IRmadillo™

APN1008

CASE STUDY:

How real time nitrogen monitoring in fermentation prevents batch failures

KEY WORDS

- Ethanol fermentation
- PAN and FAN
- Nitrogen montoring
- Primary amino nitrogen
- Freely available nitrogen
- Real-time measurement
- FTIR
- Spectroscopy
- NIR

The Problem

A batch that drops from 15% to 12% ethanol yield costs thousands in lost revenue. By the time glycerol spikes show up in HPLC results, it's too late to save the batch.

The Solution

Real-time FAN and PAN monitoring catches nitrogen deficiencies early enough to fix them.

Real Results from an Iowa Ethanol Plant

A month-long installation showed exactly how nitrogen balance affects yield

What happened

- One batch started with low FAN (freely available nitrogen)
- FAN continued dropping through fermentation
- Final ethanol: only 12% instead of the typical 15%

What the data revealed

- PAN and FAN levels shift independently during fermentation—there's biochemical activity you can't see with HPLC sampling
- Low FAN directly correlates with poor batches
- The failed batch could have been saved with a mid-batch nitrogen adjustment

Measurement accuracy

- FAN: ±20 ppm average error
- PAN: ±17 ppm average error

That's accurate enough to control your process and catch problems before they cost you money.

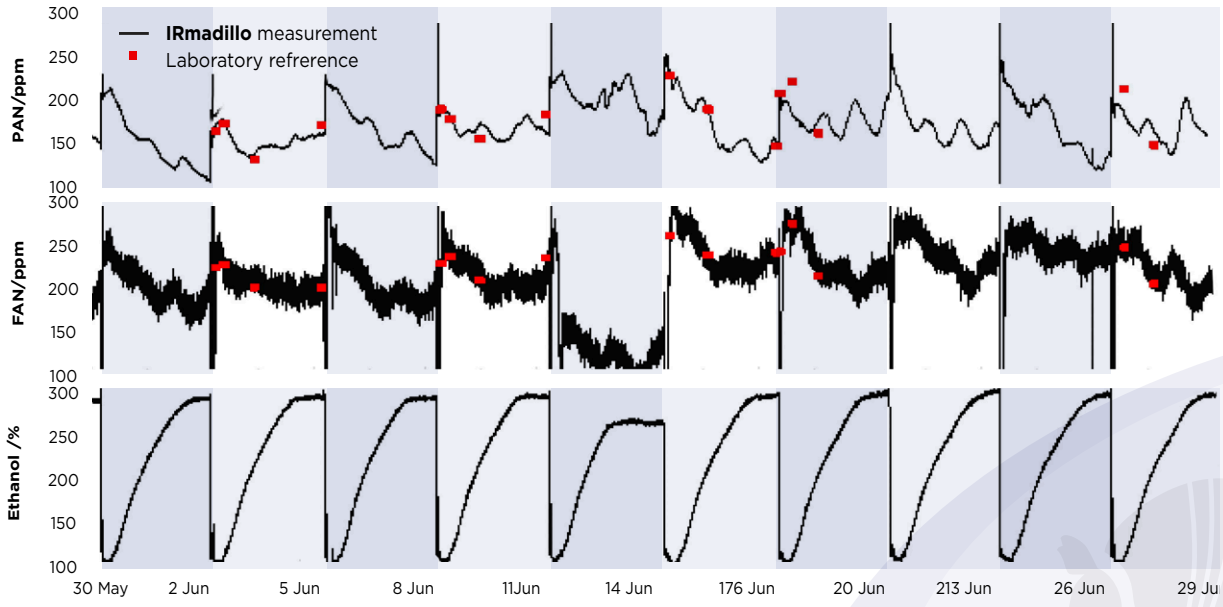

Figure: Measurements of ethanol, PAN and FAN in real-time for a month long experiment, with associated laboratory reference data provided by Foundation Laboratories www.keit.co.uk

IRmadillo™ instrument installed in a recirculation line

What This Means for Your Operation

Stop guessing on urea additions.
Real-time FAN/PAN monitoring shows you exactly when yeast needs more nitrogen — no more over-adding (wasting money) or under-adding (risking batch failure).

Catch problems in time to fix them.
Not after the fact when you're analyzing what went wrong.

One instrument, multiple measurements.
The same **IRmadillo™** measures ethanol, FAN, PAN, DP4+, DP3, DP2, dextrose, lactic acid, acetic acid, glycerol, and fusels — all simultaneously, all in real-time.

Installation & Setup

The **IRmadillo™** installs directly in your fermenter recirculation line. No sampling. No fragile fiber probes. No moving parts to maintain.

After installation, the instrument was calibrated using lab reference data (Foundation Laboratories provided FAN and PAN analysis). From that point forward: continuous real-time monitoring.

Return on Investment

That single failed batch in Iowa - the one that achieved 12% instead of 15% ethanol - could have justified the entire instrument cost.

Every batch you save pays for itself.

Want to see how this works in your plant?

Contact **Keit** to discuss a trial installation.

Real-time analysis for total process control

IRmadillo™

info@IRmadillo.com
IRmadillo.com
+44 (0)1235 431260
©2024 Keit Ltd. trading as Keit Industrial Analytics
4 Zephyr Building, Eighth Street, Harwell Campus,
Didcot, Oxfordshire, OX11 0RL, United Kingdom