TESTING BITTERNESS AND COLOUR IN FINISHED BEER: A CASE STUDY

Background

No standard method for in-house testing of bitterness and colour on final product. Wanted to utilise these parameters to ensure proper quality control.

Solution

After a trial with the DR5000, the decision was taken to go with the DR6000 which includes customised brewery software with 12 brewery methods.

Benefits

BrewDog has achieved confidence and consistency in their results while testing for bitterness, colour and total polyphenols. There is also future opportunities to use their instrument for testing critical raw water and wastewater parameters.

BrewDog Head Office, Aberdeen

Background

When Martin and James founded BrewDog in 2007, they were looking to produce new and different types of brewed lagers and ales compared to the ones that dominated the UK market. Initially, they started with brewing tiny batches, filling the bottles by hand, and selling their beers at local markets and out of the back of their old beat up van.

They operated their company with the BrewDog mission statement "To make other people as passionate about great craft beer as we are".

By 2008, BrewDog was the second largest independent brewery – quite an accomplishment for a brewery in it's second year of operation. By 2010 BrewDog had opened its first craft beer "bar" in Aberdeen.

In 2012, the 5-year dream for Martin and James became reality as BrewDog moved into the newly built, world class craft brewery located just outside Aberdeen in the town of Ellon.

In 2013, riding on their success with the brewery, James and Martin began starring in "Brew Dogs" aired by the Esquire network in the US. They traveled to craft brewers around the US, teaching viewers about craft beer, and even brewing some very unique beers.

According to the Brewers Association , the representative body for the US craft brewers, a craft brewery must be small, independent and traditional.

- Small: Annual production of 6 million barrels of beer or less.
- Independent: Less than 25% of the craft brewery is owned or controlled (or equivalent economic interest) by a beverage alcohol industry member that is not itself a craft brewer.
- Traditional: A brewer that has a majority of its total beverage alcohol volume in beers whose flavour derives from traditional or innovative brewing ingredients and their fermentation.

Punk IPA started BrewDog's craft brewing revolution

Methods to ensure product quality

At BrewDog, the team prided themselves on utilising the highest standards of lab analysis as a way to ensure their product quality and adhere to their corporate principles of:

- No added ingredients or preservatives.
- No chemicals.
- No cheap substitutes – just barley, hops, yeast, water and mind-blowing flavour.

Specific BrewDog methods

- Beer Colour 430 nm programme 2006.
- Bitter Units Beer 275 nm programme 2001.
- Bitter Units Wort 275 nm programme 2003.
- Total Polyphenols 600 nm programme 2002

The DR6000 software with customised brewing methods supports applications that are relevant for brewery analysis. The application software contains 12 methods, according to MEBAK, ASBC and EBC. These methods include: Anthocyanogens, Iron, Steam volatile phenols, Bitter units, Phtometric iodine, Thiobarbituric acid number (TAN), Free amino nitrogen, Reductones, Vicinal diketones.

BrewDog's This. Is. Lager.

Definitions:

A quick look at the parameters BrewDog is measuring and their importance:

International Bitterness Units (IBU)

This is a measure of the actual bitterness of the beer as contributed by the alpha acid from hops. Because the bitterness of a beer is subjective to the taste of the drinker, and the balancing malt sweetness of the beer is not always an accurate measure of the hoppiness of the beer, the laboratory analytical method has become the standard for measurement.

Colour

Colour measurement is important in the brewing industry as awareness of quality increases. The hue or shade of a beer is primarily derived from grains, and is sometimes derived from fruit or other ingredients in beer. Beer styles made with caramelised, toasted or roasted malts or grains will exhibit increasingly darker colours. The colour of a beer may often, but not always, allow the consumer to anticipate how a beer might taste. It's important to note that beer colour does not equate to alcohol level.

Total Polyphenols

Total polyphenol content in beer, varies between 12 and 52 mg/100 ml, depending on beer type. Ale beer/dark beer are richer in polyphenols (52 and 42 mg/100 ml respectively). Regular beer contains about 28 mg/100 ml total polyphenols. Alcohol free beer contains about 12 mg/100 ml polyphenols. Beer contains a wide variety of polyphenols and classes. However, content values for each of the single polyphenols are rather low. Nevertheless polyphenols play an important role in beer flavour (bitterness, astringency, harshness), colour and beer stability.

The **Brewery Upgrade Package (LZV936)** contains 12 brewery methods with pre-programmed curves.

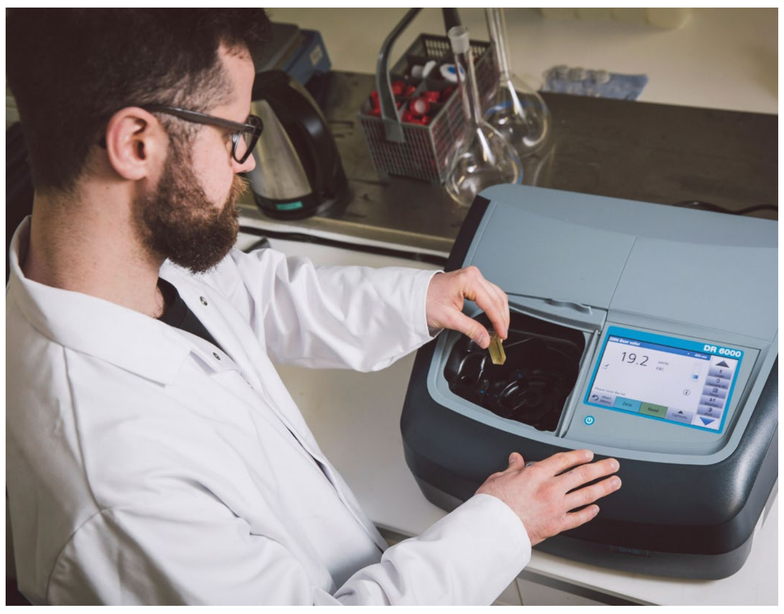
Overview of the DR 6000 Spectrophotometer

The UV-VIS Spectrophotometer uses discrete wavelengths of light to determine the concentration of certain compounds in a sample. The basic premise is that specific wavelengths of light will be absorbed by substances across a certain distance. The more light absorbed, the more "stuff" there is in the sample.

For the person in the lab, the fact is that a UV-VIS Spectrophotometer can analyse different, yet critical, aspects of the beer throughout the brewing process, ensuring they are producing consistent quality beer across their many styles.

The DR6000 provides the BrewDog site with a quick turnaround of the formentioned parameters, and also allows the process team to make minor changes to ensure the same quality of the end product is met every time. The BrewDog team found great efficiencies and consistency in utilising the DR6000 for the methods listed above.

Moving forward, Brewdog will be also using the DR6000 for the analysis of phosphate, COD, nitrate chloride, chlorine and iron.



QC methods being performed using the Spectrophotometer

Service included

Following delivery, Hach was able to offer full training and implementation support as well as a Comfort Maintenance Agreement on the instrumentation, ensuring that an annual inspection and calibration are carried out. The service agreement provides a high level of operational reliability for the instrument ensuring maximum uptime.

Conclusion

Jan Klos, BrewDog Lab QC Technician comments, "the DR6000 has been with the lab QC staff for a few years and has become part of our essential lab equipment for day to day, hour to hour measurement. With our ever increasing job list in the lab, it is great to have an instrument that is easy to setup and work with and that provides confidence in every result. The lab team looks forward to getting to grips with the reagents test kits for water quality parameters."

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DOC142.52.20223.Dec15

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