CERTS

CONSULTING AND TECHNICAL SERVICES FOR ALL FACETS OF CONTROLLED ENVIRONMENT ROOM OWNERSHIP

Limit Control Application In Controlled Environment Room Design

Product loss, equipment damage and unrecoverable schedule delays are certainly damaging to any enterprise, be it private or public. Proper design and application of limiting devices in the CER control system can reduce your risk of loss from equipment or device failure.

The job of the controlled environment room (CER) is to protect what's inside the room from the prevailing conditions outside the room. In order to perform as intended the CER has substantial capacity to change the room conditions through heating or cooling. Under normal operation this works to your advantage, but if uncontrolled, as in the case of a malfunction or other failure, the same capacity that normally protects the stored materials can act quickly to destroy them. Secondary hazards from uncontrolled equipment activity include flooding caused by bursting of frozen water lines or activated sprinkler heads, fire, and self destruction of the CER conditioning system. Only a small portion of the costs associated with equipment malfunction will normally be attributable to CER equipment repair. The major cost will be in lost product, time and other consequential damage.

A limit control is not an alarm, it is a safety device. An alarm alerts you that something has already happened. Limit controls should be designed to take action and stop abnormal activity from causing excessive damage and loss. A limit control may provide alarm annunciation as an ancillary function, but it is primarily a safety device.

In determining the appropriate scope of limit control activity, the design professional must examine the intended function of the CER and identify the range of potential failure modes. This is not easily accomplished without a thorough knowledge of CER operation sequences and characteristics. Next, evaluate the effect of each possible failure on CER equipment operation and the product within the controlled space. Advise the client about the range of limit control functions available for the proposed system and the benefits and risk reduction achieved by each function. It is important that the client has a good understanding of what will happen when limiting condition occurs and how this will affect the intended use of the CER. Once the required level of protection has been mutually established, search for a manufacturer that can provide what is needed. This step, while it may appear out of sequence, is not. Too often design professionals and purchasers will elect to accept only what is offered by vendors. CERs are purpose specific equipment items, built for each application. Clients will be better served by analyzing their risks and operational needs, then using the results of their analysis when selecting a vendor. There is a wide array of safety device implementations in the CER marketplace, with each manufacturer offering its own mix of functions and price points. Some offerings will likely be deemed unsuitable if a thorough study of the client's needs is completed. It is incumbent upon the design professional, in cooperation with the client, to determine what arrangement of safety devices and functions will best serve the needs of the client.

Here are some basic principles to use in developing and evaluating a suitable limit control strategy:

(1) Always use a separate device dedicated solely to limit control activity. Do not use the same device which controls the process, such as the room temperature, as the limiting device for that process. A failure in the controlling device may prevent the limit activity from executing at a critical moment.

(2) Limit controls should have their setpoint dials or buttons protected from tampering by inexperienced or uninformed operators. The limiting device should be properly set when the system is commissioned, or when a process condition, like the room temperature, is changed. An improperly adjusted limit control will not provide the desired protection.

(3) Each limit control should have its own input device, independent of all others. The sensor should be located at the point which will provide the earliest indication of the condition the limit control is designed to protect against. A simple illustration of this is locating the high temperature limit sensor at the warmest part of the chamber.

Continued on next page

(4) The limit control should use a different method from the primary controller to stop a process that is no longer under control. There may be a malfunction or failure in the primary controller device train that will also prevent the limit control from stopping the runaway process.

This last principle is often violated in CER design in an effort to reduce cost, and can produce some notably bad results. Improper implementation of limit controls may not produce the results that were anticipated in all failure scenarios. It's bad enough that things go wrong at all. When the safety system does not prevent excessive loss or danger to equipment or personnel, the damage is only compounded.

Technical details aside, the time invested by the design professional and client in evaluating the proposed limit control strategy will pay dividends throughout the life of the equipment. Take time to understand what the limit control scheme will accomplish, and more important, what it will not. Knowing where the risks are, which situations and events can result in damage or loss, will allow you to develop response strategies for emergency situations not effectively handled by the CER control system.

How do you wade through all the technical detail involved with a solid analysis of a limit control scheme? If you are unfamiliar with CER control technology and application, communicate your concerns regarding safety and product protection to a design professional or consultant. They can bring their experience to bear for your benefit. Be cautious of depending on information provided by vendors to be fully informative, impartial, or necessarily in your best interests. It is important to have evaluation performed by someone knowledgeable, experienced and impartial.

Hopefully, you will never need your limit control action but, if correctly designed and installed, it will be in place, ready to take control when things get out of control.

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