WHY MEASURE DISSOLVED OXYGEN IN THE BREWERY?

Beer contains many substances that react on exposure to oxygen. These oxidation reactions are greatly accelerated by warm storage and pasteurisation, since oxidation is more rapid at higher temperatures. Neglect of proper oxygen levels can cause noticeable changes in taste and clarity of the final beer.

Care must be taken throughout the brewing process to minimise oxygen pickup from air. The last, and perhaps the most critical step, is the elimination of oxygen addition in the packaging operation. All steps, from the fermenter to the package, must be taken into account since this oxidation is an additive process, resulting in the reduction of your product's shelf life expectancy and taste.

In Wort

In fermentation, oxygen is essential for adequate propagation of yeast cells. During the boiling operation, virtually all of the oxygen is driven out of the wort so, once it has been cooled to the appropriate temperature, oxygen must be added by injection or aeration. In traditional brewing operations, the wort is saturated to a desired dissolved oxygen level of about 8-12 ppm, although some modern strains of yeast can require as high as 20 ppm.

Precise control is required when adding oxygen or air to the wort. If there is too much oxygen, this will result in an undesired, rapid and over-vigorous fermentation. This affects flavour and results in excessive yeast growth. Oxygen levels in wort should be optimised based on yeast manufacturers recommendation and wort original gravity.

Conversely, a lack of oxygen in the initial stages results in poor fermentation and could lead to an increased level of acetyl coenzyme A in the yeast cells. This in turn can produce higher levels of esters in beer and other undesirable off flavours.

In Beer

After one day of fermentation, dissolved oxygen levels will fall to less than 30 parts per billion (ppb). As a result, the yeast breaks down the fermentable sugars producing alcohol and other sensory by-products. Some of these by-products are extremely susceptible to oxidation, along with polyphenolic hop and malt flavour compounds. The objective for the brewery is to minimise oxygen contact with the beer on its journey from fermenter to the package. If beer exposed to high levels of oxygen is packaged, irreversible damage will be done to the flavour profile.

British cask ale is commonly regarded as not requiring this protection since it still contains yeast, and traditionally ale has been served by allowing air to enter the cask as it is dispensed. In practice, significant oxidation does occur and this, together with the effects of air-borne microbial contamination, leads to a very short shelf-life.

Careful beer handling in the brewery can result in packaged dissolved oxygen values of less than 100 ppb. At this level the shelf life will be greatly extended.

In Brewing Liquor

When producing blended beers with a lower gravity it's important to use carbonated water that has been properly de-aerated. In high gravity brewing, this capability significantly reduces the overall dissolved oxygen value that will be found in the beer after blending.

DOC040.52.10045.Jul14