern industrial manufacturing facilities around the globe, the use of Programmable Logic Controllers (PLCs) has become almost completely ubiquitous. However, there are bakeries that have not made that investment throughout their operations. If you find that your bakery is not taking full advantage of PLCs, here is a summary of reasons to consider them for your equipment.

As a premier oven control system manufacturer, Banner-Day has extensive experience in both “classic” relay logic systems and especially in modern PLC based systems. We’d like to give you an overview of the benefits (and the few negatives) of having a PLC in your plant:

Benefits

- **Flexibility** – Unlike purely hardwired systems, the program in a PLC can be easily changed to improve existing operation, or even to add new features. Many times this work can be done while the equipment is in operation.
- **Ease of maintenance** – With hardwired relay logic systems, just finding the cause of a problem can take hours of tracing wires and checking relays adding to your labor cost and potentially impacting your productivity. Should a problem occur (typically not often), a PLC can diagnosed the problem in a matter of minutes with the built-in tools that allow you to find every occurrence of every address in the program within seconds.
- **Longevity** – The virtual relays in a PLC never wear out. The contacts never weld shut. It’s not unusual to find a 20 year old PLC still in perfect operating order. If it’s being replaced, it’s usually the result of a desire to add a new, better, advanced feature set or potentially adding built-in communications capabilities that older processors didn’t provide.
- **“Virtual Room”** – Even the smallest PLC has room for hundreds, if not thousands, of “virtual” relays, each with a nearly unlimited number of contacts. This gives you the ability to design a system with decision making capabilities and self-recovery features that would be impossibly expensive and complex in a purely hardwired system.
- **Beyond the relay** – Not only can a PLC emulate a room full of relays, it has capabilities far beyond that. Timers and counters are easily programmed, along with the capability to perform various mathematical functions from the simple to the surprisingly complex (providing control, flexibility for managing oven temperature and throughput by recipe).
- **Data collection** – In this day and age, collecting data on the performance of your systems is crucial to understanding where to target improvements. The PLC can play a critical role in this endeavor. The PLC can monitor cycle times, unit counts, conveyor speeds, interruptions, etc. If you need it monitored, the PLC can typically do it.

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- **Cost** – When you compare the cost of a PLC to a hardwired system, the break-even point is surprisingly small. Depending on the system complexity, that point can be as small as 10 relays, especially once you include the labor to wire everything together. The more complex the system, the faster a PLC will save you money. These PLCs more often than not come with new equipment. Our experience is that they are provided with mixing and other upstream equipment. When it comes to new ovens the PLC is central to its operation. However that still leaves older ovens still operating with the old technology. The incorporation of PLCs into retrofits projects can bring new life to that old box that is still very functional.
- **Overall system simplification** – The use of a PLC gives you the ability to simplify your entire system. As an example, consider a typical cam box containing anywhere from 2 to 12 cams. If that box were to need replacing, each one of the new cams must be individually set, with the potential to change the machinery operation due to very minor differences between the old and new. However, with a PLC, an inexpensive encoder retrofit can eliminate the cam box and modernize/automate a perfectly acceptable oven. The encoder simply reports its position back to the PLC, where any number of “virtual” cams can be constructed. The truly brilliant thing is that if you have to replace the encoder, the ONLY thing that has to be matched up is the “Zero” position. Since the cam settings are in the PLC, they are ALWAYS maintained and NEVER have to be adjusted unless a change in machine operation is desired.

Potential Short Comings

- **“Hidden” costs** – Having a PLC in your plant means you need at least one critical piece of equipment: a computer, preferably a laptop. In addition to the laptop you will need appropriate software. Depending on the PLC selected, you may need a compatible hardware communications interface. However, with the use of Ethernet growing rapidly, this is becoming less of an issue. As PLC usage increases in your plant, this becomes less of an issue, especially if you’re conscious of specifying the same brand/family of PLCs for each piece of your equipment, thus minimizing the additional software you may need.
- **Employee skill set** – Smaller bakeries often don’t have dedicated controls technicians or potentially even electricians. They frequently have a general maintenance staff. Many times there’s a single plant engineer who’s educated/trained primarily in the mechanical disciplines. While they may be comfortable using a multi-meter, troubleshooting the program in a PLC using a laptop computer may be outside their comfort zone. Again, you can minimize this potential concern by specifying the same brand/family of PLCs that come into your plant.
- **Program Loss** – Most PLC programs are stored only in memory, which is backed up by a long-life battery (typically 5 years or more). If the battery were dead and line power was removed from the PLC, program loss would occur, rendering the machine completely idle until the program were reloaded from a computer. This “shortcoming” is easily overcome via a good PM program that includes a regular check of the battery. Also, most PLCs have the capability of being programmed to provide an alarm when the battery is nearing the end of its useful life.

Our experience suggests that the benefits of having a PLC on your oven far outweigh the potential negatives; especially when modest planning in design, maintenance and operation can offset or mitigate any potential downsides.

If you have any questions about PLCs or any other controls related questions, our engineers are available to provide you answers.