# GET LOW D.O.
## IN BEVERAGE PACKAGING

### Setting Yourself Up for Successful Dissolved Oxygen Management

CANNING BOTTLING
WILD GOOSE
FILLING

# The Lowdown on Dissolved Oxygen During Packaging

Dissolved oxygen (D.O.) in your beverage can cause unwanted oxidation, leading to off flavors and shortened shelf life. Your packaging processes and equipment can have a big impact on dissolved oxygen in your products. Knowledge about D.O. and how to minimize it can keep your drinks tasting fresh.

## Set yourself up for low-D.O. success by following these steps:

## STEP 1 Get real about D.O. guarantees.

Beware of equipment manufacturer claims that promise certain dissolved oxygen results. Dissolved oxygen is dependent on many factors!

In fact, any filling system has the potential to produce undesirable D.O. levels if an operator is not properly trained to manage the equipment.

**BE AWARE!**

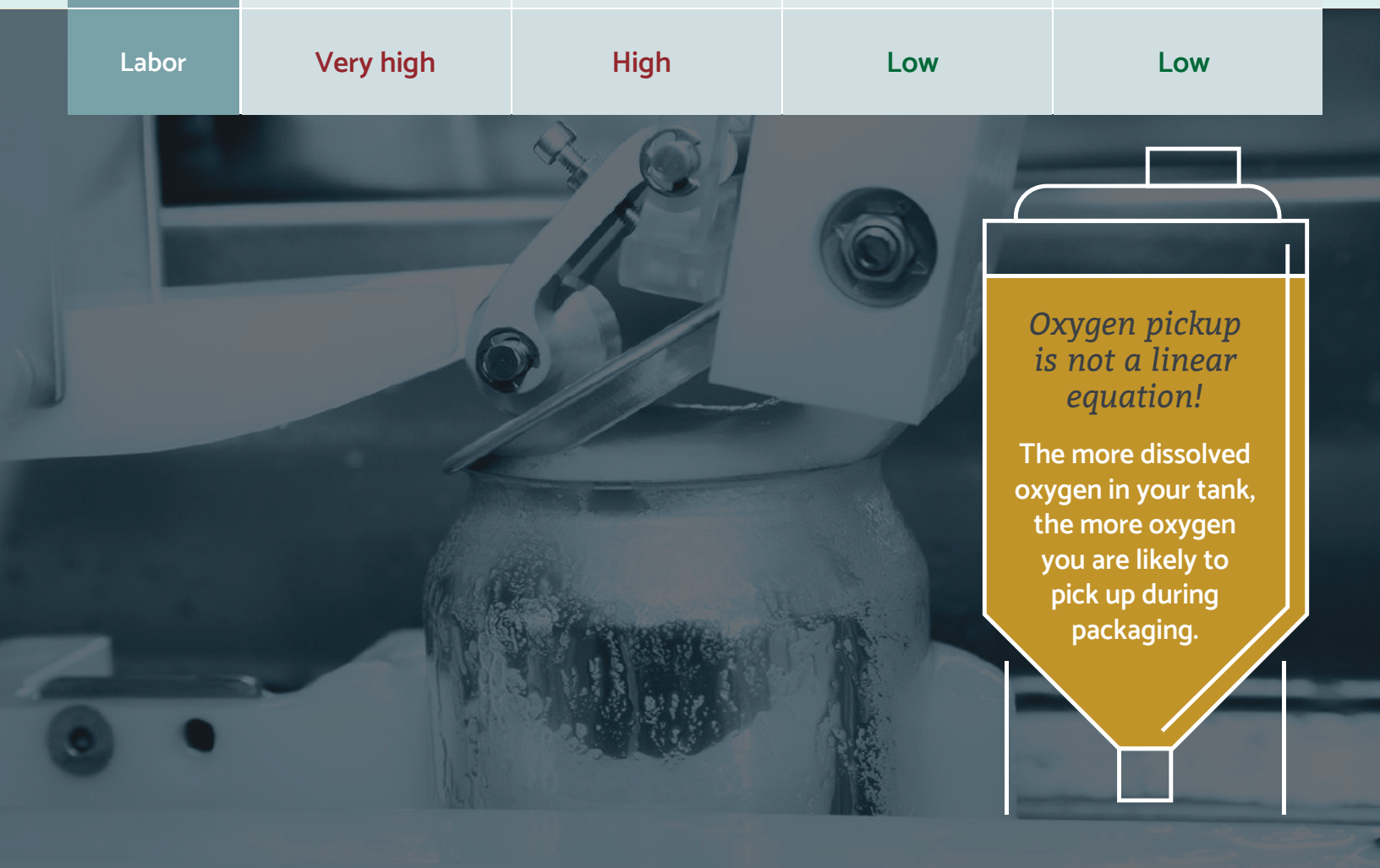
*An inline filling system cannot guarantee you*

**"Under _#_ ppb dissolved oxygen."**

# STEP 2 Invest in filling equipment with D.O.-minimizing technology.

## What results can you achieve on different types of filling systems?

| | Hand Packaging *Crowler, Growler, On-Demand* | Manual System *Limited Automation* | Inline System *Atmospheric or Counter Pressure (Isobaric) Automation* | Rotary System *Large-Scale Automation* |
|---|---|---|---|---|
| D.O. Pickup Potential | High | Dependent on operator | Low | Low |
| Packaged Product Shelf Life | Up to 3 days | Less than 6 months | 6 months | 6 months |
| Cost | Very low | Low | Moderate | High |
| Labor | Very high | High | Low | Low |



*Oxygen pickup is not a linear equation!*

The more dissolved oxygen in your tank, the more oxygen you are likely to pick up during packaging.

**When purchasing a packaging system like a canning line, look for well-engineered, quality equipment that offers:**

## Multi-stage low + high flow control

Produces good liquid-to-foam ratio

## Filling from bottom to top

Gives fast pours while reducing turbulence and splashing

*Residual liquid is naturally exposed to the environment between fill cycles, so look for bottom-actuated fill heads to prevent oxygen intake. Bottom-actuated subsurface filling also minimizes cross contamination.*

## Proactive D.O.-blocking technology

*(pre-purge, bubble scraper, underlid gassing)*

Works together to maintain an oxygen-free environment

## Control over fill timing

Creates smooth, $CO_2$-rich foam cap bubbles to push out oxygen, as well as accurate fill volume to ensure proper headspace

## Foam pulse control

Generates foam cap barrier without breakout

## Variable line restriction

Provides total control of flow rates and turbulence throughout the fill process at multiple flow rates

*With variable line restriction, you can use one flow rate to initiate the fill, and another to maximize throughput (speed). In addition, look for the option to return to low flow at the final fill stage to provide accuracy and optimal filling conditions.*

## Control of can lid placement and lidless can detection

Firmly seats the lid from placement to seaming, and alerts the operator in the case a lid is missed prior to seaming

## Repeatable seaming

Prevents leaking seams and preserves a low-oxygen environment

## Consistent, reliable machine operation

Keeps product flowing smoothly without interruptions

# STEP 3 Control your packaging variables.

Proper use of your filling system and control over your fill process are the keys to minimizing dissolved oxygen during packaging.

## Make sure your packaging process includes:

- ✓ Knowledgeable, manufacturer-trained operator
- ✓ Well-designed packaging layout that limits product transfer and agitation
- ✓ Managed product conditions, like temperature or carbonation
- ✓ Pre-filling conditions that minimize oxygen pickup
- ✓ Control over your fill: $CO_2$ purging, flow rates and minimal disturbance

**D.O. Tip:** *Avoid turbulent air movement around the container while it is open.*

- ✓ Good liquid-to-foam ratio with a small-bubble foam cap
- ✓ Well-calibrated and maintained equipment

### AVOID PRE-FILL D.O. RISKS:

- Dented or damaged containers
- Using non-deaerated water or oxygenated cleaners for pre-rinsing
- Leaving residual rinse liquid in the container before filling

### WATCH OUT!

Damaged or loose hoses, gaskets, clamps and other components throughout your packaging process can raise your D.O. levels.

## Do “closed” filling environments like counter pressure systems automatically reduce dissolved oxygen?

**No.** No filling system remains under constant closed pressure. All fillers, including counter pressure (isobaric) machines, open to the atmosphere before a lid is applied to the can or bottle, giving oxygen a chance to move in. If the exposure time is long and/or the cap on foam is suboptimal, additional steps must be taken to minimize D.O. *regardless of the fill technology*.

**To reduce dissolved oxygen, properly controlling your fill process and investing in quality equipment makes all the difference.**

# STEP 4 Set measurable D.O. targets based on your product goals.

There are no defined rules stating your dissolved oxygen levels must be below a precise limit of # ppb.

General guidelines in craft brewing suggest keeping your total D.O. pickup under 100 ppb, for instance, but your product quality, flavor and shelf life should be the ultimate drivers of your D.O. processes.

**IT DOESN'T TAKE MUCH OXYGEN TO SEE HIGH D.O. LEVELS:**

The equivalent of 1 liter of air in a 3000L tank = 100 ppb D.O. in your product!

Focus on actionable results to make continual improvements in D.O prevention.

# ASK YOURSELF:

## What is your intended shelf life?

Dissolved oxygen negatively affects flavor over time. According to can manufacturing companies, even the best packages offer just a six-month recommended shelf life, no matter how low the initial D.O. levels. In the case of bottles, additional light that comes in through translucent glass further can further shorten potential shelf life.

Minimal D.O. pickup is ideal in all cases, but the effects of D.O. are more drastic if the product is being broadly distributed (longer shelf life needed) versus being sold in a tap room for immediate consumption (shorter shelf life needed). On-demand cans manually filled and sealed from a tap are prone to high dissolved oxygen levels and should be consumed within 3 days. After that time, oxidation will noticeably impact product flavor and quality.

You can't control how soon your customers drink your product after purchase, so make sure your D.O. processes uphold your product quality and brand reputation.

# STEP 5 Commit to best practices for dissolved oxygen management.

## Invest in analyzing equipment.

Good instruments like a dissolved oxygen meter will accurately measure small PPM or PPB quantities.

## Measure consistently.

Create (and follow!) standard operating procedures (SOPs) for dissolved oxygen management and train staff on quality control processes. Testing at every potential D.O. pickup location is best. Most importantly, know what you're measuring: dissolved oxygen (D.O.), total package oxygen (T.P.O.), headspace oxygen (H.O.), and shaken or unshaken measurements are all different things.

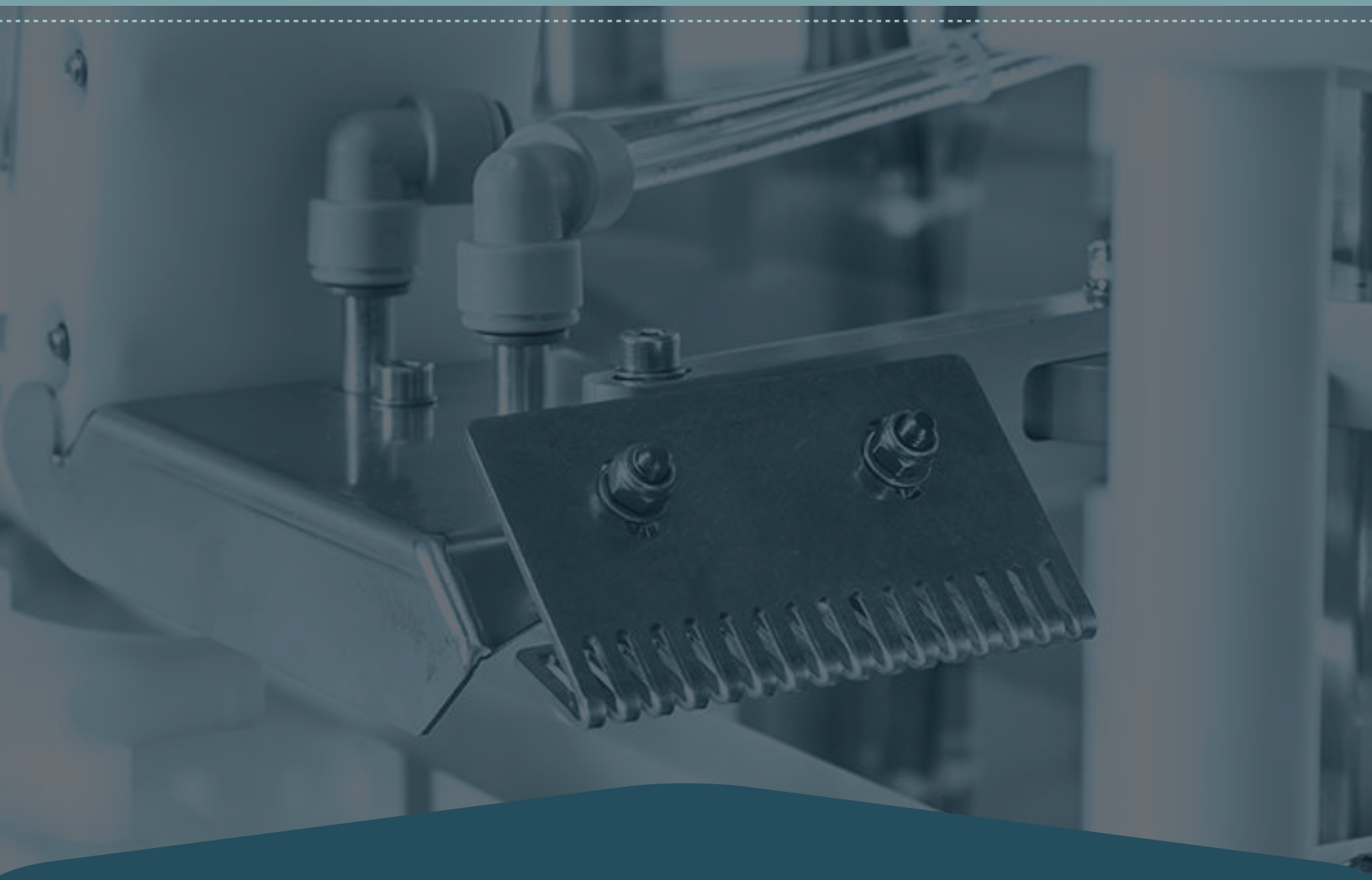
## Evaluate your product.

Take time to conduct a sensory panel and understand what D.O. levels mean to your beverage flavor.

## Document the results.

Keep track of your D.O. data so you can monitor trends and progress over time. Having baseline information helps you identify problems and make informed decisions in your D.O. reduction efforts.

Any time your product transfers from one vessel to another, it can pick up oxygen. By paying attention to best practices, investing in quality equipment and focusing on your product quality, you can create a recipe for low-D.O. success during packaging.



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