

APN1072

Real time measurement of the Propagation Process in Ethanol production using the IRmadillo

Key Words

- Ethanol production
- Propagation
- Yeast health
- Glucoamylase
- Robust FTIR

Abstract

Measuring the performance of propagation tanks is essential to maximise yeast health for transfer to fermentation, and to optimise the levels of Nitrogen and the use of glucoamylase(GA). Achieving the optimal balance of Mash, Nitrogen, GA and thus sugars is key to maximising overall plant performance. In separate installations, the IRmadillo has proved capable of quantifying the key chemistries, in real time, with great reliability.

Introduction

Yeast is a biological substance and its healthy growth is dependent on managing its environment closely. Sugar levels need to be maintained at around 2% to optimise aerobic respiration, minimise ethanol production and sustain the conditions optimal for the multiplication of the yeast. Monitoring the process in real time enables the operator to send the prop to fermentation in a shorter time but at higher quality, thus optimising fermentation performance. GA is an expensive component in the ethanol process and optimising its use (or minimising over-use) has significant cost and performance benefits. Urea, or sometimes Ammonia, is used to introduce Nitrogen to the process to encourage metabolism and increase yeast counts.

Spectrometers allow continuous and detailed measurement of chemical concentrations in real time. The majority of process spectrometers are based on near infrared light, which is fundamentally less informative than mid infrared light. Conventional mid infrared spectrometers (which often use a Fourier transform and so are referred to as "FTIR spectrometers") have sensitive moving parts and fragile fibre probes - making them wholly unsuitable for production environments such as ethanol refineries. The IRmadillo is a process analyser built using FTIR spectroscopy, but with static optics, removing the need for moving mirrors or fibre probes, and dramatically improving stability, reliability, and ruggedness.

Example Use Case

This application note presents data from a European ethanol plant, measuring 10 different chemical species, enabling the precise monitoring of the activity of the GA in breaking down the mash, the production of ethanol and the presence of lactic and acetic acids: indicators of yeast ill-health during propagation. Chemical species, measurement range and accuracy are shown below.

Chemical	Min range	Max range	Accuracy (RMSECV)	Units
Ethanol	0.00	6.50	0.25	%w/v
DP1	0.50	7.00	0.37	%w/v
DP2	0.50	5.50	0.64	%w/v
Maltotriose	0.00	2.00	0.27	%w/v
DP3+	1.50	4.50	0.38	%w/v
Total sugar	1.50	18.00	0.98	%w/v
Lactic	0.00	0.08	0.01	%w/v
Acetic	0.00	0.04	0.01	%w/v
Total Acids	0.00	0.30	0.01	%w/v
Glycerol	0.20	1.00	0.07	%w/v

Contact us

-  +44 (0) 1235 431260
-  (Sales) enquiries@keit.co.uk
-  (Product Support) support@keit.co.uk
-  www.keit.co.uk

