

KEIT

**INDUSTRIAL
ANALYTICS**

Measure | Trust | Improve

How to see the value with IRmadillo

Guidelines on how to set up your DCS to get the most from your data

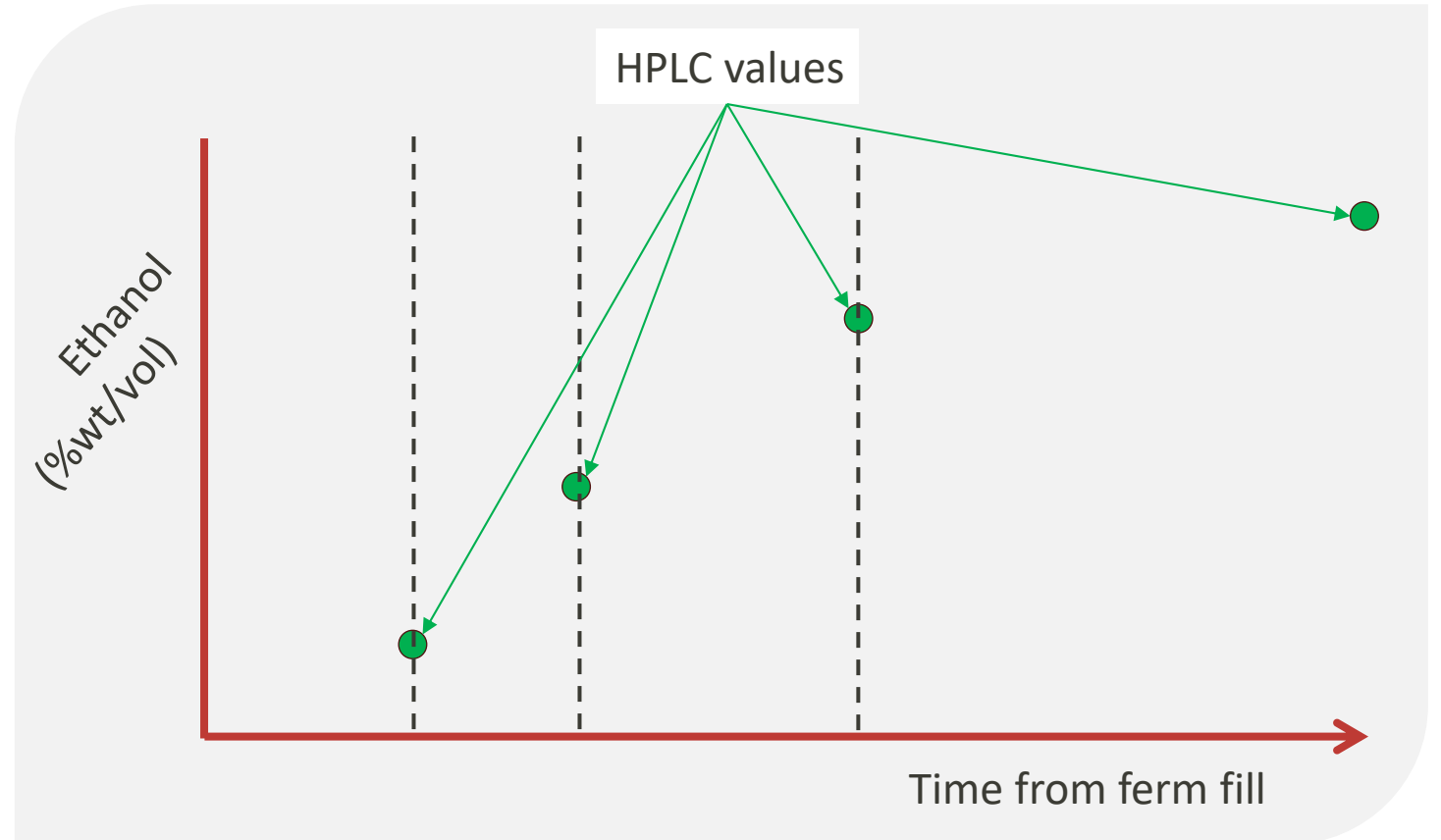
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How do you currently see your data?

For most ethanol plants fermentation is monitored by HPLC with samples every 8-10 hours

While waiting for the next sample anything could happen

The IRmadillo is different!

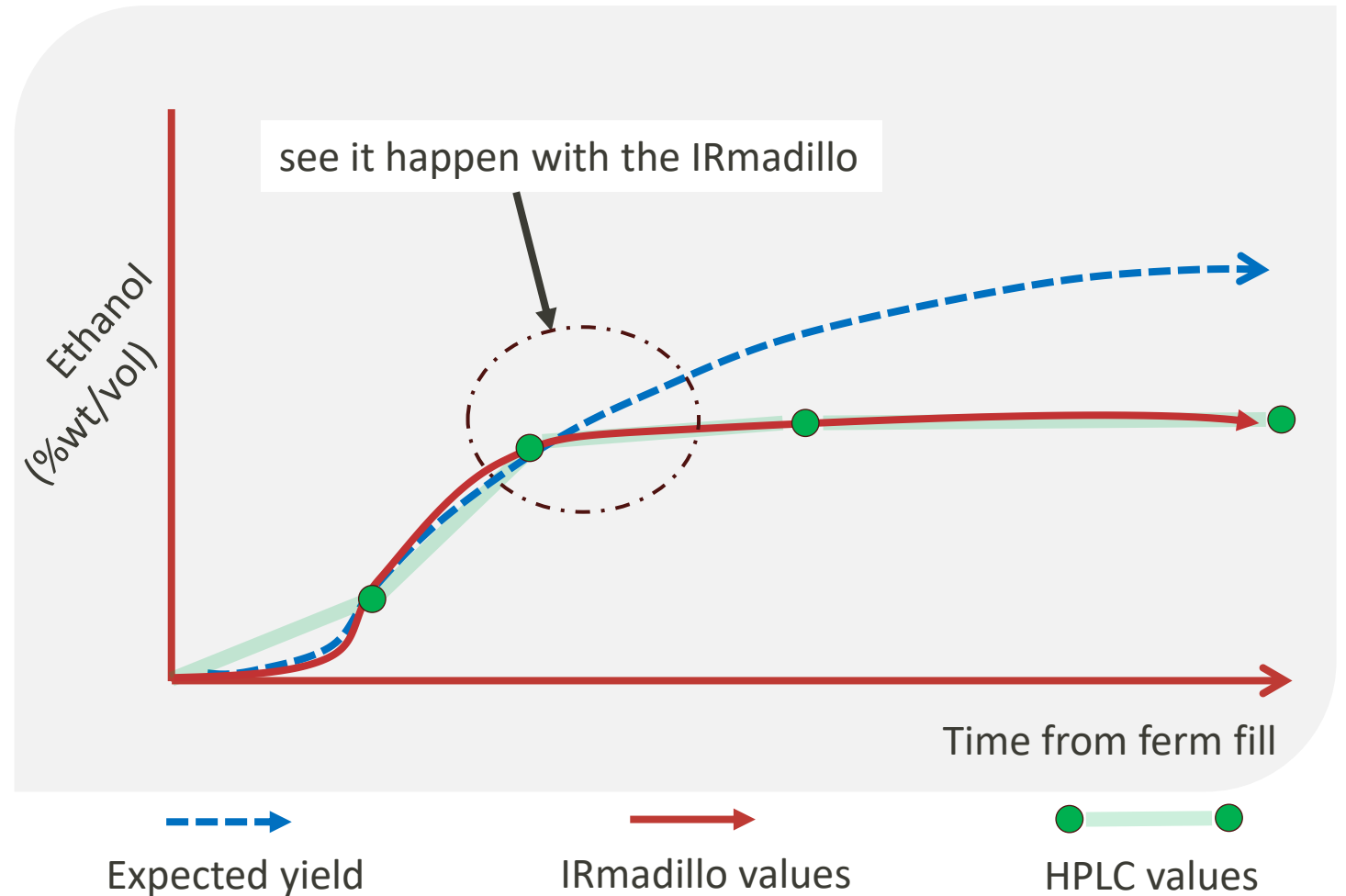


What the IRmadillo can show you

With the IRmadillo you'll see the whole process

Allowing you to catch problems earlier...

... if you alert your team to the problem



Alerts are a key step in the ethanol data journey

Time 

Freeing up the operators by reducing sampling

 **Insight**

Off-line analysis enabled by continuous data

Awareness 

Trending in the DCS

 **Alerts**

Alert operators to deviations from the historical batch

Improve 

Advisory input for how to improve a current batch

 **Optimize**

Advanced Process Control

Time

Insight

Awareness

Alerts

Improve

Optimize

Replacing regular sampling

Free up operator time to work on other improvements to the plant

Eliminate the human error in sample collection

Time

Insight

Awareness

Alerts

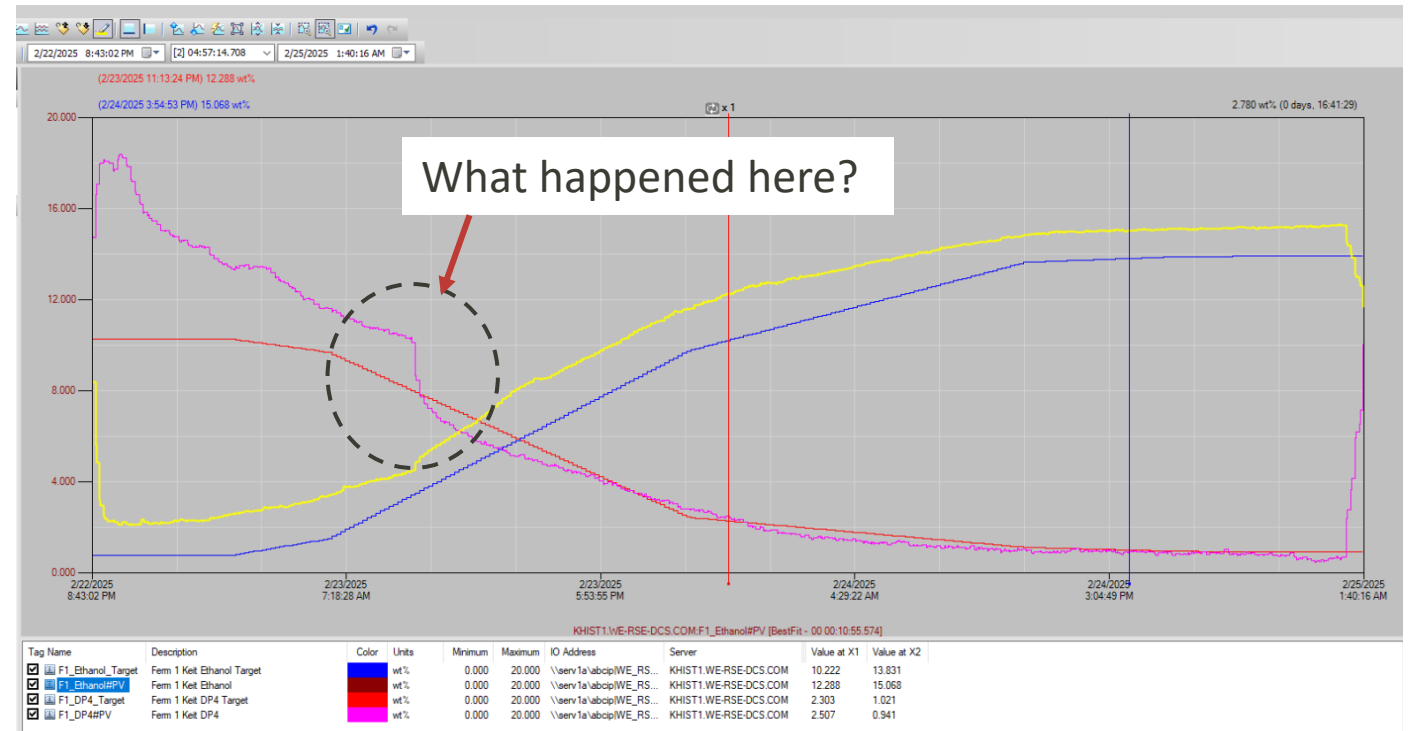
Improve

Optimize

Retrospective learning

Plot out historical IRmadillo data:

- See your process like you never have before, to better understand how actions impact the yield
- Looking back over the previous batches or anomalies you can review the behavior to learn how best to resolve similar situations



Time

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Optimize

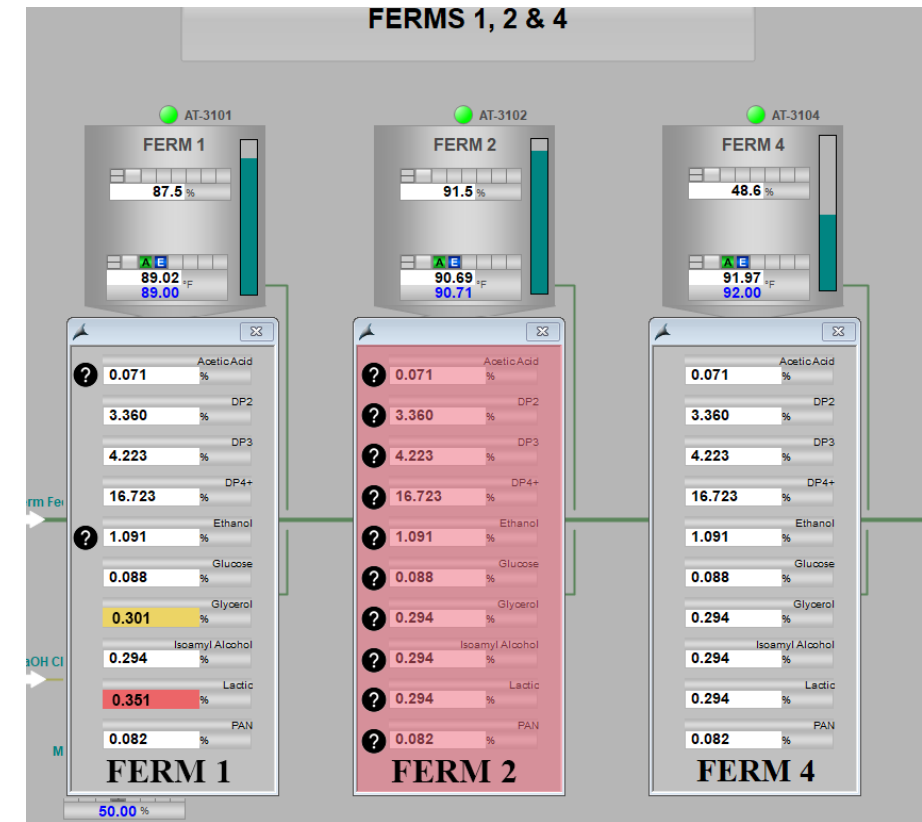
Alert operators immediately

Make sure you see changes quickly by setting limits for how far the process can drift before action is needed.

You can do this with 'Historical batches' based on how the HPLC or IRmadillo has behaved in previous runs: setting limits from standard deviations.

Flag these by:

- Alarms on the DCS home pages
- Send texts or emails to the people who need to intervene
- Alert later stages of the plant to coming process variation



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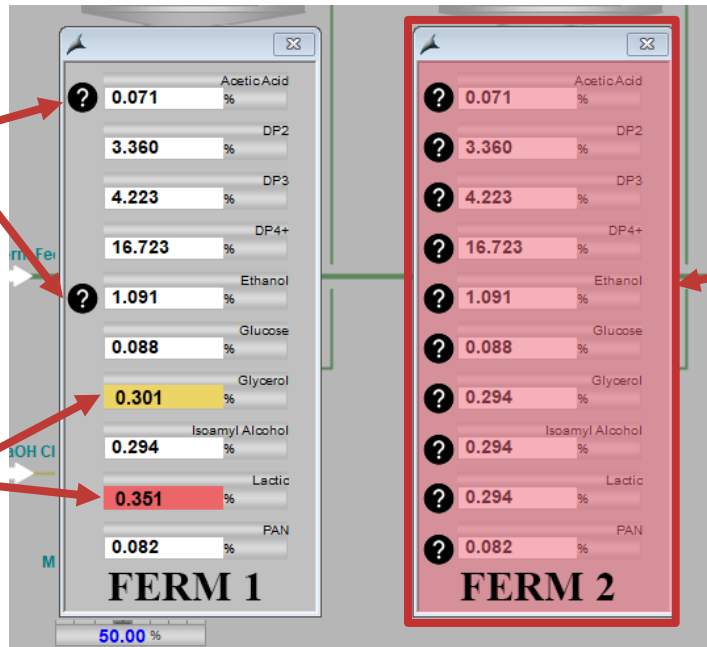
What to look out for

Confidence models

A model to indicate that the concentration predicted by the IRmadillo can be trusted.
0 = within specification.
1 = low confidence.

Drifting from target

Setting warnings and alarms for when a species drifts from the target or 'historical batch' value to trigger operators to act



Instrument issues

The IRmadillo is reporting an issue with operations that could be impacting all results:

- System warning
- System errors

If these persist for more than 12 hours, please contact Keit

Time

Insight

Awareness

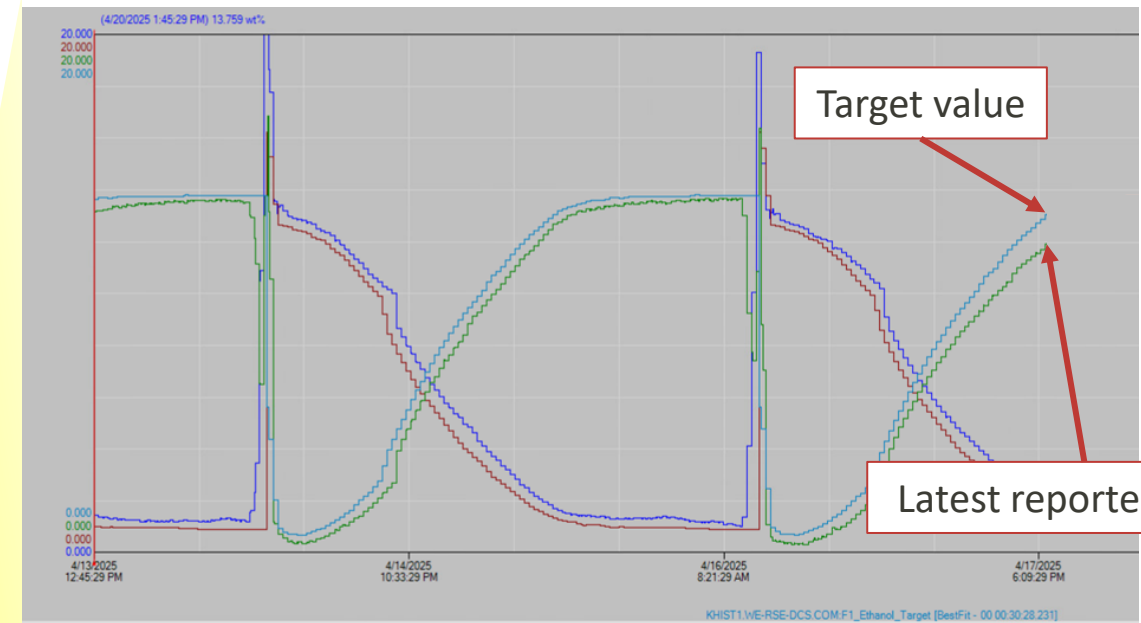
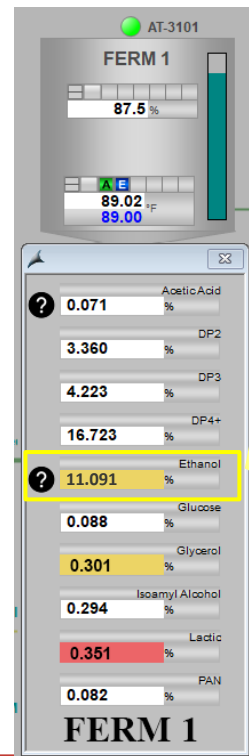
Alerts

Improve

Optimize

Identify the problem

Follow the alerts through to identify what's happening to your process relative to the expected behavior or historical batches in real time



Tag Name	Description	Color	Units	Minimum	Maximum	IO Address	Server	Value at X1	Value at X2
<input checked="" type="checkbox"/> F1_DP4#PV	Ferm 1 Ket DP4		wt%	0.000	20.000	\\serv 1a\abcp\WE_RS...	KHIST1.WE-RSE-DCS.COM	1.427	1.293
<input checked="" type="checkbox"/> F1_DP4_Target	Ferm 1 Ket DP4 Target		wt%	0.000	20.000	\\serv 1a\abcp\WE_RS...	KHIST1.WE-RSE-DCS.COM	1.023	0.947
<input checked="" type="checkbox"/> F1_Ethanol#PV	Ferm 1 Ket Ethanol		wt%	0.000	20.000	\\serv 1a\abcp\WE_RS...	KHIST1.WE-RSE-DCS.COM	13.164	13.593
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Set recommendations based on what is happening

If this happens	Do this
High lactic acid	Add antibiotics
Low sugar conversion	Add Glucoamylase

Time

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Advanced Process Control

Once your team is happy with the performance, the final stage is implementing and enhancing closed-loop control (APC): some examples are given below:

- Automatic dosing of enzymes, antibiotics and additives
- Use the IRmadillo in a control scheme to operate distillation columns at optimal efficiency (e.g. energy vs recovery trade-off)
- Release yeast to the ferm when they are at their maximum growth rate
- Implement model-based predictive control on the ferms and distillation columns