

Moisture control

Good moisture control systems will also automatically adjust down burners when product flow is reduced or stopped (i.e., changing products).

Quality improvements

The ability to produce product, day-in and day-out, with a narrow moisture content distribution will significantly improve the product quality. With a consistent, on-target moisture control, color and palatability problems will decrease dramatically.

Intangible benefits

Intangible benefits of a quality moisture control system include: Optimum sensor location, automatic control, service and support and the other items described here.

Sensor location

Where is the moisture sensor located? The sensor must be located in a position where it maximizes its ability to sense and then control moisture. Feed-back and feedforward moisture control

systems, although popular, are not as effective as moisture sensors located inside the dryer. The ability to sense moisture inside the dryer and then make adjustments in real-time, as needed, to insure consistent exiting product moisture content adds to a moisture control system's overall ability to reduce the moisture content distribution.

Easy to install and maintain

A good moisture control system will install easily and will be maintained with very little upset, if any, in production. If for any reason the moisture control system fails, will the dryer continue in a manual mode? The answer should be yes!

Non-invasive

The ideal system should also sense and control moisture with as little contact with the product as possible. The more contact a control system has with the product, the more maintenance will be required.

Correct problems

A control system must have the proven ability to handle upsets coming through the dryer. When an extruder unexpectedly starts producing half its normal production or when incoming moisture abruptly increases by a third, the control system must sense this upset and make necessary adjustments to exiting product moisture content so it will remain constant and on target. It's not enough to sense and report the problem; the problem must be corrected without operator input.

Automatic control

A good moisture control system will not replace operators but will give them confidence and more time to perform additional duties. A moisture control system that automatically senses upsets or deviations from target moisture should make the necessary adjustments to maintain a constant exiting product moisture content.

Also, when changing products, most operators are busy at or near the extruder. The control system should automatically reduce heat when no product is going through the dryer and then automatically return to set-point temperature when product begins moving through the dryer again. A control system that simply displays process variables and little else is not an automatic control system.

Short learning curve

Although the algorithms or logic behind the control system might be complicated, there is no reason that the operator interface (OI) should be difficult or cumbersome to use. A good moisture control system will be intuitive and have the necessary on-screen information for operators. It should also be able to be customized to meet particular needs and should be upgradeable as changes and expansions occur. Good systems will allow the operator to input certain process variables or functions that would normally not be found in off-the-shelf systems.

Integration with existing equipment

Manufacturers should demand that new moisture control systems utilize pre-existing control hardware. For ex-

Figure 2. The two-pass, conveyor dryer is a popular configuration in dry pet-food manufacturing. Pet-food enters the upper level on one side, travels the length of the dryer, falls to the second level and travels back to the dryer exit. The circles attached to lines represent temperature probes. The two-pass dryer is usually divided into separate heated zones (primarily utilizing natural gas). Some dryers have separate heated zones on top and bottom (three on the top and three on the bottom), while some dryers combine the upper and lower sections into single zones.

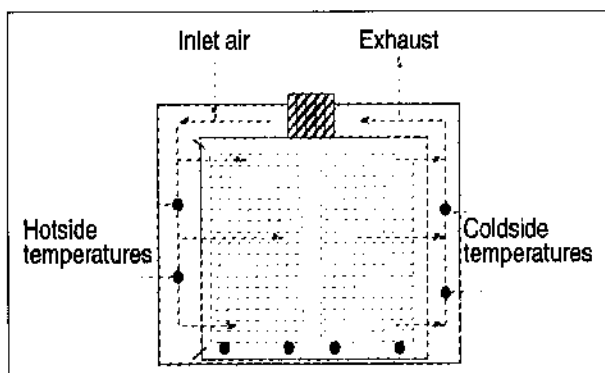
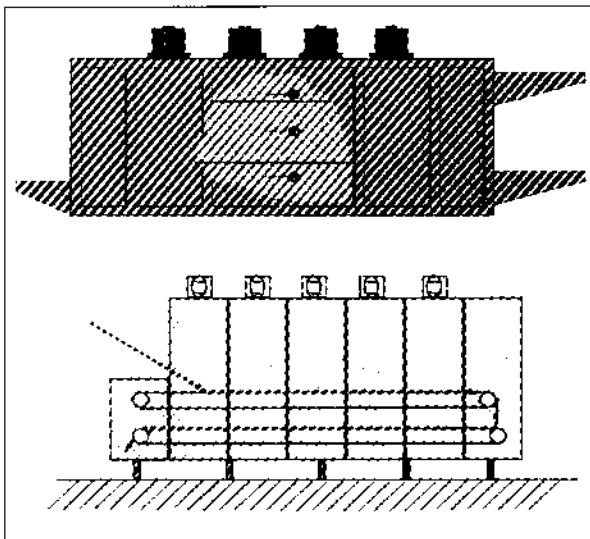


Figure 3. The batch tray dryer utilizing convective air drying (warm air passing over product) is seen in the treats industry: Jerky, rawhide, pigs ears, etc.

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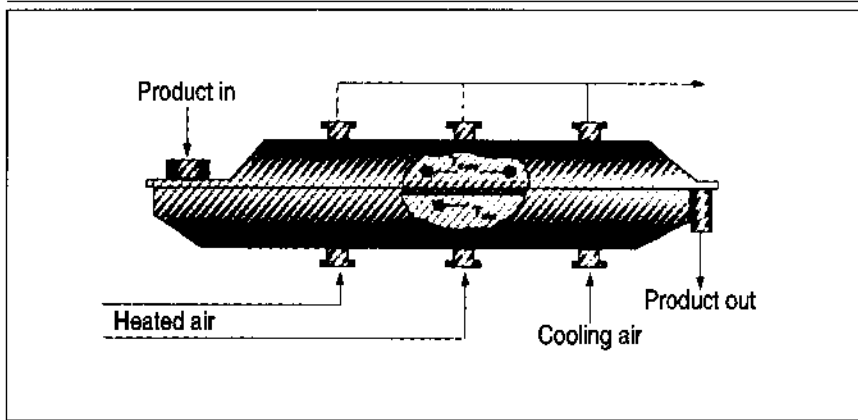


Figure 4. The continuous fluid-bed dryer is similar to conveyor dryers. Hot air flows through the product (usually a powder) in two to three heat zones (usually a cooling zone at the end). It is used for ingredients and additives drying. Kibbles and chunks too large to be fluidized.

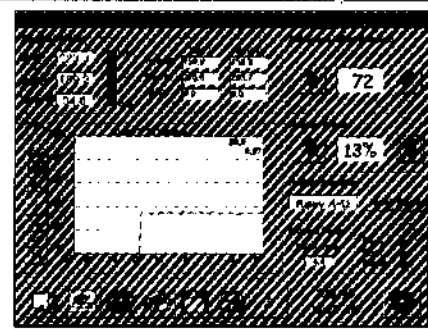


Figure 5. A typical control screen on an HMI (human machine interface) PC. Control software is Windows-based. All process variables, graphical displays and information are located on its screen. One can control the entire dryer (and moisture) from this screen.

ample, if a facility has a PLC, will the moisture control system be able to get on the data highway and utilize all the information contained there or will redundant hardware be installed?

Service and support

Finally, does the manufacturer of the moisture control system have a proven track record of repeat sales? Ask for a list of references of satisfied customers. Do they charge you every time you call for technical assistance? Do they charge for simple cosmetic changes in

the control program? Do they service what they sell in a timely manner? Production is the life's blood of petfood manufacturers—will moisture control manufacturers respond when production shuts down (24 hours a day, seven days a week)? Does the system have a modem as standard or optional equipment? These questions must be answered favorably before selecting a particular control system.

Do a test

After carefully examining the bene-

fits, many systems currently on the market will be excluded. If an impasse is reached with two or more systems, do a test. Grade each system on its ability to produce tangible benefits. Be careful to evaluate the systems with a sound protocol and determine which one lives up to the claims made about it. Most moisture control manufacturers will work with petfood manufacturers and prove their technology. Finally, it's your money, so don't settle on second best or a system destined to fail. ☐

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Methods

Loss of weight on drying—Gravimetric methodology: gold standard for moisture determination, used to calibrate model-based methods, not practical for production line, excellent in laboratory environment.

Moisture I—Non-contact, model-based moisture control technology: measures moisture inside the dryer for real-time sensing and control. Uses temperature probes to sense moisture. Must use inside dryer. Virtually no environmental limitations.

Moisture II—Non-contact, model-based moisture control technology: measures moisture outside the dryer for feedback or feedforward control. Environmental limitations.

Moisture III—Non-contact, model-based moisture control technology: measures moisture outside the dryer (some models internal) for feedback or feedforward control. Some models have environmental limitations.

Resistance/conductivity—Contact model-based moisture control technology: measures resistance/conductivity between two plates of electrodes, usually outside the dryer for feedback or feedforward control. Environmental limitations.