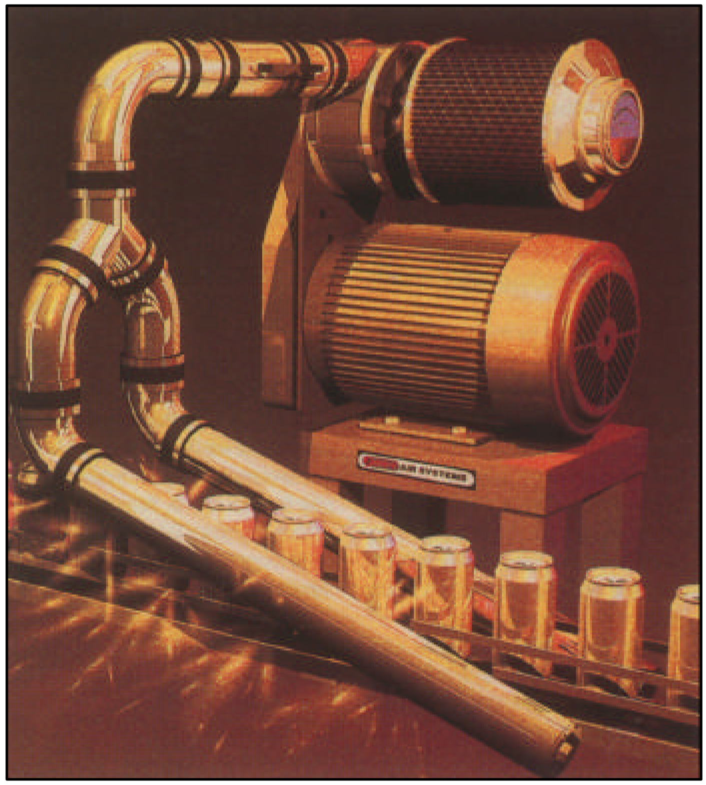
THE Canner & Filler

Damp cans are liable to cause all manner of pack failures as well as make printing difficult, so drying is a necessary process in the filling plant. Specialized techniques are both more efficient and economical than using compressed air, says Daniel VanderPyl.*



How dry is dry?

> **"A little neglect may breed mischief... for want of a nail, the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost."**
>
> **Benjamin Franklin**

Ben Franklin never ran a canning line, but if he had he might have amended his famous quote to warn against the 'nail' that jeopardizes the canner's bottom line – outmoded drying systems.

In the past 20 years, canning line speeds have more than doubled. Filling, labeling, inkjet coding and seaming have seen one major improvement after another, all contributing to greater operating efficiency and more cost-effective use of energy, resources and manpower.

Higher line speeds go hand-in-hand with technology that has enabled a typical plant of 100,000sq ft to double or triple its production within the same four walls.

At a competitive canning facility, each phase of the operation, from filling to packaging, works in concert and is timed precisely to meet the requirements of the next. Yet the equipment used for drying cans has often lagged far behind – the most significant advance being the can twist, which throws water from the surface of the cans.

In plants where drying has traditionally been an afterthought, problems are now routinely causing costly slowdowns and it is only in the last few years that attention has turned to canners' drying systems.

Drying is in a literal sense the invisible process on the canning line – and, being out of sight, has been out of mind. Drying has often not been regarded as a bona fide process; it is something that happens on the fly, a step that occurs in between this or that procedure. Though drying itself is seemingly invisible, the effects of inadequate drying are very easily seen. They include illegible inkjet coding, water spots, rotted packaging and moisture collection beneath pull tabs.

With the phasing out of solvent-based inks, drying has become even more of a challenge for the canner. Cans must be totally dry to ensure the legibility of water-based inks. When inkjet coding is smeared or incomplete, reject rates increase.

Inadequate drying can also cause unsightly water spots, and poor water quality may contribute to the problem. Attempts to purify the water by removing debris and minerals may be helpful, but costly. Water spots may also multiply if cans are conveyed a long distance to a packaging point, or if they are sent on a conveyor to add time for drying. In such cases, dust and dirt may mix with moisture to intensify water spotting. Also, water spots can occur when conveyor lines switch back, one over the other, and moisture is redeposited onto dry cans.

Rotted packaging, the result of moisture on can bottoms, regularly results in tremendous losses. Tinplate cans that are shrink-wrapped are especially prone to packaging failure, particularly if the product is in transit or storage for long periods. Six to eight weeks in a moist, humid environment for cans that are inadequately dried sets the state for damaging package corrosion.

Drying is particularly important for the ring-pull can. Moisture laden pull-tabs pose a possible health hazard, as well as discouraging consumers.

Drying the pull-tab requires a tremendous velocity and volume of air pinpointed to a specific area, a capability not found in many canning line drying configurations.

Neither superior quality nor profitability can be maintained on today's high-speed canning lines with outdated drying systems. High reject rates from inadequately dried cans, waste of energy and rising maintenance costs will eat up the higher profits to be gained from greater productivity. Today, 'getting by' with a substandard drying system is not economically viable.

So how dry must cans be in order to meet the aesthetic and sanitary requirements demanded by today's consumers? For canners, the answers lie at the point of purchase: can are adequately dry if reject rates are zero.

A US$20 million advertising campaign will be a complete waste of money if water-spotted cans hit the shelf. If a label is crooked,

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or if packaging is rotted due to moisture on the can bottom, the product will not sell. Cleanliness, aesthetics and sales are intertwined.

But the technology for efficient drying on a canning line does exist. Canners should demand not only completely dry cans, but also various other capabilities in the drying system they specify.

First and foremost, the drying configuration should be effective. It should dry the cans completely while meeting the requirements of the line speed. It should cause no bottlenecks on the line, no costly maintenance and no flaws that give consumers reason to reject the cans.

Canners are also entitled to drying systems that are energy efficient. Equipment operating costs affect the bottom line, and by converting to the most efficient drying system, canners should be able to save thousands of dollars per year.

A drying system should also be flexible. Canning lines are subject to change at a moment's notice. Production rates, the addition or elimination of lines or the introduction of different sizes or surface contours of cans or pull-tabs may necessitate reconfiguration of the drying system. An inflexible system will cause costly downtime.

Durability is also a vital element of the successful drying system. With canning lines operating 24 hours per day, equipment must be capable of continuous duty without maintenance problems and must be able to withstand extreme washdown conditions.

Canners no longer need settle for hit-or-miss drying, jerry-rigged or homemade systems, doctored equipment with substandard performance or brand-new systems that simply do not dry as originally claimed. Canners have no time to wait for cans to be 'vibrated dry' on endless conveyors set up for just that purpose.

Drying technology used by canners currently includes a basic trio of options:

- Compressed air with air nozzles for water blow-off
- Low velocity air blower with air knives
- High velocity air blower with air knives

In the first, compressed air is delivered to the surface of the can with an assortment of commercially-available and custom-built knives, slotted tubes and nozzles. Air volumes are between five and 30 cfm per linear inch of air knife with exit velocities of 15,000-30,000 fpm (170-340 mph).

It is commonly accepted that the main benefit of using compressed air for drying is the apparently unlimited air supply available to the plant. ('apparently', since this supply of air is in fact not unlimited – it is required for other uses and becomes extremely expensive when used for drying.) A second suggested benefit is that compressors are already in place, delivering air to actuate pneumatic cylinders, operate tools and fill large receivers throughout the plant. This option therefore appears to be inexpensive.

However, compressors were never designed for continuous duty drying service and are very inefficient when used for this purpose. Compressed air is delivered at pressures of 100 psi or more, but by the time this air exits the nozzle for drying, discharge pressures are well below 5 psi, volume is low and the capacity to shear off moisture is minimal.

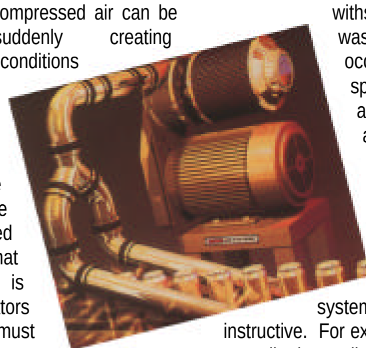
In addition, maintenance costs on compressors skyrocket with 24-hour operations. Because the compressors are already supplying various plant functions with air, fluctuations in line air pressure may occur. Therefore, compressed air can be unpredictable, suddenly creating inadequate drying conditions for one can or hundreds, for a second or for minutes at a time.

Moreover, the oil and moisture found in compressed air means that complete drying is impossible. Operators learn that they must invest in extra filtration to prevent oil or moisture from contaminating the cans as they are dried. Drying quality is also impaired by the cool air delivered by the compressed air dryer.

In low-velocity air blower systems supplying air knives, a paddle-wheel centrifugal fan generates high air volumes at low air-knife pressure --- air volumes of 18 cfm per linear inch per air knife at exit speeds of 12,000 fpm (135mph).

Low-velocity air blower systems use less energy than compressors, and sound levels are also lower. In addition, this system delivers air uncontaminated by oil or moisture and does not require extra filtration. Designed for continuous duty, low-velocity air blowers offer low maintenance costs and are highly durable.

The low-velocity air blower with air knives was an adequate drying solution for canners prior to the advent of increased line speeds. Complete drying on today's high speed canning line may require twice the number of low-velocity air blowers consuming twice the power required by high-velocity air-blower/air-knife configurations. The cost of low velocity air equipment itself and equipment operating costs are prohibitive when throughput rates accelerate.



Left: Sonic Air Systems high-velocity air blower and air knives are able to keep up with the fastest line speeds.

By using even higher exit velocities, more economical use can be achieved. A high-velocity air blower with air knives uses a high-speed centrifugal fan supplying air at 12 cfm per linear inch with exit speeds of up to 35,000 fpm (400mph).

This configuration consumes up to 75 percent less energy than compressed air systems and 50 percent less energy than comparable low-velocity air-drying systems. Additionally, the high-velocity system generates heat of compression as a result of the 1.5 to 4.0 psi pressure rise produced by the blower. The air exiting the air knife is as much as 80 F deg above ambient temperature, and it is oil and moisture free.

The high-velocity air blower is a self-contained air system, dedicated to each line, so fluctuations in line pressure (and in drying efficiency) will not occur. It is rated for continuous duty, is durable enough to withstand the most extreme washdown conditions and occupies minimal floor space. Finally, it is flexible; air knife configurations and air velocity can be adjusted to fit any line speed and any can size.

A comparison of power usage between compressed air and high-velocity air systems used for drying is instructive. For example, on a single-file 12 oz pull-tab can line which after exiting the can twist would run at 1,200 cans per minute, water must be sheared from the bottom of the can for inkjet coding. Compressed air to completely dry this product using six Air Comb assemblies producing air at 45-50 psi would have power consumption of 30hp. A high velocity air knife/blower system with a 1.5in nozzle followed by a 24in air knife tube to dry the same product would use 6.5hp. Based on 1,200 cans per minute with 23.5hp reduction at 9 cents per kwh, savings of US$1.58 per hour of operation would accrue. On a continuous basis, at 24 hours per day, 365 days per year, annual savings would equal $13,840 per air knife station (of which there may be more than one per line).

To meet the demands of today's market, canners are seeking ways to cut costs and improve efficiencies all along the canning line. Those who find the best solutions for fastest throughput have a more competitive edge.

Technology exits to resolve any drying challenge on the canning line both efficiently and cost-effectively. Substandard solutions, today as in Ben Franklin's day, should never be acceptable.♦

Why use specialised air drying systems?

Compressed air systems in production plants are intended to provide high pressure air at low flow rates. Air drying requires high volumes of clean low pressure air. Drawing large volumes of air from high-pressure systems causes pressure drop impairs performance, so that drying effectiveness is variable. Specialized high-volume, high-velocity supply systems for air drying are designed for continuous use and more economical operation.

* Daniel VanderPyl is president of Sonic Air Systems, 4111 N. Palm St., Fullerton, CA 92835 USA. Tel: 1 714 870 2700. Fax: 1 714 870 0100.