

# Simplify Your Fermentation Efficiency

## Introduction

To control flavour and quality, brewers rely on a number of tests to prove and maintain consistency. Brewing associations and government agencies have set guidelines for testing specific parameters important for determining and controlling beer quality.

In this case study, we are focussing on a key brewing parameter – Free Amino Nitrogen (FAN). Testing for FAN is a part of standard brewing quality control analyses. This enables the protein content to be estimated and serves as an indicator of beer quality.

### What is Free Amino Nitrogen (FAN)?

FAN is extracted from the malt during the mash process. The age and quality of the malt will influence the amount of FAN that is present in the wort.

FAN is an important nutrient to the brewer and is vital to maintain healthy yeast cells during fermentation.

### Benefits of measuring FAN

When mashing, a brewer should get amino nitrogen from the grain. The benefits of measuring FAN levels allows the brewer to make a decision on whether or not they need to add more nutrients to the wort prior to fermentation.

This measurement means brewers can avoid losing product and saving costs. If the necessary nutrients are not added, then the mash may not completely ferment (this is known as stuck fermentation) and the yeast cells don't survive due to the lack of free amino nitrogen. The stuck fermentation is then thrown away, causing the brewer to lose product and production time.

### Why is FAN measurement important to a brewer?

FAN is regarded as a good index for predicting healthy yeast growth, viability, vitality and fermentation efficiency which leads to beer quality and stability. If a brewery tests for VDK and they keep having issues, testing for FAN could be useful as this could be the root cause of their VDK problem.

### Low levels of FAN

Low FAN levels may indicate slow or incomplete fermentation. Worts low in FAN can have high diacetyl. Basically, if a brewer feeds their yeast cells, the yeast will try to make their own amino acids (valine) which will produce more diacetyl.

Usually malted barley supplies all the FAN needed. However if a brewer uses corn, rice, unmalted wheat or barley, honey, or refined sugars then the wort won't have enough nutrients necessary for the yeast to build strong cells. Extracts are sometimes thinned with corn sugar and will cause low FANs. So nutrients would need to be added to the wort.



Fig 1. Wort Fermentation

### High levels of FAN

Measurement of FAN allows the brewer to reduce the risk of high levels of FAN, which can lead to problems, both in the taste and in the microbiological stability of the beer. If there is too much nutrient, the beer gets infected by microbes; spoiling the finished beer and costing the brewer time and money as they will have to throw the beer away.

### When and where should FAN be measured?

Samples should be taken before fermentation at the brew kettle. Samples can also be measured in beer.

### How to test?

Tests can be performed using relatively simple and inexpensive UV-Visible spectroscopy methods.

The DR6000 UV-VIS Spectrophotometer supports many of the analytical measurements necessary for monitoring throughout the entire brewing process; from raw materials to final product.

The DR6000 brewing-specific software has been expanded to include the most important parameters from both MEBAK and the American Society of Brewing Chemists (ASBC). This means that the DR6000 can be used to measure beer quality around the globe.

In the DR6000, the programmes for the measurement of FAN are available in accordance with both MEBAK and ASBC.

- FAN, light beer Programme 2008 0 - 400 mg/L FAN
- FAN, light wort Programme 2007 0 - 400 mg/L FAN
- FAN, dark beer Programme 2016 0 - 400 mg/L FAN
- FAN, dark wort Programme 2015 0 - 400 mg/L FAN
- ASBC FAN, beer Programme 2024 0 - 400 mg/L FAN
- ASBC FAN, wort Programme 2025 0 - 400 mg/L FAN

### FAN MEBAK and ASBC Methods

The methods for both MEBAK and ASBC are identical. The prepared beer or wort is mixed with a colour reagent (based on ninhydrin) and the absorbance is measured at a wavelength of 570 nm in a 10 mm cuvette.

**ASBC method – Wort-12 0 - 400 mg/L and Beer-31 0 - 400 mg/L**

**MEBAK, Wort, Beer, Beer-Based Beverages, 1st Edition 2012, page 84 ff**



*Fig 2. FAN Measurements with a DR6000 UV-VIS Spectrophotometer*