

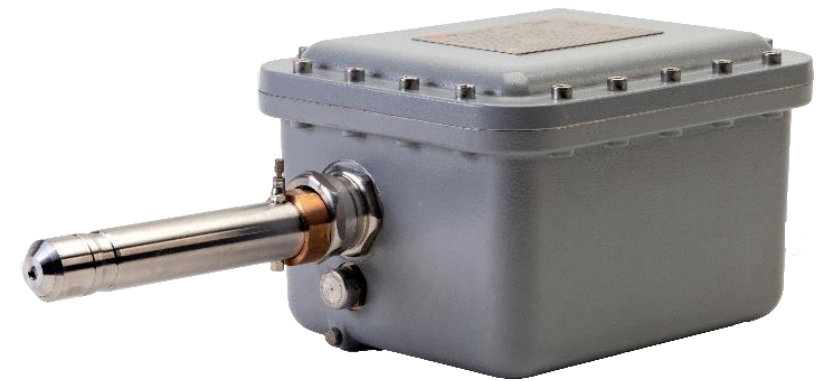
KEIT

INDUSTRIAL
ANALYTICS

Measure | Trust | Improve

IRmadillo on-line industrial Process Analyzer

Real-time process monitoring of
liquids | slurries | emulsions



The IRmadillo will save your ferm batches

A failed ferm batch can cost an ethanol plant hundreds of thousands of dollars.

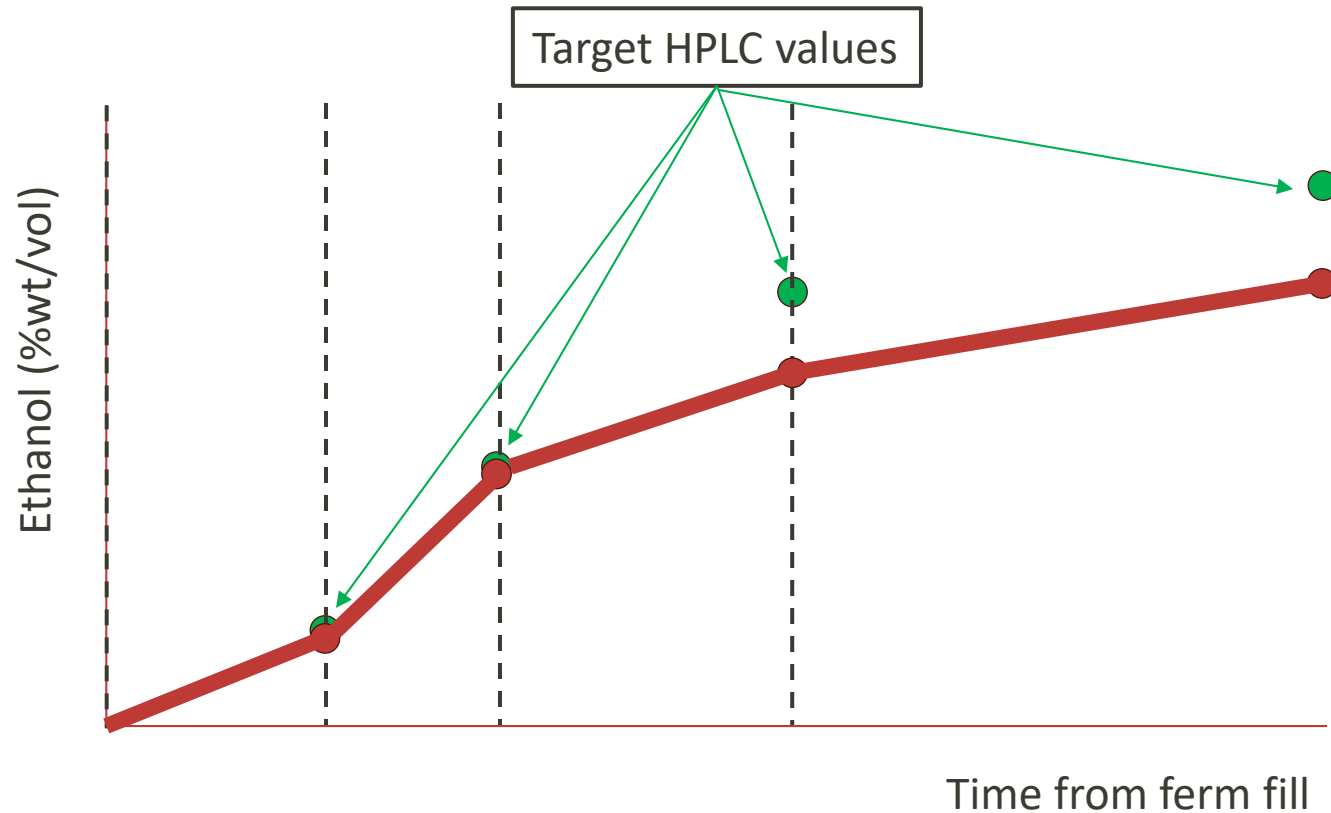
Often these failures are caused by bacterial infections or human errors that aren't **caught in time**.

HPLC measurements only give you a result **every few hours**.

How can you get data **fast enough**?

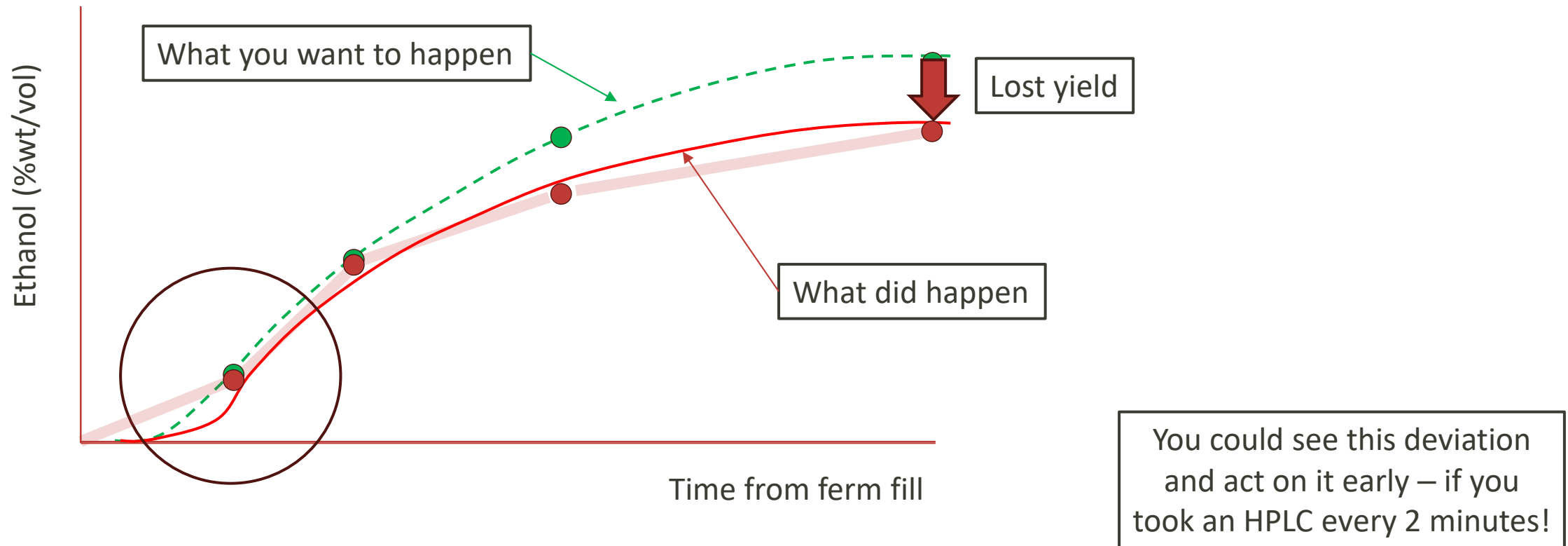


HPLC only shows part of the picture



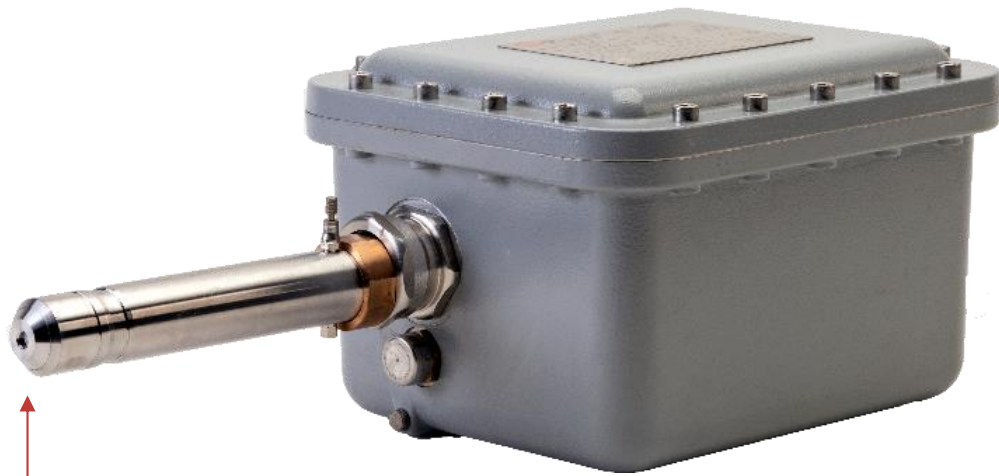
Batch	Sample	Expected ethanol	Actual ethanol
12345	10 h	1.7	1.6
12345	18 h	5.5	5.4
12345	25 h	13.9	10.7
12345	52 h	14.7	11.1

HPLC only shows part of the picture



Introducing the IRmadillo

An infrared spectrometer that measures ethanol, sugars, glycerol, lactic acid, acetic acid **every 2 minutes**.

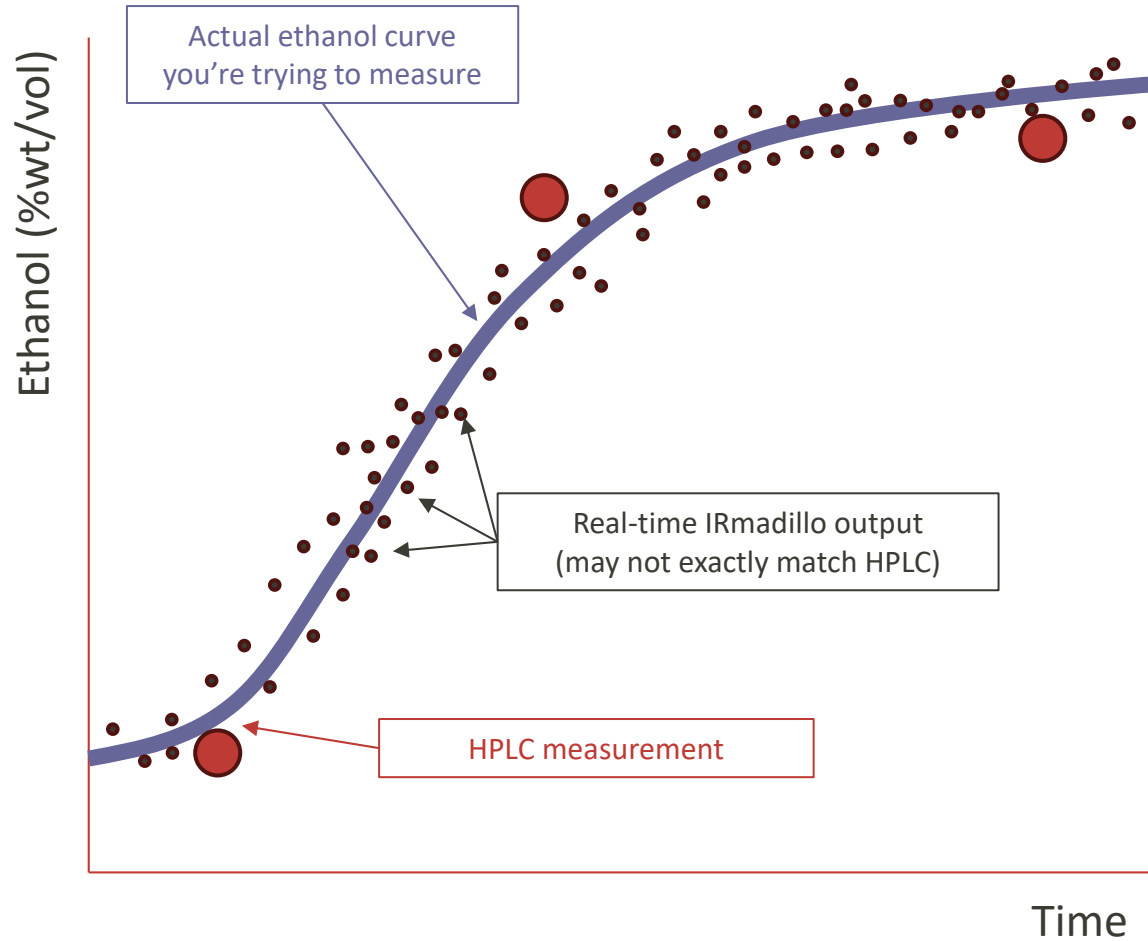


Sensor that measures your fermentation



IRmadillo installed directly into recirculation pipe. The cradle allows for easy installation and removal.

IRmadillo gives you the full picture

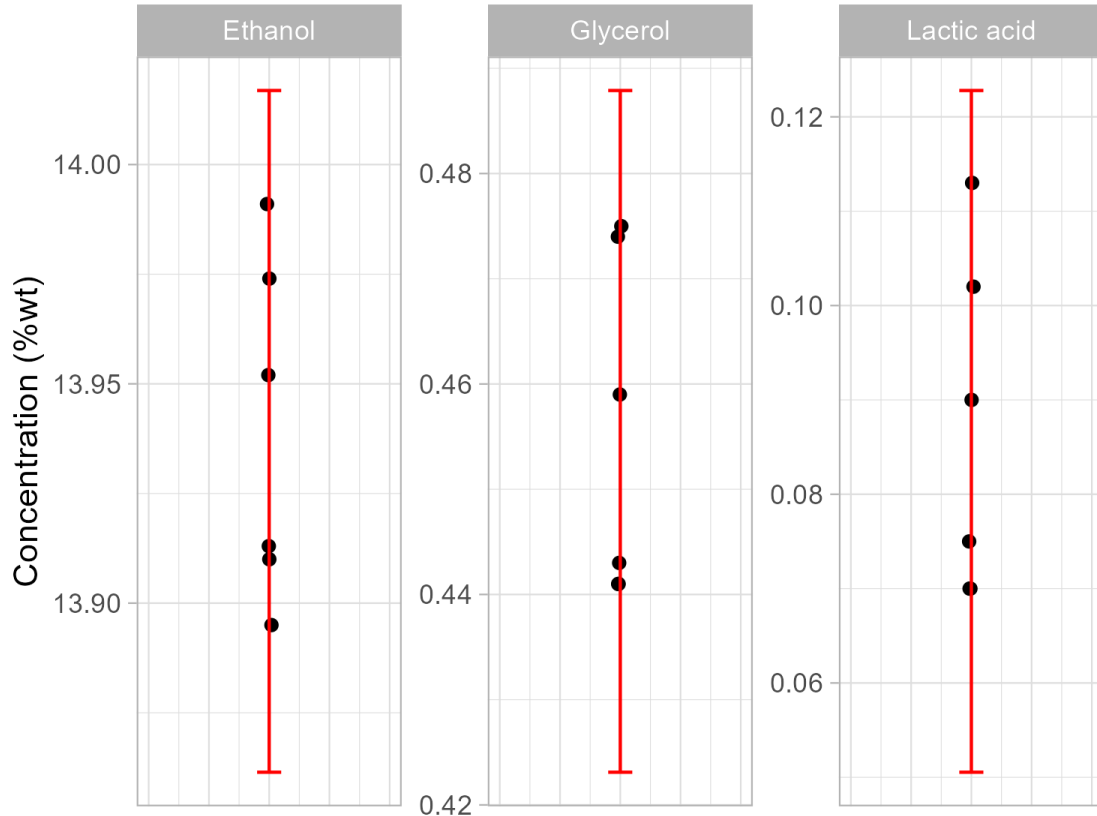


Ethanol, acids, sugars etc. will be fed live to your DCS.

The IRmadillo results may look noisy on your DCS. This is because you are taking so many data points. Your DCS can apply smoothing to reduce this.

It's important to act based on **trends** in the data, not on single measurements.

Your IRmadillo won't match the HPLC exactly



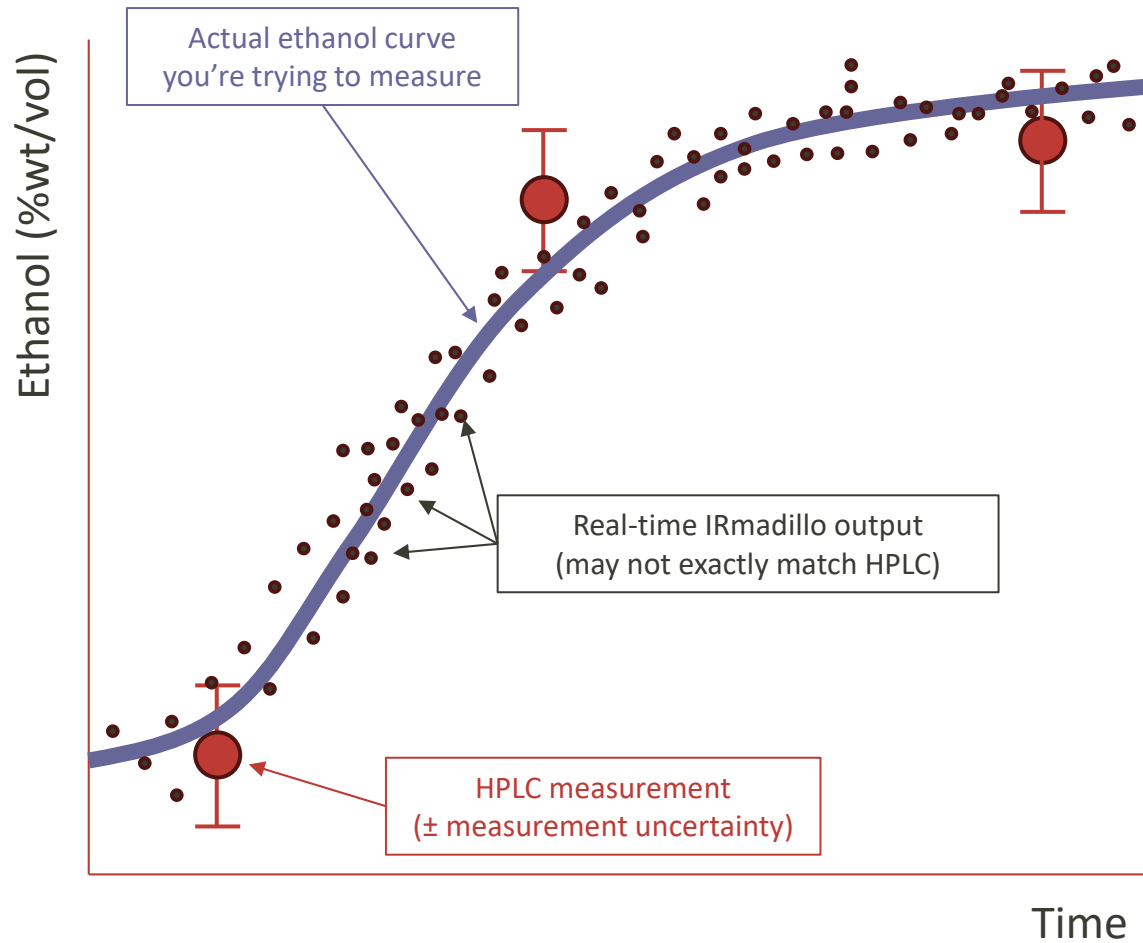
Results from your IRmadillo won't match your HPLC values exactly. **This is normal.**

The graph on the left shows the same sample measured six times by HPLC. The answers vary.

You can't see this variation because you only pull one HPLC sample every few hours.

If you pulled an HPLC sample every 2 minutes, you would see "noise" in your HPLC results – just like the IRmadillo.

What does this give you?



HPLC and IRmadillo results are both noisy
Comparing single measurements can be misleading.

Look at plots of the IRmadillo data over time to get the full picture – **not** single values!

Based on this new insight, should you intervene?

How you can help

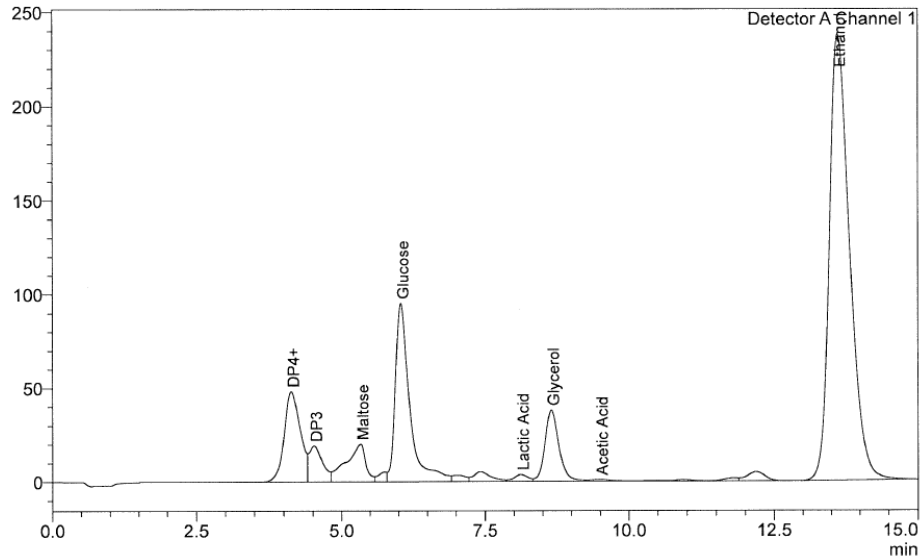
The IRmadillo does not work straight out of the box. It doesn't know what ethanol (sugars, acids etc.) “looks like” at your plant.

We use your HPLC measurements to train the IRmadillo.

The IRmadillo needs to know:

- The results of your HPLC runs.
- Exactly when the sample was **pulled** (not when it was run on the HPLC), to match it up to what the IRmadillo saw at that time.

How you can help: accurate HPLC data

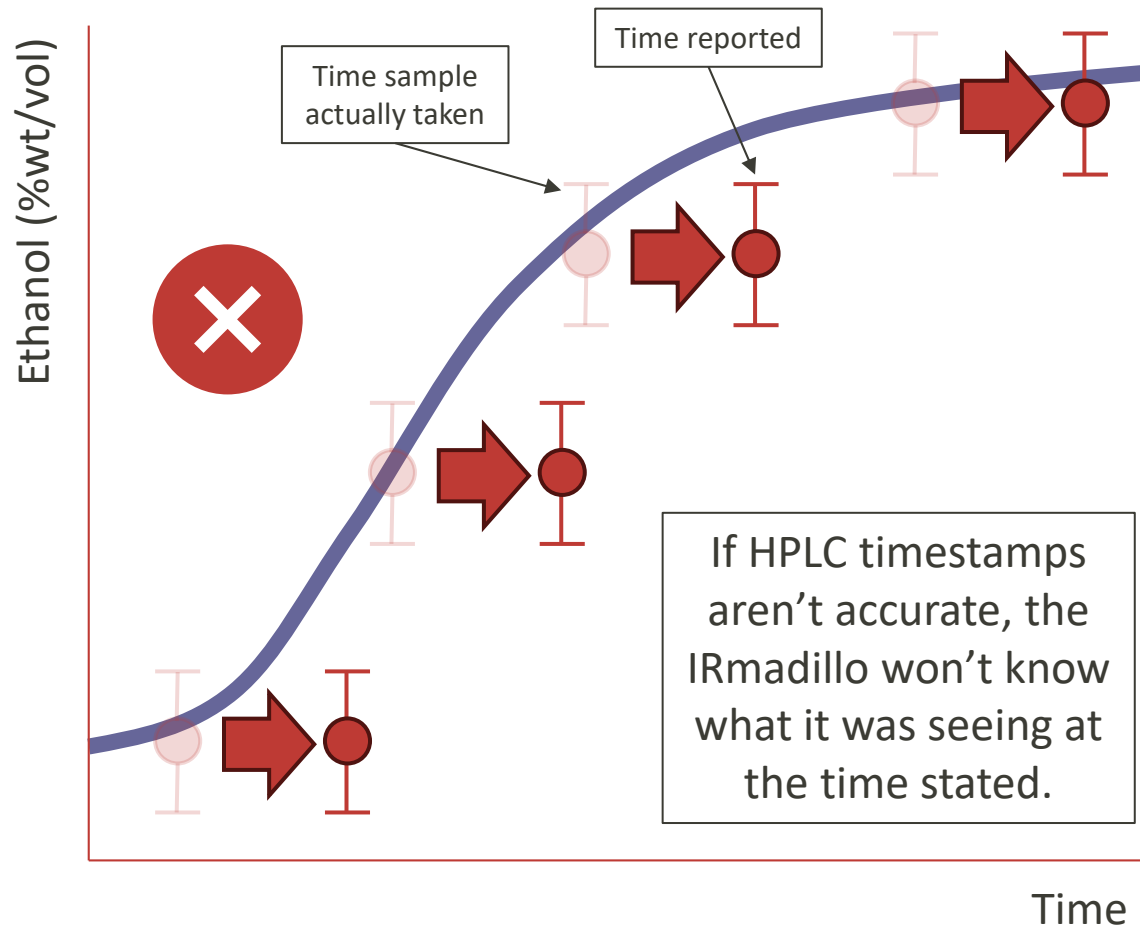


Is your HPLC data the best it can be?

- How old is your column? Would you consider using a fresh one during IRmadillo training?
- How long is your column? Would you consider using a longer one to reduce shouldering?
- How variable is your sample prep? A lot can change between the sampling point and the HPLC.

Keit can plan experiments with you to show how much variation there is in your HPLC data.

How you can help: accurate timestamps



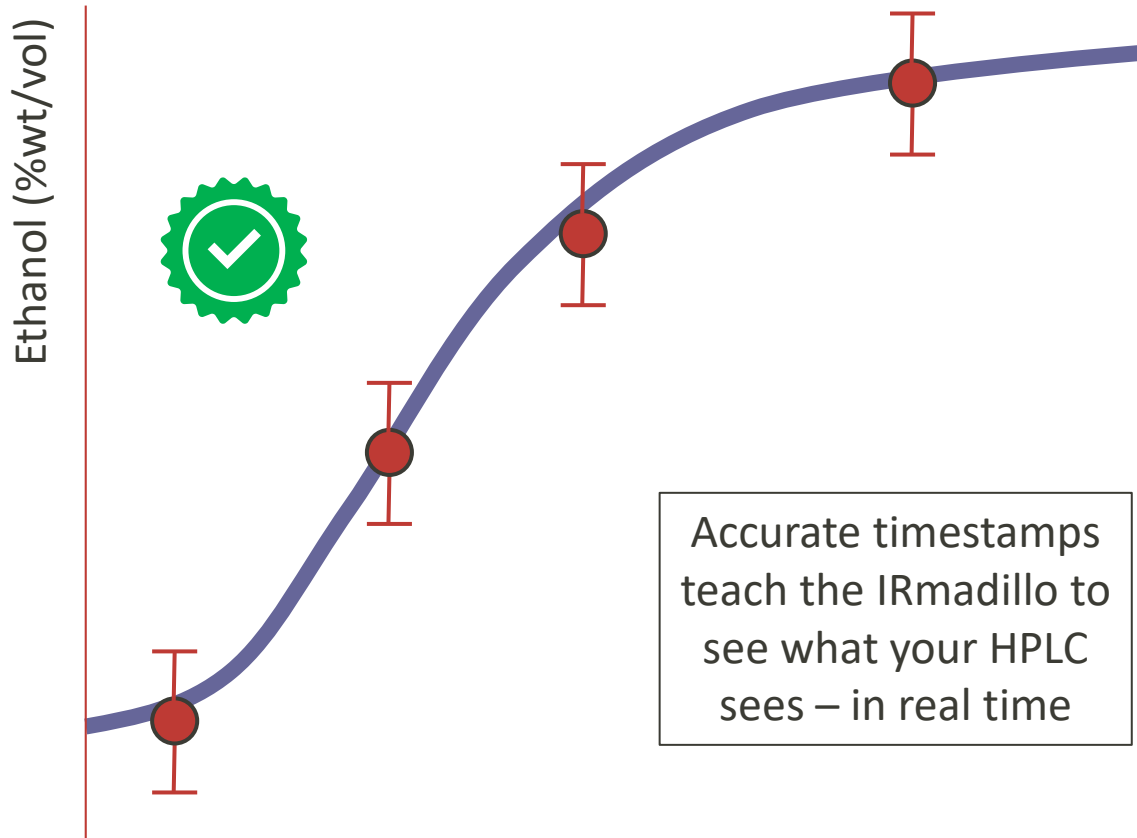
Normal samples may be taken at 6 h, 10 h, 18 h...

We need you to pull the same samples **and** record the exact time you pulled them.

Batch number	Sample
12345	6 h
12345	10 h
12345	18 h



How you can help: accurate timestamps



Normal samples may be taken at 6 h, 10 h, 18 h...

We need you to pull the same samples **and** record the exact time you pulled them.

Batch number	Sample	Sampling time
12345	6 h	2025-02-01 09:22
12345	10 h	2025-02-01 13:44
12345	18 h	2025-02-01 19:58

These aren't at exactly 6 h, 10 h or 18 h – **and that's okay!** We just need to know when.

The IRmadillo is here to help!

