

Case study

The use of the Aber PerfectPitch at Summit Brewing Company, St Paul, Minnesota

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By Rhys G. Jones, Aber Instruments Ltd

Introduction

Historically, yeast has been pitched into fermentation vessels based on mass or volume, and adjusted according to the viability of the sample. This method may result in highly variable and unpredictable fermentation times, large batch-to-batch variation and inconsistent product quality.

This variability in fermentation times directly impacts and reduces the product throughput of the brewery as well as the quality and consistency of the product. Breweries both establish and differentiate themselves from others based on their product brands; each is unique in its flavour, aroma, body and various other characteristics. Once this brand quality has been established, it is imperative that this remains consistent and recognisable to the customer. Therefore being able to consistently replicate the product quality with little or no process deviation becomes a pivotal aspect to any brewer hoping to maintain consistent flavour and a loyal customer base.

A brewery looking to expand and hoping to increase throughput may do so in two ways, the first by purchasing additional fermentation vessels and expanding inorganically, or the second option, and the far more cost-effective option, is to increase and maximise the output of existing vessels. Why make large investments when the same product throughput may be achievable with minimal expenditure and improving efficiencies with the existing vessels?

Key objectives for an expanding brewery are maximising product throughput and making the most efficient use of fermentation vessels. This may be achieved in two ways, firstly reducing the end of fermentation time by consistently achieving the correct target pitching rate concentration, and secondly, and as importantly, reducing process variability and improving consistency with regards to end of fermentation times to aid in planning.

The Aber PerfectPitch is a mobile skid that is built for craft brewers to help pitch yeast more consistently. The skid is comprised of the successful Aber Compact Adapt probe, a flow meter and a V350 monitor that serves as a mini PLC.

The skid is designed to be easily connected to hoses, and may be wheeled around, ideal for cone to cone pitching and a perfect fit for use in craft breweries with multiple fermenters. In addition, the Aber PerfectPitch is designed to undergo CIP and is IP65 rated.

The PerfectPitch has been very well received since its inception in 2014 and is now well established throughout the US, improving craft brewer's processes across the board.

How does the Aber PerfectPitch work?

The Compact probe works on Aber Instruments' trusted principle of capacitance measurement, where only the viable/live yeast concentration is measured online, in real time. The Compact and the flow meter work in conjunction with one another by communicating complimentary measurements to the Aber V350 PLC which totalizes the live cell concentration passing through the PerfectPitch and into the fermentation vessel. This ensures that the correct concentration of live yeast is pitched every time. A beacon on the Aber PerfectPitch is activated when the pre-set target concentration is reached, which may be used as an indicator to switch off the pump.

Individual recipes may be stored as a pre-set program within the Aber PerfectPitch based upon yeast strain and wort volume. The PerfectPitch may be used to pitch into the first brew and then to re-seed from cone to cone. CIP can be performed inline without issue.

For more information on the principle behind the Aber measurement, please get in touch with - support@aberinstruments.com



Objectives:

The following case study was performed at Summit Brewing Company in St. Paul, Minnesota to assess the functioning and benefits of the Aber PerfectPitch. The impact of using the PerfectPitch at Summit was also compared to their previous pitching strategy.

Summit was an ideal candidate to work with because of its recent and continued expansion, exceptional reputation and emphasis on product quality and throughput. The work in this study was conducted on its two main brands, EPA and SAG.

All data was gathered independently by Summit Brewing Co. And has not been modified, omitted or interfered with in any way.

Results:

Following the calibration of the yeast strains, the PerfectPitch system was used for pitching. Over a period of twelve months, data gathered which is seen below contrasted against comparative data over a period of six months prior to the installation of the PerfectPitch.

The ABER PerfectPitch estimates the right amount of live yeast relative to the target yeast concentration...

...pitching the appropriate litres of yeast necessary for an improved fermentation performance.

Pre (red), post (green) and target (black) viable pitching rate relative to the introduction of the PerfectPitch

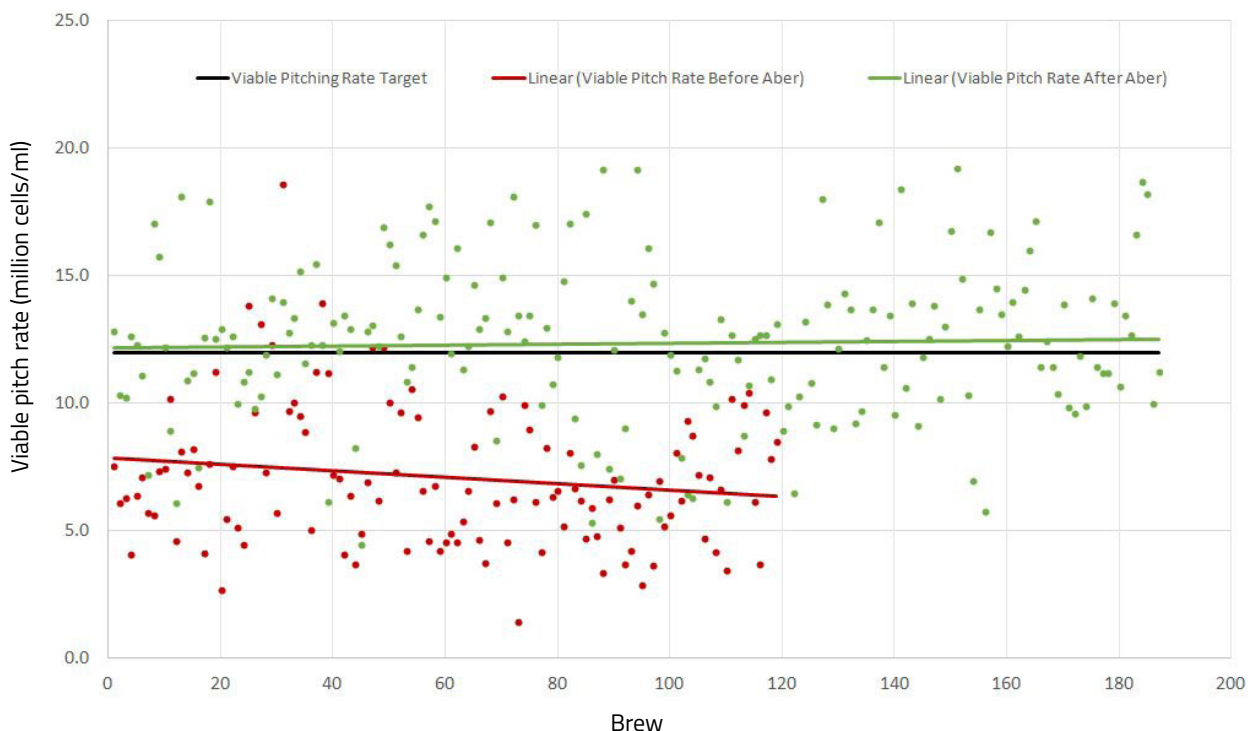


Figure 1

Viable cell pitching rate (CPM) for small FV brews (400hL) with linear trendline's for viable pitch rate pre (red line – 7.1 million cells/ml) and post (green line – 12.3 million cells/ml) introduction of the PerfectPitch relative to the target pitch rate (black line – 12 million cells/ml).

This leads to slower fermentations and inadequate fermentation performance. In contrast, the Aber PerfectPitch estimates the right amount of live yeast relative to the target yeast concentration, thus pitching the appropriate litres of yeast necessary for an improved fermentation performance. This can be seen in the precision of the green trendline in relation to the black, target cell concentration.

The same trend for pitching rate was seen for large FV brews (800hL) with the average viable pitching rates of 10.8 million cells/ml pre installation and 20.8 million cells/ml post introduction of the PerfectPitch relative to the target pitching rate of 20 million cells/ml (data not shown).

The high variation in the cell concentrations at the start of the fermentation is likely because the pitching rate is manually assessed which inevitably introduces error/variability, especially given the relatively low sample concentration. The important metric is the average viable pitching rate achieved post installation.

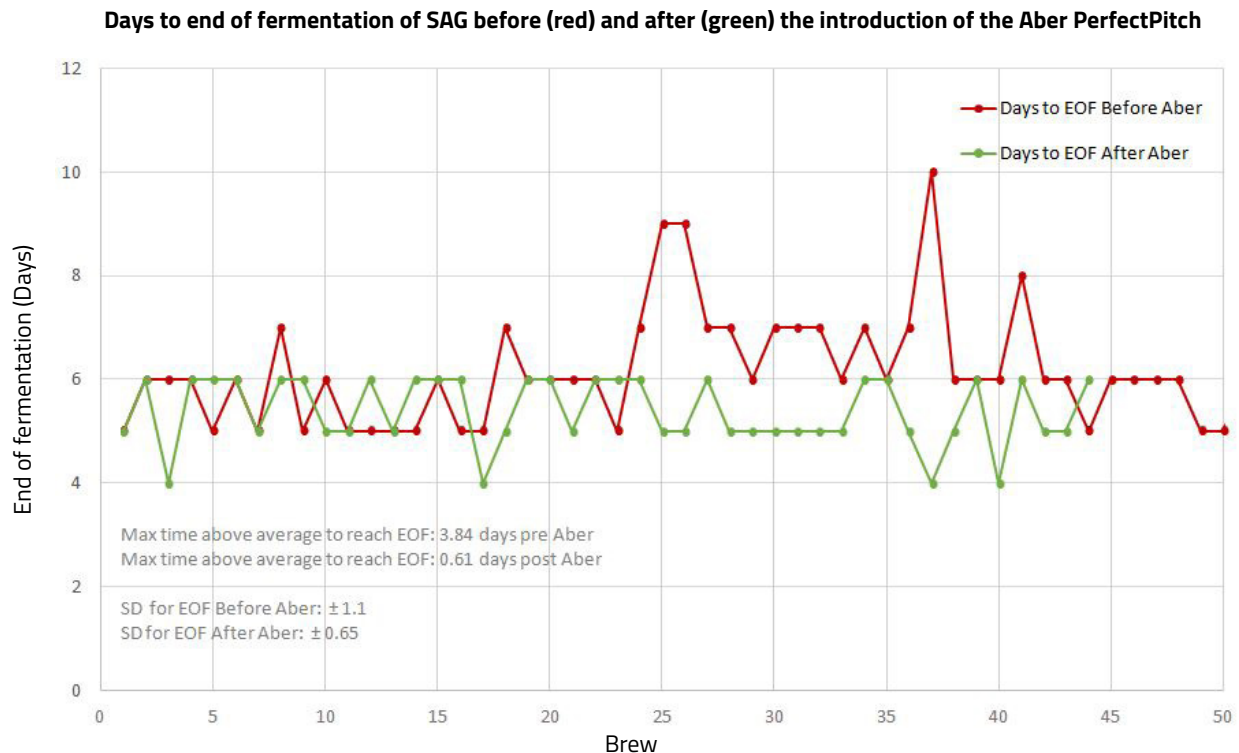


Figure 2

Individual brew lengths in integers of days for the Summit Brewery brand SAG to reach the end of fermentation target, both prior to (red) and following (green) the installation of the Aber PerfectPitch. The average time to reach the end of fermentation has been reduced from 6.16 days before the installation of the PerfectPitch and 5.39 days after. The maximum time above the average time taken to reach EOF was also significantly reduced following the installation of the PerfectPitch from 3.84 days to 0.61 days. The Aber PerfectPitch pitches the right concentration of yeast cells; hence the nutrients in the wort are consumed most efficiently, thus optimising the brew.

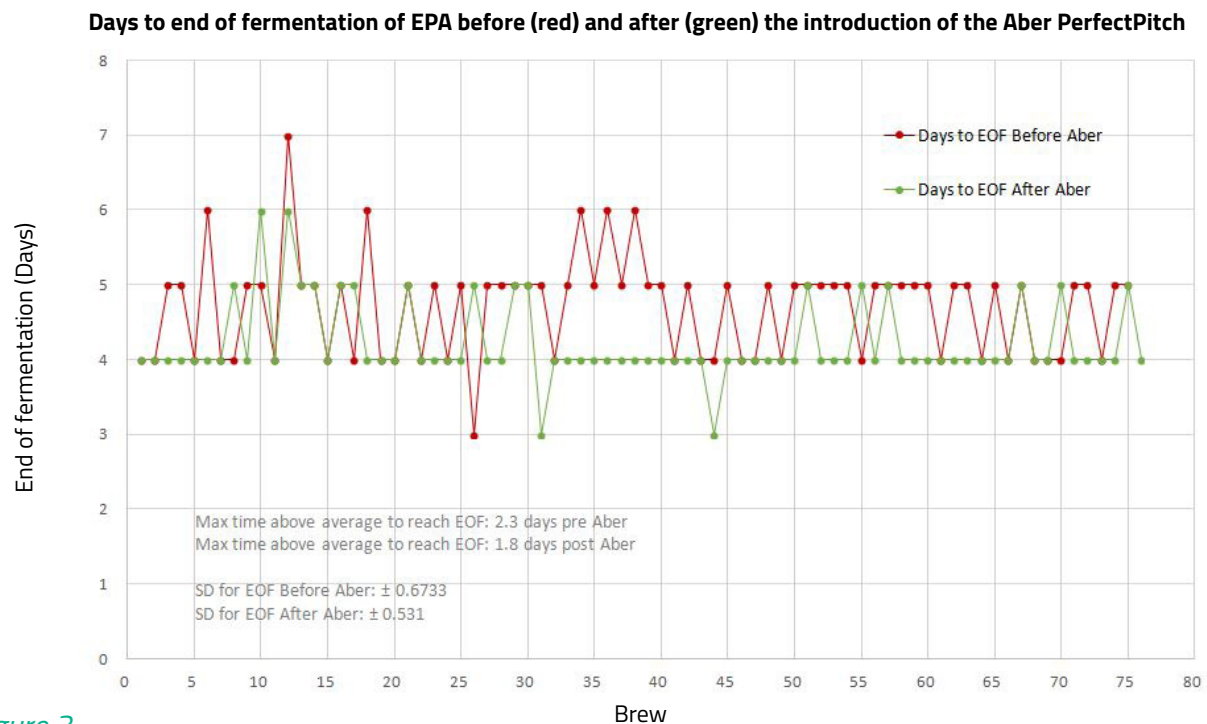


Figure 3

Individual brew lengths in integers of days for the Summit Brewery brand EPA to reach the end of fermentation target, both prior to (red) and following (green) the installation of the Aber PerfectPitch. The average time to reach the end of fermentation was 4.7 days before the installation of the PerfectPitch and 4.2 days after. The Aber PerfectPitch pitches the right concentration of yeast cells; hence the nutrients in the wort are consumed most efficiently, thus optimising the brew.

Figure 4(a):

Degree plato over time for EPA brand before the introduction of the Aber PerfectPitch across 75 individual brews

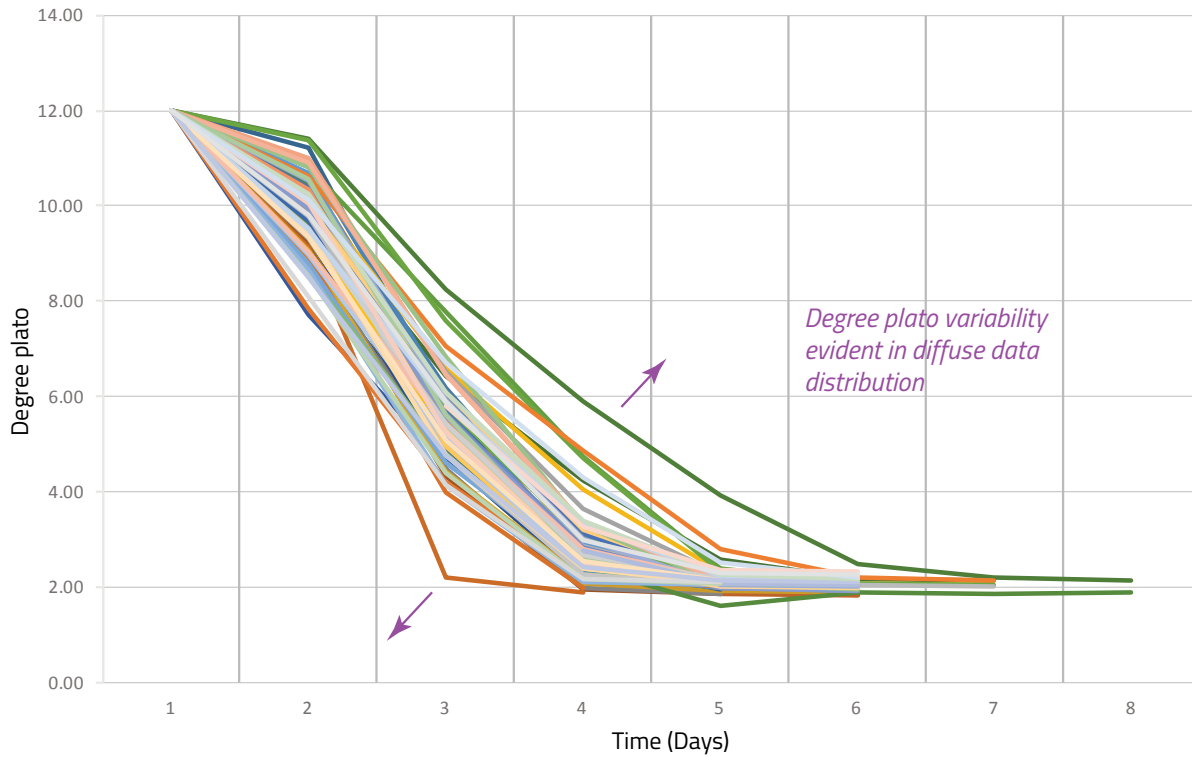
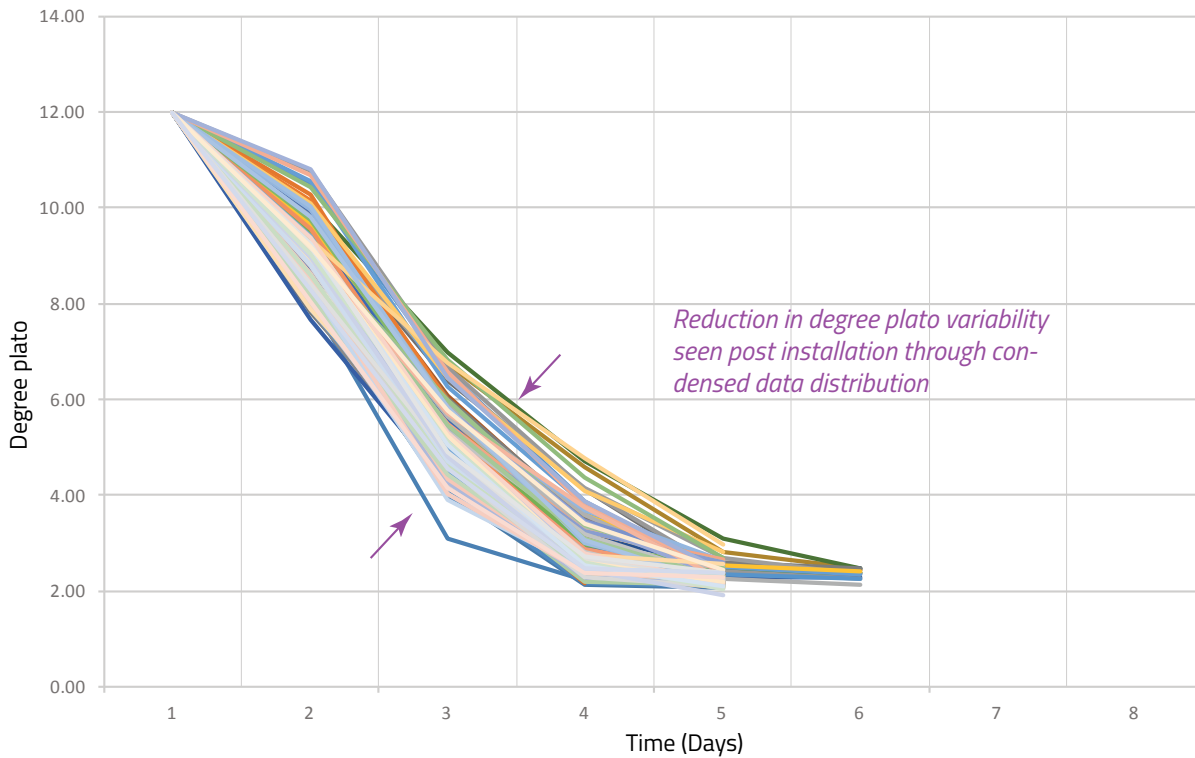


Figure 4(b):

Degree plato over time for EPA brand after the introduction of the Aber PerfectPitch across 131 individual brews



Fermentation profiles for EPA strain over 75 and 131 discrete brews, where the degree Plato is displayed over time, firstly when pitched by mass (4a.), and by the Aber PerfectPitch (4b.). It is clear that the degree Plato versus time is far more consistent across different runs when the PerfectPitch is used.

Figure 5(a):

Degree plato over time for SAG brand before the introduction of the PerfectPitch across 51 individual brews

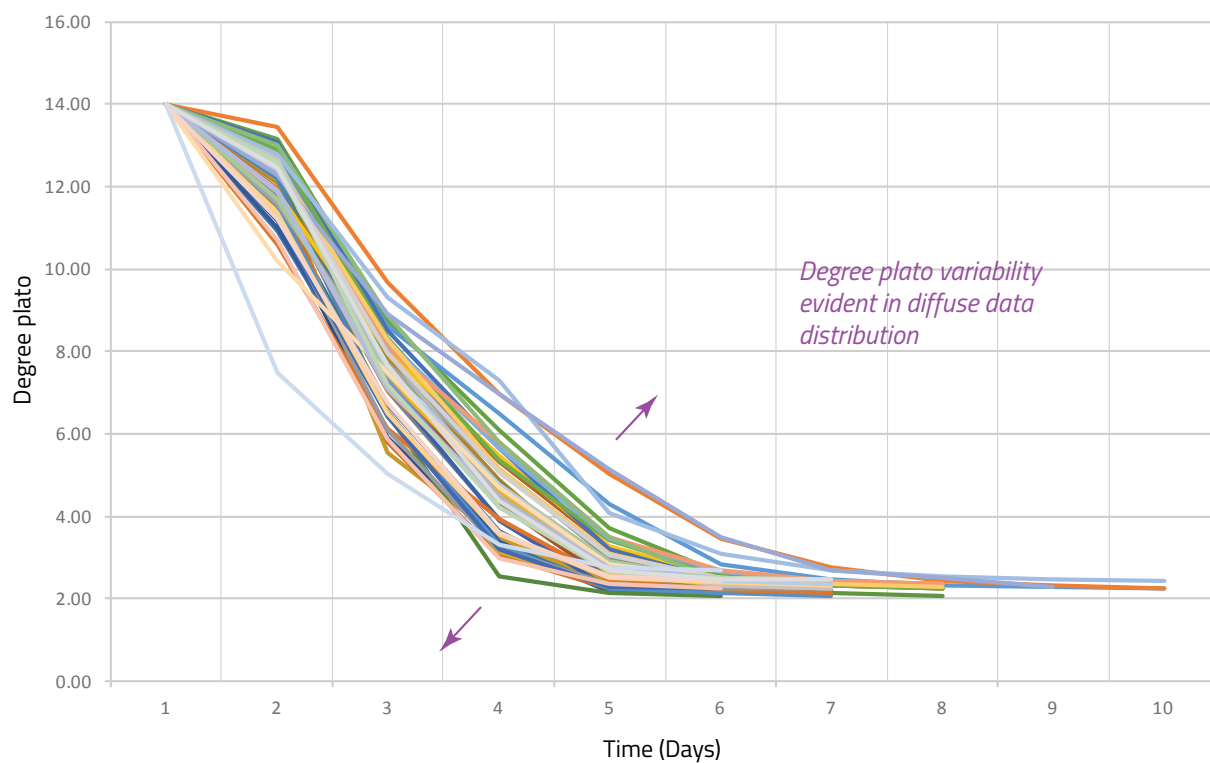
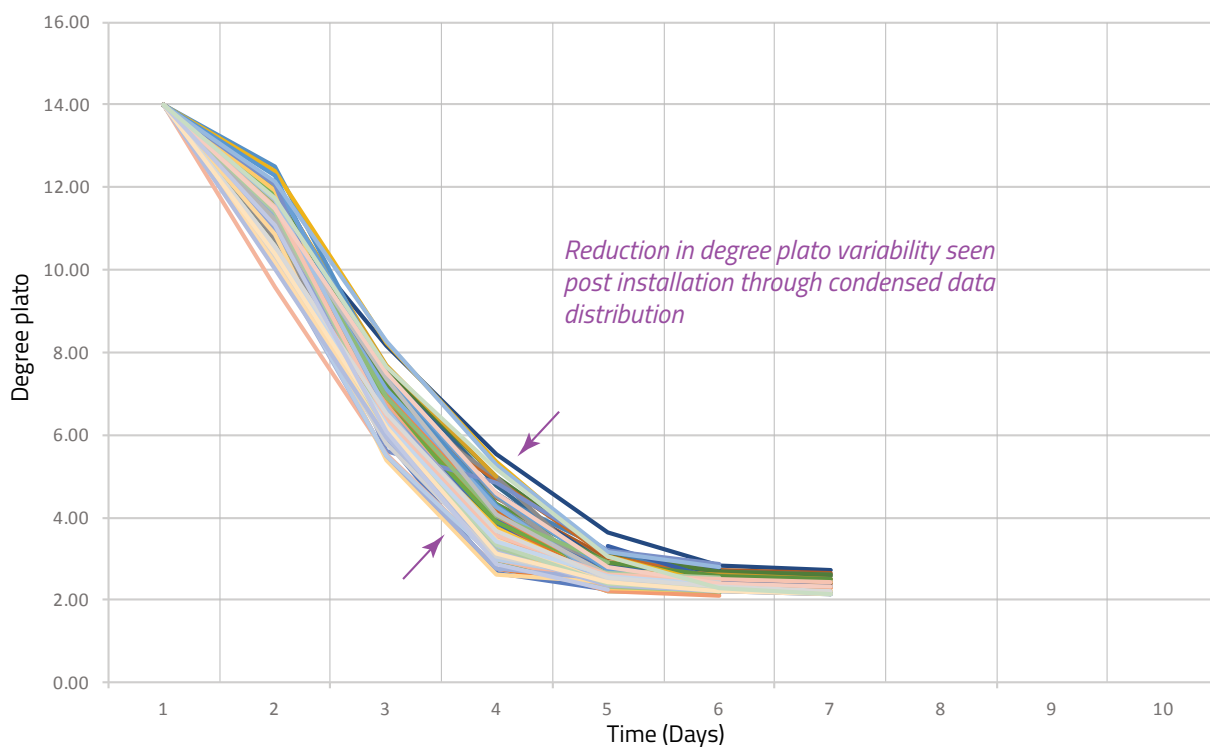


Figure 5(b):

Degree plato over time for SAG brand after the introduction of the Aber PerfectPitch across 78 individual brews



Fermentation profiles for SAG strain over 51 and 78 discrete brews, where the degree Plato is displayed over time, firstly when pitched by mass (5a.), and by the Aber PerfectPitch (5b.). It is clear that the degree Plato versus time is far more consistent across different runs when the PerfectPitch is used.

Conclusions:

Based on the feedback received from Summit, it was apparent that the PerfectPitch started performing better than the previous method immediately after the instrument's calibration. This improvement upon the previous manual pitching method can be seen across all the metrics measured as seen in each of the figures above.

Pitching rate:

It is evident that the pitching rate target was consistently not being met prior to the installation of the PerfectPitch. The pitching rate concentration achieved on average was 40.83% below the target pitching rate concentration. This inaccuracy results in slower or hung fermentations, variable and inadequate fermentation performance.

By contrast, the Aber PerfectPitch estimates the precise amount of live yeast relative to the target yeast concentration, thus pitching the appropriate litres of yeast necessary for an improved fermentation performance. This can be seen in Figure 1 with the precision of the green trendline in relation to the black, target cell concentration.

Fermentation times:

The distribution and varying end of fermentation points seen before the PerfectPitch was installed, highlight inconsistencies in the fermentation rate, likely caused by the variable, pre-installation pitching rates. The distribution of EOF data post installation highlight reduced variability relative to the results prior to installation. From the condensed data points we can infer a more consistent fermentation rate. Therefore the homogeneous distribution of data and consistent end of fermentation points following installation indicates there is little variation in the fermentation rate.

This is also evident in the maximum time taken to reach EOF above the mean, which was significantly reduced following the installation of the PerfectPitch from 3.84 to 0.61 days and 2.3 to 1.8 days in figures 2 & 3 respectively. Therefore not only was the average fermentation time reduced, but also the variability in the time taken to reach EOF. This consistency is invaluable; any variability may impose additional planning constraints upon a brewery.

A significant improvement in the performance and consistency of the fermentations and a reduction in the fermentation times following the use of the Aber PerfectPitch could result in energy, cost and efficiency savings. Greatly increasing the efficiency of vessels and significantly improving product throughput while increasing product consistency. Moreover, the advantages of consistent and reduced fermentations because of the PerfectPitch include better planning capability and possibility of scheduling more fermentations per month or year to increase brewery output, without the need to invest in real estate.

Degree Plato vs time:

A reduction in degree plato variability over time across multiple brands and brews was observed with the data point distribution being significantly condensed post installation. The reduction in variability could improve the final quality of the product. Therefore the consistency of the degree plato trend over time that the PerfectPitch provides, delivers predictable, consistent and greater product quality.

These improvements to Summit's processes have greatly increased their vessel efficiency, maximized throughput, maintained brand quality by achieving consistent and accurate pitching rates and repeatably reduced degree plato variability throughout their fermentations.



Testimonial from Summit Chief Brewing Officer, Damian McConn:

Summit was historically inaccurate when it came to measuring cell counts and optimising the fermentation system, using the PerfectPitch system has allowed us to become much more accurate when it comes to pitching rates and also tie in those pitching rates with the viability of the yeast.

Using the PerfectPitch has enabled us to save in a couple of key areas:

- o Firstly with labour, we're not spending as much time performing manual cell counts, there is less guesswork involved when it comes to managing their yeast.
- o Secondly in terms of tank throughput, we've shaved a couple of days off our primary fermentation times, that's allowed us to maximise the throughput of our fermentation capacity and move beer faster through our tank farms, again without compromising the quality of the beer.

Further benefits described include:

- o Highly robust, good quality of equipment and reliability of the technology
- o Improved consistency of yeast management and yeast performance
- o Optimised yeast pitching rates
- o Improved fermentation management systems
- o Improved consistency and increased efficiency across the board
- o [The Aber PerfectPitch] Helped complement the existing technologies that we already had at Summit

The experts at Aber have been terrific partners on this project and we look forward to working on projects with them in the future. The key is the degree of technical support, that separates Aber and Gusmer from other suppliers is their passion for our business, their desire to help drive our business forward. It's not just selling us great equipment, it's trying to optimise our process, and it's trying to work as a partner with us so we can drive things forward together.



"The PerfectPitch has really allowed us to move things forward in terms of managing our yeast, in terms of optimising our fermentation rates, in terms of being more consistent with pitching rates and managing the viability of our yeast"

For Damian's full testimonial, please visit the site below:
<https://www.gusmerbeer.com/catalog/instrumentation/aber-perfectpitch/>

ABER Instruments would like to thank Damian McConn, Chief Brewing Officer at Summit Brewing Co., his colleagues for providing the data and testimonial for this case study and to Aber's North American Distributor, GUSMER for setting up and introducing this collaboration.

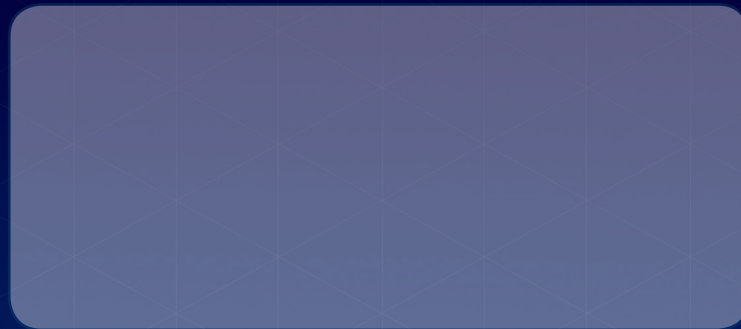


To discuss the benefits of the PERFECTPITCH for your brewery please call our technical sales support team on:

+44 (0) 1970 636 300

or email

support@aberinstruments.com



For general sales enquiries please find your nearest ABER distributor via our website or email us at: sales@aberinstruments.com

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