SUPPLIERS' TIPS

What safety-monitoring equipment or controls should my dryer include?

Most dryers should include burner safety interlocks and dryer system interlocks. An interlock is a safety mechanism programmed into a dryer's control system that automatically alerts the operator or shuts down the equipment if a certain process parameter is exceeded.

Burner safety interlocks should preferably be duplicated on the dryer operator's screen to simplify troubleshooting and should include high gas pressure, low gas pressure, low combustion airflow, low process airflow, high burner temperature, and no burner flame.

Dryer system interlocks could include low chamber pressure, high dryer inlet temperature, high dryer outlet temperature, high baghouse differential pressure, and high scrubber outlet temperature.

If you're drying an organic material, there could be a fire or explosion risk. The risk level for your material can be evaluated by a specialized testing facility, which can determine the material's explosivity, maximum pressure developed during deflagration, minimum ignition energy, and minimum ignition temperature. Options for protecting the dryer against a possible deflagration include:

- Venting, which uses either lightweight doors and latches or rupture panels to direct a deflagration directly outdoors or into a specially designed flame trap in the process room.
- Suppression, which quenches the pressure shockwave using a chemical suppressant powder, usually sodium bicarbonate.
- Containment, which is when the dryer system is designed as a pressure vessel to contain the material's maximum pressure developed during a deflagration, as determined by the explosion testing described previously.

Two other specialized systems are:

- Infrared spark detection, which can be linked to a downstream water spray to quench the spark before it can ignite the main dust cloud.
- Carbon monoxide (CO) detection, which compares the CO level at the dryer outlet to the level at the inlet. When there's a significant increase in the amount of CO at the outlet, various safety measures can be initiated.

Options for protecting the dryer against a subsequent fire are generally:

- Water, which is controlled by a specially designed valve(s) to extinguish the fire, quench the burning material, and remove the heat. Water is sprayed to cover the entire internal surface of the dryer system.
- Steam, which is controlled by a different valve type. The steam quenches the flames by displacing the air inside the dryer but doesn't remove much of the heat, which the fire brigade will have to address.

If you're drying solvents instead of water from your material, or if there's a significant fire risk, the dryer can be designed to operate without oxygen. This can be done using nitrogen under a closed circuit or by self-inerting, using a specially designed burner that consumes most of the oxygen (approximately 97 percent) in the combustion air. Both system types require a condenser after the powder collection system to remove the vapor evaporated from the dryer feed. The dried exhaust from the condenser is then directed back to the heater. Either system can be used when drying water from the feed material, but only the nitrogen system would be used when drying solvent.

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A dryer's most critical safety equipment and instrumentation are specified by regulations and standards from organizations including the National Fire Protection Association (NFPA), UL, FM Global, OSHA, CSA Group, Control Engineering or by the National Electric Code. All of these industry regulations and standards mandate that certain safety monitoring features are built into new equipment.

If your dryer has a gas-fired burner, determine whether it has gas trains that tie the monitoring instrumentation alarms back to the control system. This could include high- and low-gas-pressure switches and some of the valves. Additionally, other proofing switches and interlocks for airflow and devices must be met before burner ignition. The dryer's control software can monitor these devices and provide first out annunciation for any ignition sequence problems or flame failure. It's important to be able to see where each part of a sequence is proofed in case there is a system fault. That way you'll be able to find the primary cause, make repairs, and be safely up and running sooner.

For steam control and delivery stations as well as steam or condensation trapping stations, pressure gauges should be placed at several locations to alert you of overpressure or back pressure in the steam system, which can lead to a failure in the steam coils or piping system. These gauges can also help in diagnosing system performance issues.

Consistently monitoring the material flow and watching for unusual conditions can prevent material backups and minimize safety hazards and equipment damage.

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Equipment suppliers are a valuable source of information about equipment and processes. In light of this, each month we ask suppliers a question of concern to our readers. Answers reflect the suppliers' general expertise and don't promote the suppliers' equipment. If you have a question you'd like suppliers to answer, send it to Kayla Carrigan, Associate Editor, Powder and Bulk Engineering, *1155 Northland Drive, St. Paul, MN 55120; fax 651-287-5650 (kcarrigan@cscpub.com).*