

Characterizing Beer stability with the Turbiscan

- Haziness, foam and process optimization -



Introduction

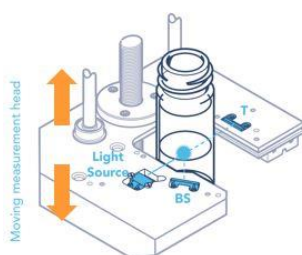
Beer, one of the oldest beverages produced by humans, appeared as early as 5,000 years ago. It is a complex beverage, containing a diverse mixture of carbohydrates, proteins, and aroma compounds. Unlike other manufactured beverages that can be easily fine-tuned by adding/removing ingredients, the natural fermentation process does not lend itself to simple tuning to achieve precise ingredient concentrations. Instead, raw ingredients and processing parameters (i.e. time, temperature) must be carefully adjusted to achieve the desired stability and sensory profile. Unfortunately, the Turbiscan didn't come along until 1994 to help brewers fine tune the stability of their beers and easily estimate shelf life and other quality parameters (yeast sedimentation, haze stability, flocculation, clarity, foam...). The Turbiscan can be used to quantitatively predict sedimentation of yeast and proteins, haze stability, flocculation, clarity and foam stability, all of which are key parameters for many beer types

KEY BENEFITS

QUANTIFIED
NO DILUTION
SENSITIVE

Reminder on the technique

Turbiscan® technology, based on Static Multiple Light Scattering, consists on sending a light source (880nm) on a sample and acquiring backscattered (BS) and transmitted (T) signal over the whole sample height. By repeating this measurement over time with adapted frequency, the instrument enables to monitor physical stability. The signal is directly linked to the particle concentration (φ) and size (d) by the Mie theory knowing refractive index of continuous (n_f) and dispersed phase (n_p):



$$BS = f(\varphi, d, n_p, n_f)$$

The Turbiscan® and Turbiscan® Stability Index (TSI) are 'must-have' tools for formulators for fast and quantitative formulation screening, rapid product development, and quantitative measurements of stability. Turbiscan technology has been used for decades by formulators for stability measurements and is now recognized as a standard technique for direct stability analysis.

Methods



The Turbiscan can be used to quantitatively predict sedimentation of yeast and proteins, haze stability, flocculation, clarity and foam stability, all of which are key parameters for many beer types. In this note, we will highlight the utility of the Turbiscan for analyzing beers at all stages of the brewing process for raw ingredient analysis, optimization of processing parameters, and rapid shelf life determination.

Stability analysis of a "hazy" IPA

Hazy IPAs have gained significant popularity in recent years and represent an emerging trend for craft and large breweries. These beers are characterized by their hazy appearance that has been described as similar to that of orange juice. Indeed, the taste profile is commonly quite fruity.

These types of IPAs are especially prone to sedimentation due to their high turbidity (proteins, yeast...) and for optimal consumer experience, the haze should be stable in a variety of storage media (cans, bottles, or kegs) at given temperature. The early stages of this destabilization phenomenon can be detected using the Turbiscan (**Figure 1**).