

Fig. 1 Pressurized Dye Beck

Why Use a C1960?

- ▶ Automatic temperature control for increased production and operational efficiency.
- ▶ Up to ten set point profiles per controller, including guaranteed ramp and soak with individual hysteresis for precise temperature profiles and improved product quality.
- ▶ Dedicated front panel for Ramp/Soak profile applications.
- ▶ Status indicators and a deviation bargraph.
- ▶ Fast start-up with self-seeking set point.
- ▶ Direct-connected RTD and/or thermocouple inputs reduce installation costs.
- ▶ Easy-clean NEMA4X/IP66 front face.

Features and Benefits

Precise Set-Point Profiles Improve Quality, Consistency and Yield

- ▶ The C1960 features a Ramp/Soak set point profile generator with configurable hysteresis. It can be programmed with up to 10 temperature profiles and has a maximum of 99 segments that can be distributed throughout the programs.
- ▶ Configurable hysteresis provides the flexibility to set the upper and lower limits of both ramp and soak segments to achieve a particular process requirement.
- ▶ A guaranteed process ramp is provided as part of the C1960 profile. This feature is useful in situations where steam fluctuations may occur. For example, when ramping the process to the desired temperature set point, the guaranteed process ramp tries to ensure that the process keeps pace with the rising set point. If it cannot, the set point ramp is delayed until the process is within the specified hysteresis band, thus preventing a sudden change in temperature that could damage the fabric in the dye beck.
- ▶ The guaranteed soak ensures that the temperature and duration of the soak are held to the configured set points. This also ensures that the temperature is accurately maintained during the interrupt cycle at the end of the soak cycle.

Comprehensive Displays for Improved Operation

- ▶ The large, dedicated ramp/soak front panel display of the C1960 allows the operator to see displayed information from a distance. This information includes the target set point, time remaining in main soak segment and the segment running.
- ▶ The controller also includes status indicators to show if the profile is in a ramp or soak segment. Dedicated keys allow simple control of the profile. The keys are:
 - Run
 - Hold
 - Stop
 - Increase Time/Temperature
 - Decrease Time/Temperature

The Application

Textile manufacturers are relying more and more on digital process control instrumentation to increase efficiency and product quality and to reduce production and utility costs.

Using reliable digital controls, variables such as temperature can be controlled automatically and very accurately with little, if any, operator involvement.

In the dyeing process, the main process variable requiring accurate control is the temperature of the dye bath.

The control system used to monitor and maintain a precise temperature must be capable of allowing heat transfer at maximum rate on the initial rise without sacrificing accurate control during the hold period. Fabric dyeing is accomplished through the use of many different types of machines and equipment. The dye beck is one such device.

The dye beck is a vessel containing the dye liquor into which fabric is immersed for the purpose of obtaining a specified color and shade. Dye becks are of either the atmospheric or pressurized type.

Control System Objectives

When fabric is batch dyed, the temperature of the dye liquor in the beck is controlled by a process profile similar to that shown in Fig. 2. The beck is heated either by open or closed steam coils, or by an external shell and tube heat exchanger. In order to obtain proper dispersion of the dye in the dye beck, it is essential to maintain the dye liquor at the correct temperature. The sequence of events for batch dyeing is to partly fill the beck with water, add the chemicals and dyes, then add more water to bring the dye liquor to the operating level. The temperature of the dye liquor is then raised to the required temperature. An important objective is to raise the dye liquor temperature at a controlled rate so as not to damage the product. The C1960 allows a fast approach and a slow, controlled rise to the main dyeing temperature by cascading two ramp segments together with different rates-of-rise.

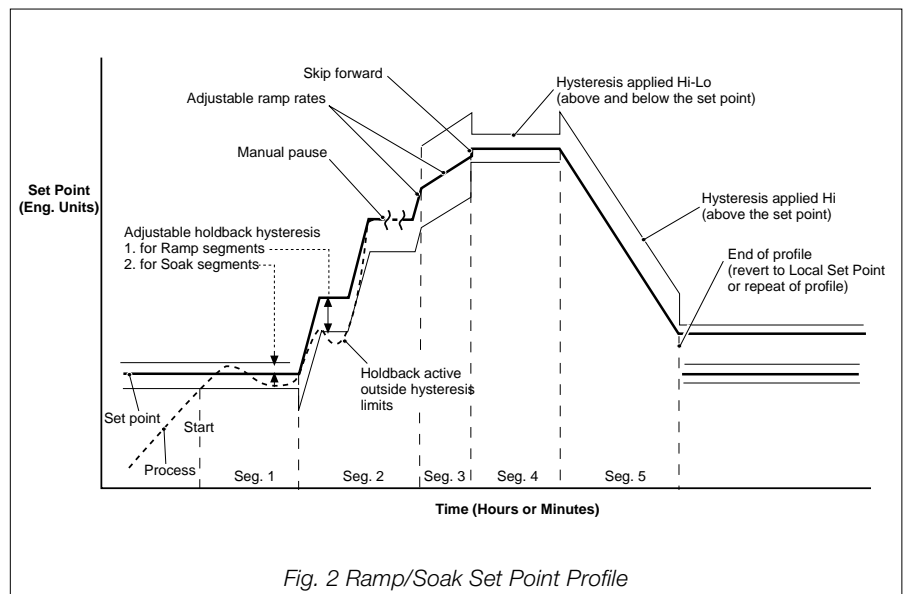


Fig. 2 Ramp/Soak Set Point Profile

Control Issues

Pressurized dye becks offer two major advantages over atmospheric becks:

- ▶ Uniform temperature control is more easily accomplished using an external pump and external heat exchanger.
- ▶ Dye cycle times are shorter since higher temperatures are possible by controlling the pressure within the beck.

However, pressurized dye becks are expensive. They can provide good payback if properly controlled, but they do represent a large initial investment.

In a pressurized beck, the dye liquor temperature is relatively simple to control and is often measured with an RTD which is typically located at either the inlet or the outlet of the beck.

If steam demand fluctuates, the controller manipulates the steam control valve to ensure a precise dye liquor temperature.

Optimum productivity and quality are essential in the dye house. In pressure applications, it is more difficult to obtain patches to check the quality of the material; the beck must be depressurized so that the doors may be opened and a patch taken for analysis. The ability of the control system to quickly restore the correct temperature and pressure after a patch is taken can greatly increase productivity and reduce concerns about improper dyeing. In essence, the control system must be able to respond quickly and accurately so that production and quality can be optimized.

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