CASE STUDY:
The benefits of early detection of bacterial infections in fermentation

KEY WORDS

- Ethanol
- Lactic Acid
- Acetic Acid
- Bacterial Infections
- Yield Maximization
- FTIR

The Problem

By the time you notice a stuck fermenter, the damage is done. One severe infection dropped ethanol yield from 14% to 7% - a $110,000 loss in a single batch.

The Solution

Real-time lactic and acetic acid monitoring catches infections early, when you can still do something about it.

The real cost

Not just the first batch - the infection affected five consecutive fermentations before the plant fully recovered.

What Happened at an Iowa Ethanol Plant

FIVE CONSECUTIVE FERMENTATIONS TOLD A COSTLY STORY:

Fermentation 1 – Severe infection:

- Lactic acid spiked to 1.4% w/v (normal: 0.2%)
- Acetic acid hit 0.3% w/v (normal: ~0%)
- Ethanol at drop: only 7% instead of 14%
- Revenue loss: ~$110,000

Fermentations 2-4 – Lingering contamination:

- Lactic acid remained elevated but decreasing
- Ethanol yields still depressed: 12-13% instead of 14%
- Ongoing revenue impact from the initial infection

Fermentation 5:

- Lactic acid returned to normal levels
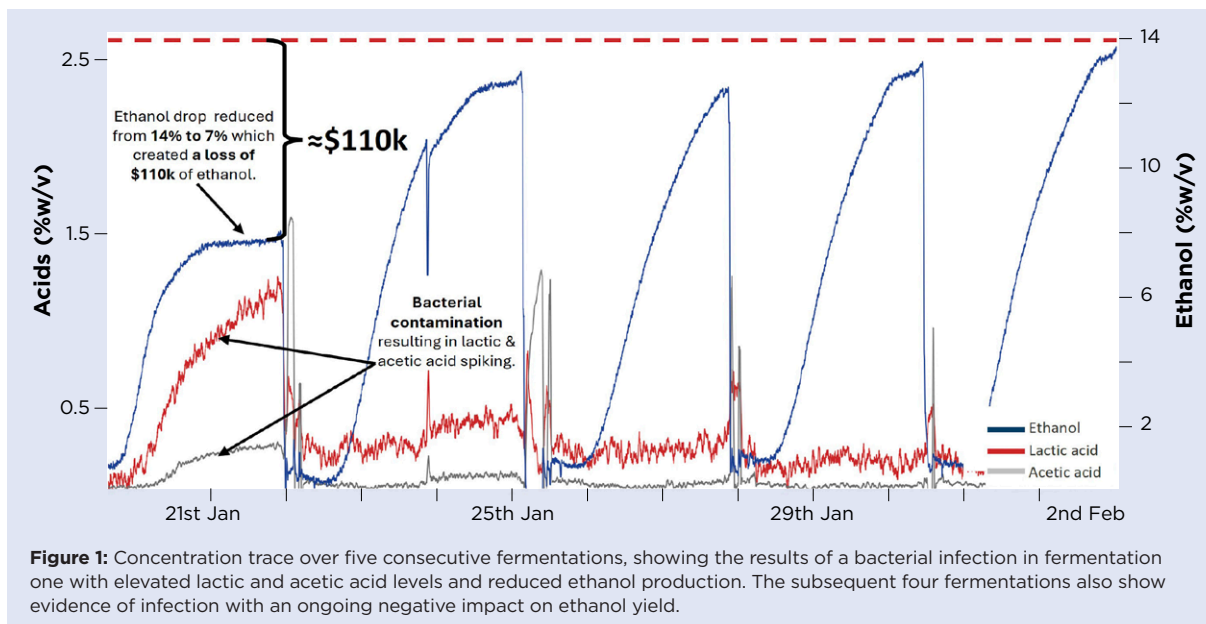- Ethanol yield recovered to expected range

What early detection changes

Catch infections when treatment still works. The IRmadillo detects lactic acid spikes as small as 0.5% w/v and acetic acid increases around 0.2% w/v - well before you have a stuck fermenter.

Use less antibiotics. Early intervention means smaller doses and lower costs. Waiting until the infection is obvious means heavy antibiotic use or complete shutdown.

Prevent cascade failures. That Iowa infection contaminated four subsequent batches. Early detection in batch 1 would have prevented the downstream losses.

Figure 1: Concentration trace over five consecutive fermentations, showing the results of a bacterial infection in fermentation one with elevated lactic and acetic acid levels and reduced ethanol production. The subsequent four fermentations also show evidence of infection with an ongoing negative impact on ethanol yield.

Chemical	Detection Range	Accuracy
Lactic Acid	0 - 1.48% w/v	±0.050% w/v
Acetic Acid	0 - 0.31% w/v	±0.013% w/v
Ethanol	0 - 15% w/v	±0.227% w/v

- Accurate enough to spot problems in real-time, not in retrospect.
- One Instrument, Complete Process Monitoring
- The same IRmadillo that watches for infections also measures: Fermentation: Sugars, glycerol, FAN, PAN, ethanol
- Other process stages: Distillation, liquefaction, propagation

Continuous monitoring across your entire operation.

Installation

Mounts directly in your fermenter recirculation loop. No sampling systems. No fragile components. No moving parts.

The Bottom Line

Bacterial infections are rare, but when they happen, the economics are brutal. A $110k loss in one batch - plus four more compromised batches - makes the case for early detection.

The IRmadillo pays for itself the first time it catches an infection early enough to treat it.

Want to protect your fermentation process?

Contact **Keit** to discuss installation options.

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

Real-time analysis for total process control