

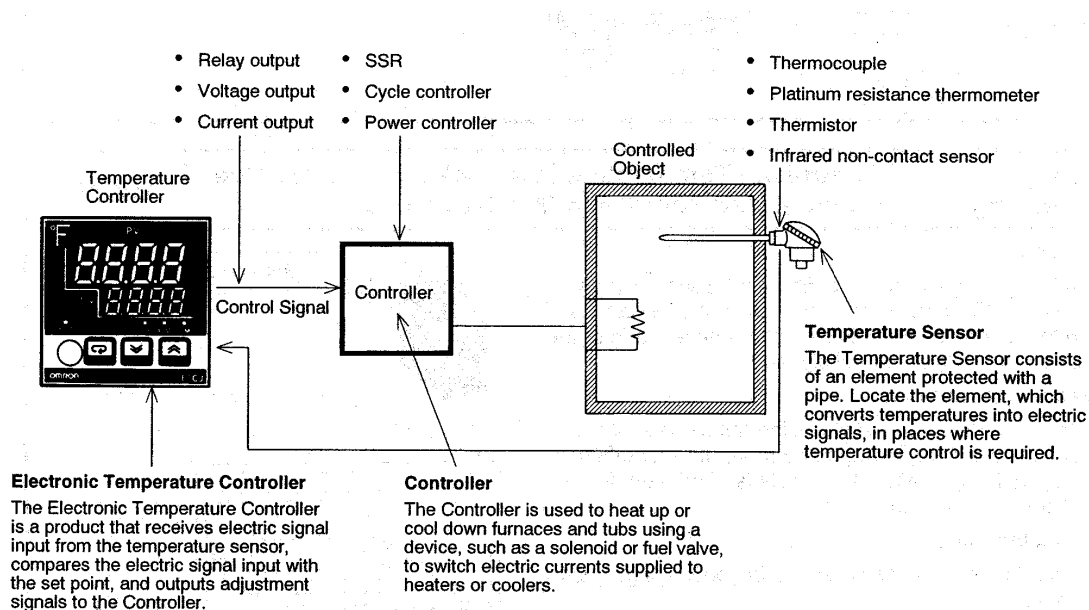
Communication Software - Key To Improving Thermal Control Systems

Whether your plant is molding plastic containers, applying adhesives, extruding plastic films, powder coating automobile parts, or is involved in any other thermal process application, adequate controls are needed to ensure that an acceptable product is produced.

Temperature Control System Basics

A temperature and process control system consists of four basic components, which are joined in the form of a closed-loop system. The four elements include:

- *Heater or cooler* - This provides the heating or cooling energy to the system.
- *Sensor* - Measures the temperature or other process variables (i.e. humidity, pressure, etc.) of the system, and feeds the information back to the controller.
- *Load* - The object whose temperature or other parameter is to be maintained at a constant, specified value.
- *Controller* - The device that compares the information received from the sensor with the desired temperature (set point) or process value. The task of the controller is to regulate the power input to the load, based on the demand of the system. The controller automatically adjusts the power that is fed to the heater or cooler to compensate for any tendency of the load temperature to drift up or down, thus closing the loop.



Trend Toward Communication

Technological advancements in communications continue to escalate, and these advancements can help improve thermal manufacturing processes as well. The distribution of information from an input, like a sensor, to a central location, where decisions can be made, is the role of the communications system. Data from sensors located in the manufacturing process can be

transmitted to a controller, then to a printer, a disk drive, or even a remotely located terminal or computer which can be part of a local area network (LAN).

Controllers are typically connected using RS-232, RS-422, or RS-485 serial communication and an existing RS-232 serial port on a computer. RS-232 refers to the Electronic Industries Association's (EIA) recommended standard for the mechanical and electrical interface which specifies a DB25 connector. This type of serial transmission is designed to communicate between one computer and one controller, and is usually limited to lengths up to 50 feet. RS-422 and RS-485 serial transmission types are designed to communicate between one computer and multiple controllers, have a high level of noise immunity, and are usually limited to lengths of 650 feet (for RS-485) or 1,650 feet (for RS-422).

Device level buses have become predominant types of networks in industrial automation. These buses or networks are a type of communications link, which connect industrial devices such as sensors, switches, or panel displays to a controller, such as a PLC or computer. The most popular general-purpose buses are DeviceNet and Profibus.

Software's Role

Industrial processes usually require the precise control of temperature, humidity, motor speeds or other parameters. Managing this type of operation and amount of information can be a difficult task at times. Recent advances in software technology are helping to manage temperature and industrial processes more efficiently and increase cost savings. Software allows easy communication to help simplify set-up parameters, monitor processes, and collect data. This data can then be used to improve a process by reducing manufacturing down time and wasted product, and to predict equipment malfunctions.

Set-up

Temperature or process controllers in a manufacturing process must be programmed to know what parameter values they should be monitoring, and what course of action (turn the heating elements off, ring an alarm, etc.) to take when a process value deviates out of the specification tolerances. As time and technology have advanced, controllers have become more complicated to program. Software can be used to simplify the set-up parameters in an industrial process. It allows users to program controllers through their PC, instead of the traditional method of using the front panel keys. This can save a significant amount of time and money, especially if a user has a large number of applications, or uses a variety of controllers. This initial set up data can also be saved and quickly cloned into other controllers if future demand requires the expansion of a process to other controllers.

Monitoring

Having access to accurate data in a timely fashion is critical to ensure that a product is manufactured with acceptable and consistent results. Having the tools to monitor a process and the manufacturing equipment is of great importance to avoid and fix problems. Continuous live monitoring allows users to check, test and modify an application's operation instantly and can flag alarms when problems occur so that the plant personnel can correct them. All temperature loops can be monitored from a single location. Remote monitoring via the Internet



should prove to be a powerful new tool over the next several years. This will allow remote access to a company's process information so that corrective action can be taken quickly in case of a problem, and expensive travel costs can be avoided.

Data logging and trend analysis

Data logging refers to the recording of key parameters, such as set points and process values, into a computer database. The temperature that a product experiences during the course of a manufacturing operation can be monitored, recorded and charted using software. A typical reporting chart will show temperature plotted along the vertical axis and time along the horizontal axis.

This data can then be reviewed and analyzed to search for the cause of past problems or to predict future trends in a process. Potential areas of improvement, like changes in maintenance schedules, can also be determined. This data is usually saved in an ASCII file type so that it can be exported later into other programs, like Statistical Process Control (SPC) software.

An example of software that includes a data logging function is Omron's SYS-Config v.2.0 software.



Summary

Regardless of the product a manufacturer produces, the ability for temperature or process controllers, at the actual manufacturing work station to communicate with a PC or PC network is key to reducing downtime and increasing productivity. Software can make an effective interface between the factory floor and a central decision making location, where a manufacturing process' information can be monitored and reviewed.

Biography

Pete Leal is a Product Marketing Specialist of temperature controllers, process controllers and solid state relays for Omron Electronics LLC. He has a bachelor's degree in Industrial Engineering from Northern Illinois University.