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How the PI System supports Umicore's Go for Zero

Towards a better environment

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AVEVA

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Introducing PMR: Precious Metals Refinery (Hoboken, BE)

Our history



1887

Start of a lead
de-silvering operation
in Hoboken



1995

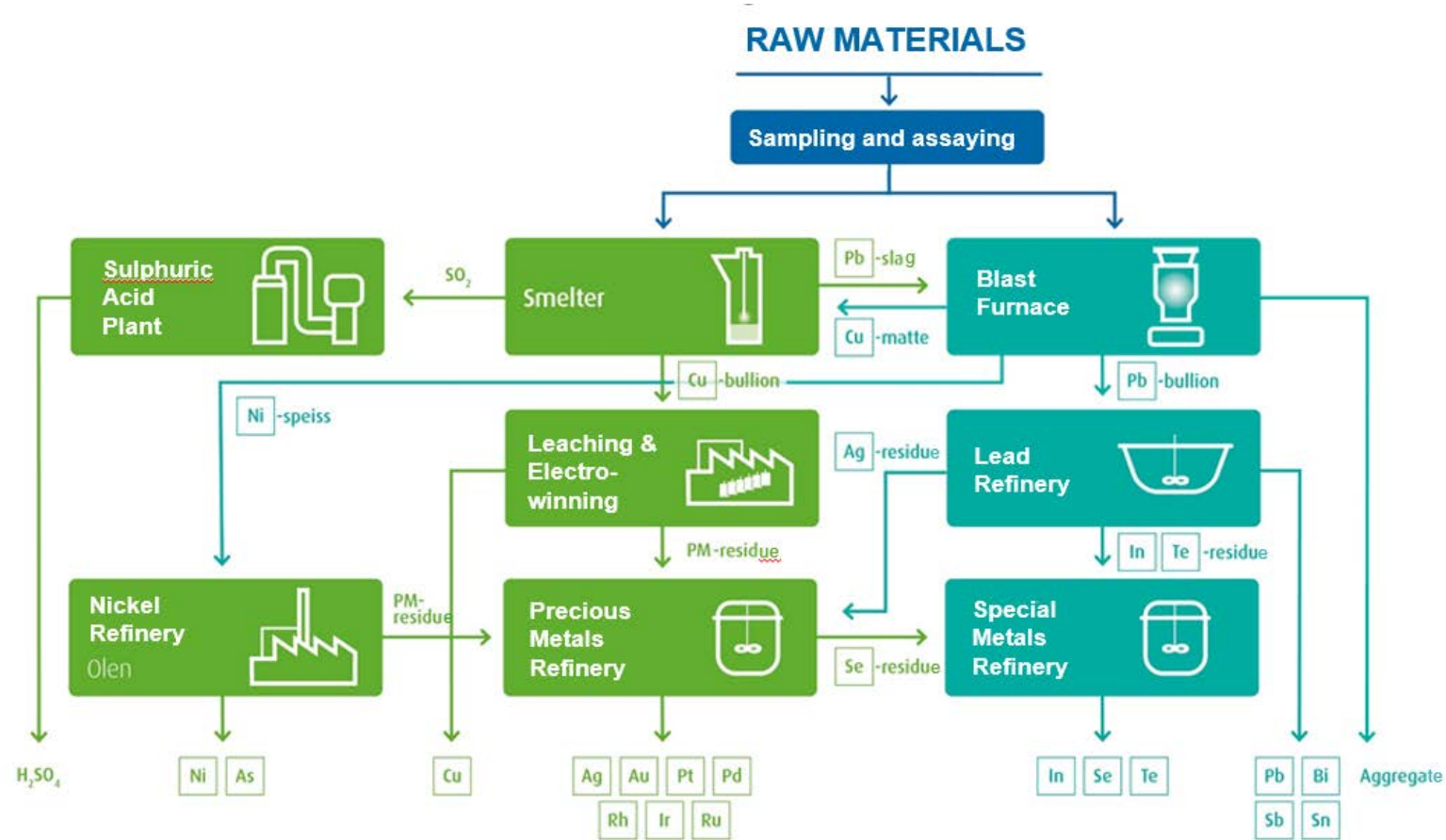
Investment programme
launched to re-engineer
flowsheet



Now

Capacity to 500 kt/y

Refining at PMR



A global leader in recycling





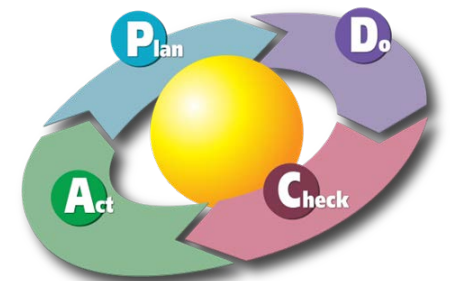
Challenge

- The **Hoboken plant** is situated close to a **residential area**
- Metal emissions are systematically monitored by government (monthly results)
- **Operating license depends on environmental results.**
- Measures to control emissions are known but need for **quick detection anomalies!**
- 1 single incident, not detected in time, can have a huge impact on the monthly emission results.
- If an increase is measured (in monthly results), it is often very hard to find an (ad hoc) root cause.



Requirements:

- We need a **dashboard** that informs us about any potential anomaly that could lead to an emission
- **Progressive insights** should be **easy to add** to the dashboard (PDCA).



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Opportunity: CBM

In 2019 Osisoft organized a Business Discovery Service (BDS) workshop with us



Condition Based Maintenance (CBM) was identified as an opportunity



Osisoft helped us in developing a custom solution for our CBM (workshop)



Operating conditions have been established for critical assets



Deviations from normal operation are captured via **Event Frames**



A **PI Vision** dashboard now gives a real time overview of these events when triggered

Opportunity: CBM

CBM: dashboard in PI Vision

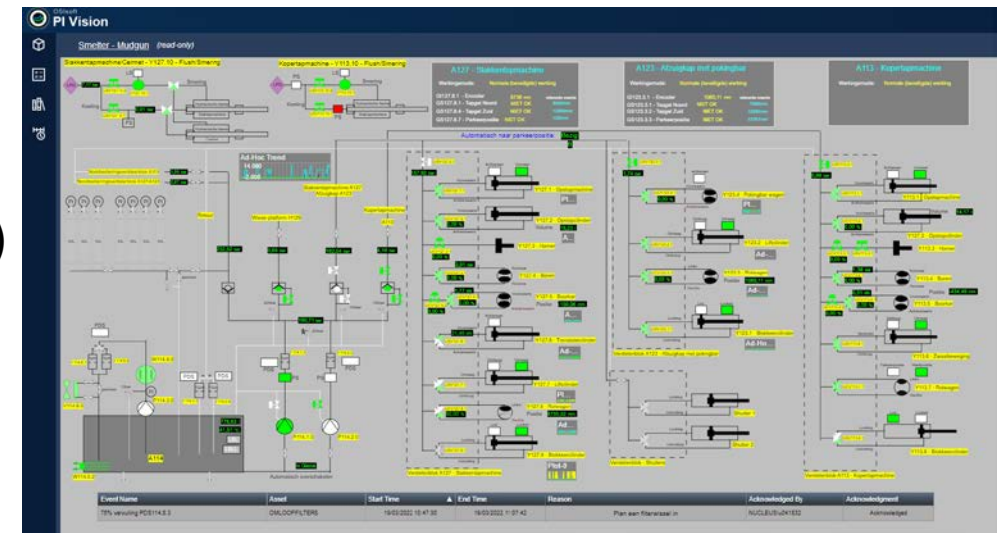
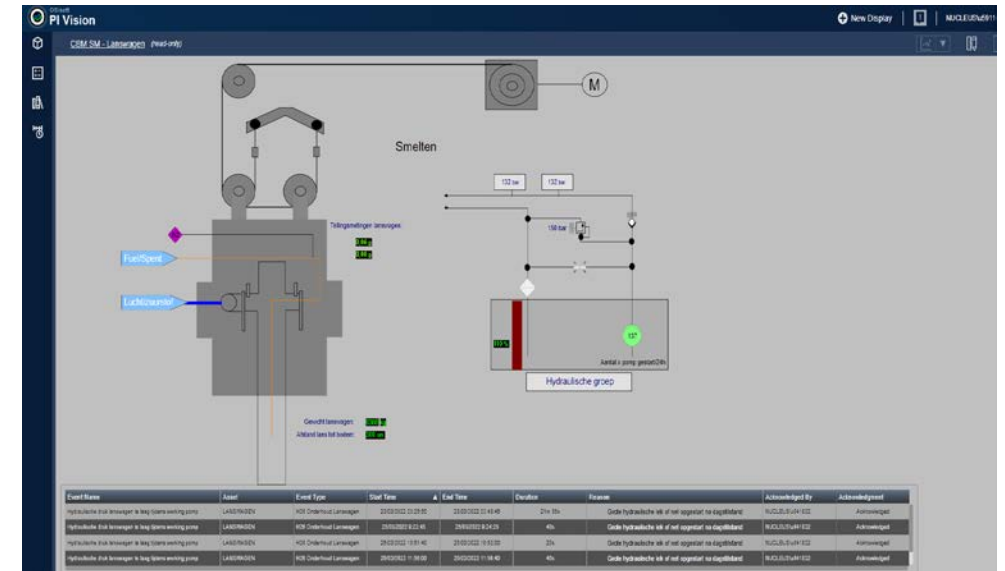
CBM roll out in Hoboken still ongoing
>1000 events set-up and validated (10 units)

Systematic follow-up of operating conditions for critical assets

Acknowledging the events = Feedback to users

Project changed maintenance in Hoboken fundamentally:

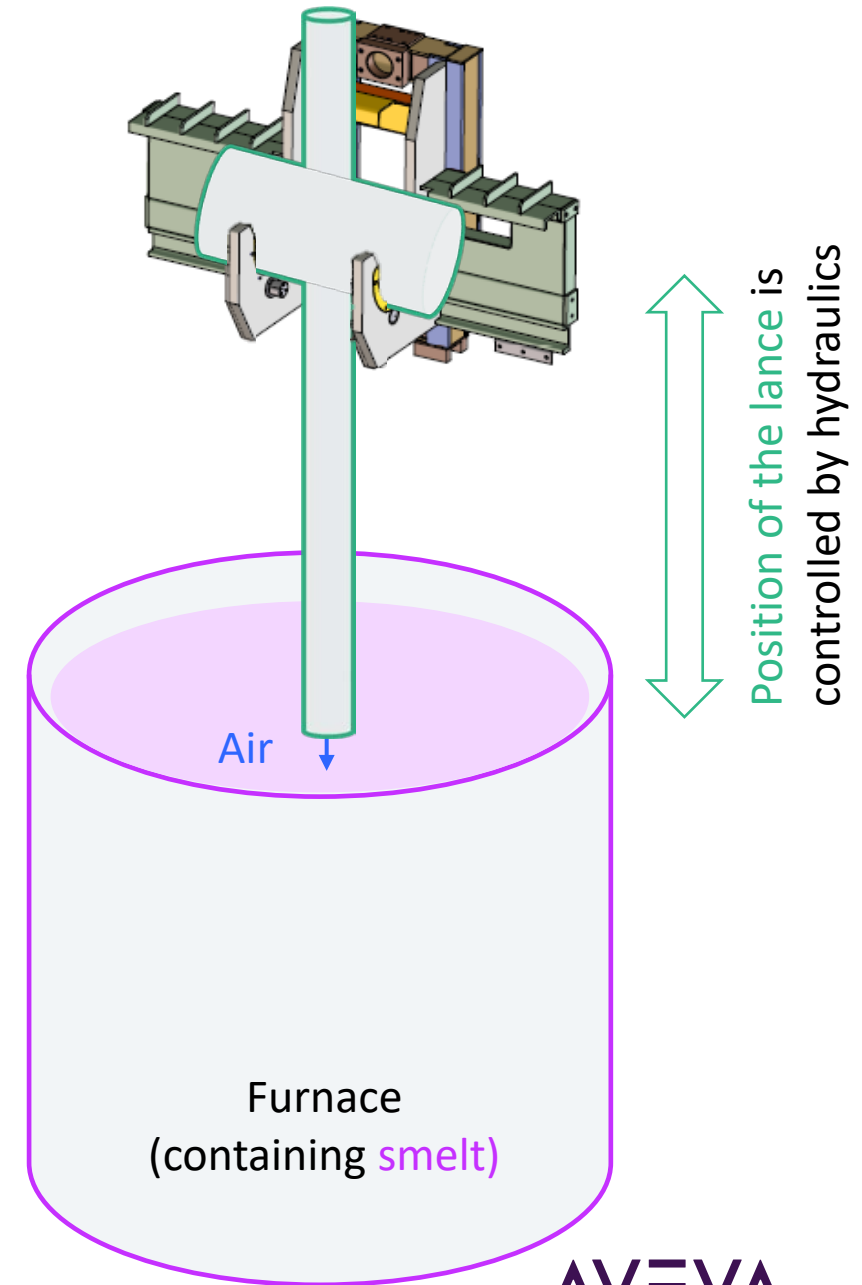
- Inspection walks triggered by events (vs. at predefined moments)
- Bi-weekly evaluation meetings to review the triggered events
- Adding extra sensors to create and capture more events



CBM Example “lanswagen”

- At the smelter, we blow oxygen enriched air in the smelter furnace with a lance.
- The position of the lance is important. It is controlled by a hydraulic system; the “Lanswagen”.
- The hydraulic system should only operate to reposition the lance.
- Normally, repositioning happens <50 times per day.
- If the hydraulic group (compressor) **starts** significantly more, it could indicate an issue with the hydraulics (often a leak) and it requires maintenance attention.

Condition for CBM Event Frame: “**Compressor starts >200 times/day**”



Other CBM examples

Valve Monitoring

A **new** value **setpoint** always followed by **feedback loop** from the value reporting its **actual position**.

Normally;



1. the setpoint should be reached in a short amount of **time**.
2. the difference between the setpoint and the actual position reached should be low (**accuracy**).

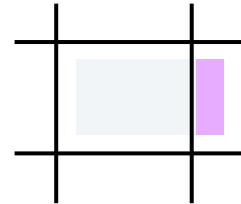
A feedback loop not in time or a large difference between the setpoint and the actual position could be an indication of:

- Fouling / bad seal
- The valve might be stuck
- Leakage

Condition for CBM Event Frame: ***"valve position deviates more than 15% of its setpoint after 3s"***

Motor Monitoring

In the design phase, motors are dimensioned to operate within their **best operating zone**. Eg. 40-60% of their maximum load.




A motor operating (far) outside its best operation zone, often means addition friction by e.g.:

- Obstruction on the drive side
- Wear (eg. bearing failure)

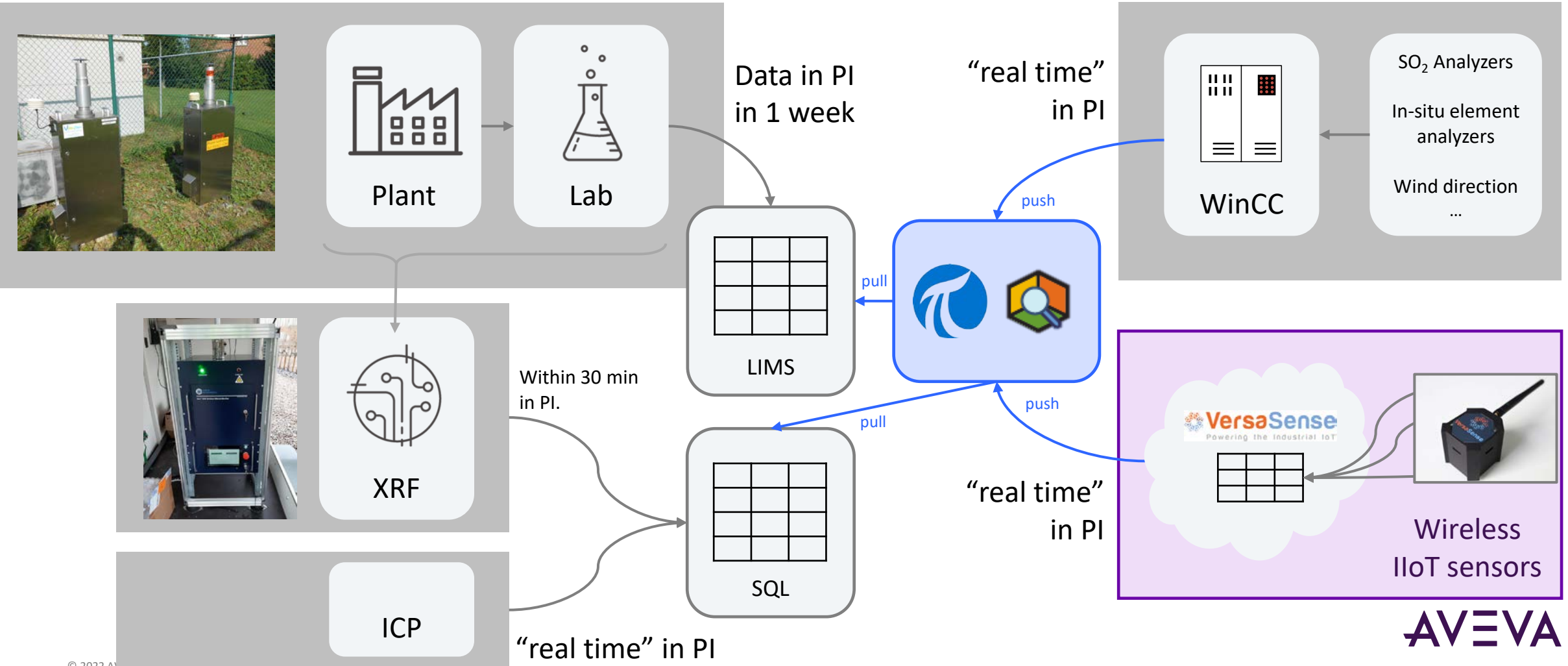
Condition for CBM Event Frame: ***"Motor current for 2 minutes above 80% of max. motor current."***

Challenge/Opportunity/Solution/Benefits

Challenge	Opportunity	Solution	Benefits
<p>Facts:</p> <ul style="list-style-type: none">• Heavy process industry• Urbanized environment <p>Emission incidents must be prevented by all capable means.</p> <p>License to operate.</p> <p>Everyone works together to achieve the Go-for-Zero objectives.</p>	<p>Condition Based Maintenance:</p> <p><i>Monitoring equipment based on conditions defined in Event Frames.</i></p>	<p>“Condition Based Environment”</p> <p>People from Environment and Maintenance and the different plants collaborated</p> <p>CBM concepts were applied to potential Emission triggers</p> <p>First input:</p> <p>Milieu Effecten Analyse More sensors (IIoT)</p> <p>Additional input:</p> <p>Root-cause Analysis with TrendMiner</p> <p>Result:</p> <p>PI Vision dashboards to monitor incidents.</p> <p>Next: IIoT/Azure integrations for advanced reporting and Machine learning</p>	<ul style="list-style-type: none">• Fast detection – contain impact of incidents• Root causes are quickly found.• New mitigations are defined• Better insights into process behavior.• Less emission incidents 

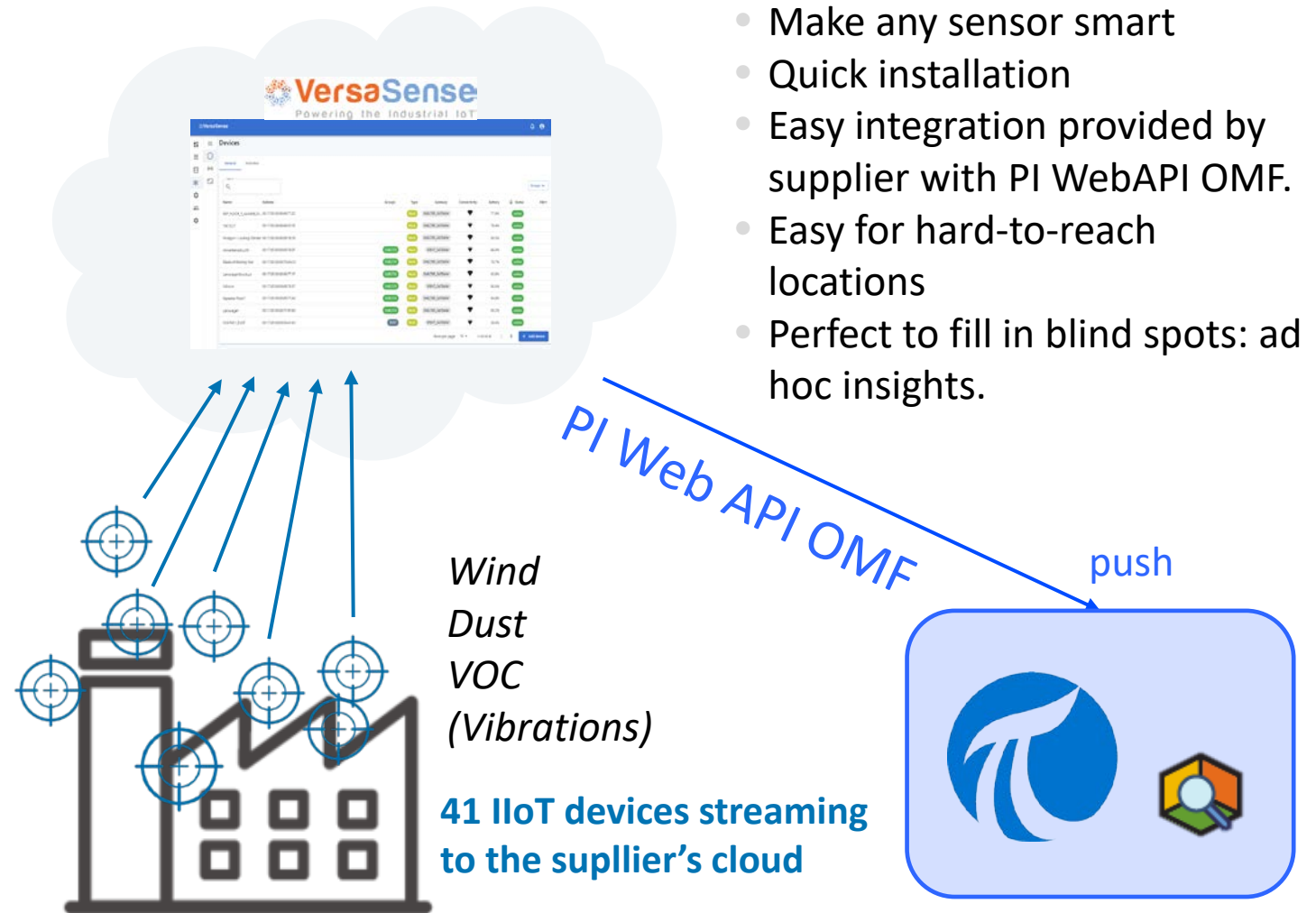
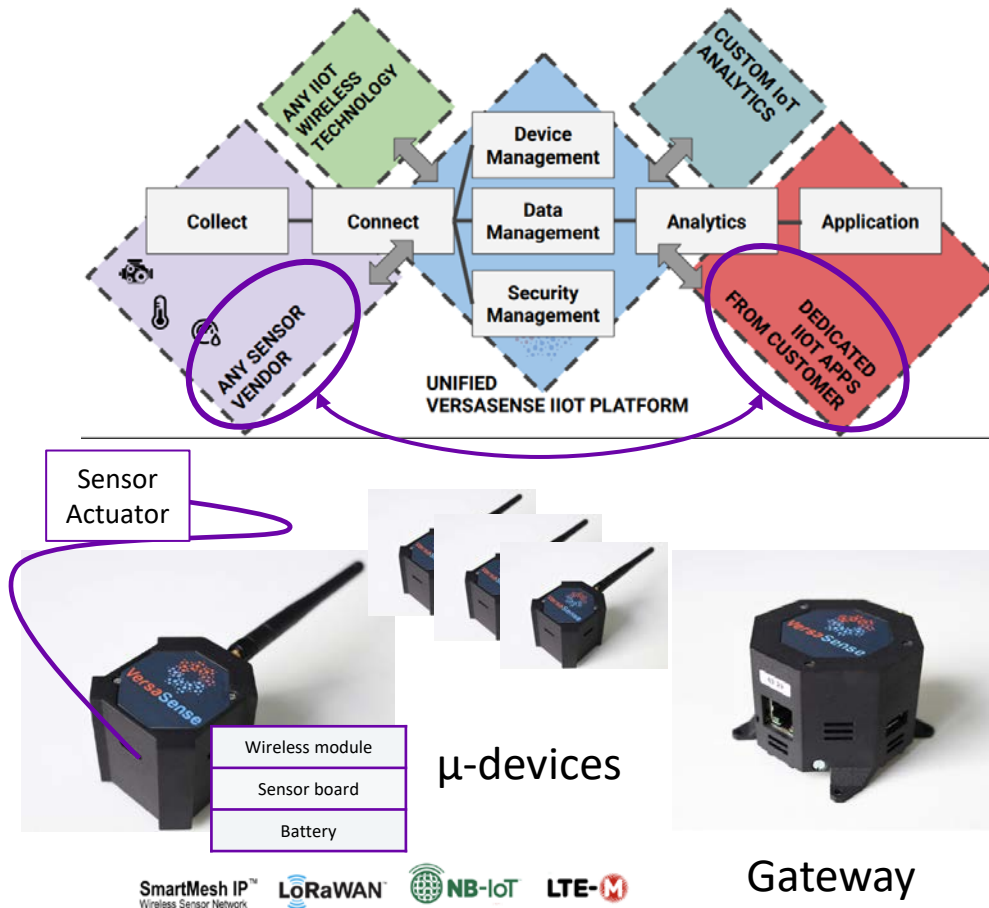
“Environmental tags” - getting relevant data

Several data sources are combined in the PI System



Solution: IIoT sensors for remote measuring

VersaSense use-case



Advantages:

- Make any sensor smart
- Quick installation
- Easy integration provided by supplier with PI WebAPI OMF.
- Easy for hard-to-reach locations
- Perfect to fill in blind spots: ad hoc insights.

First iteration **>150 risks identified** and documented (*Milieu aspecten analyse*)

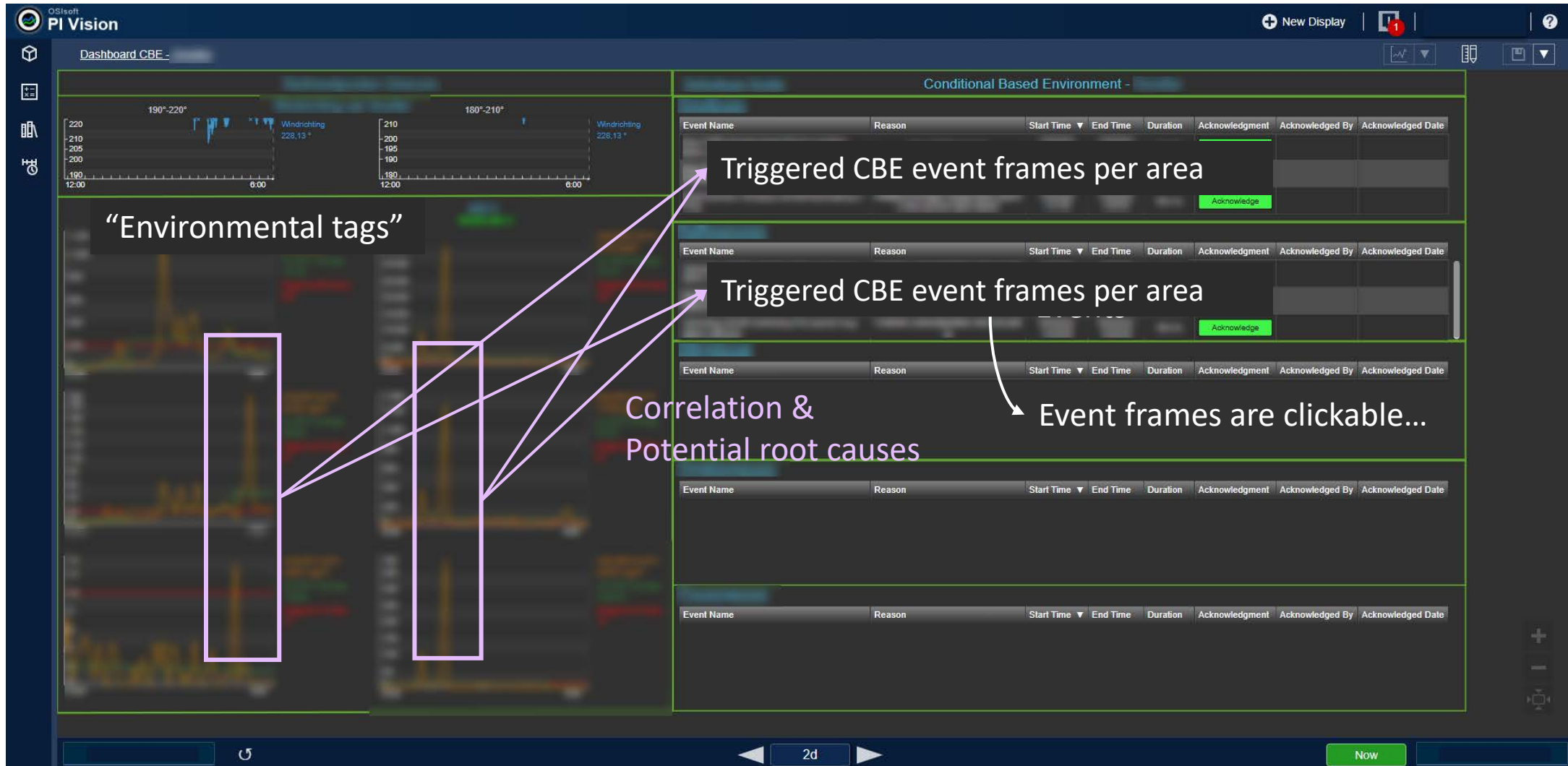
First iteration **>150 risks identified** and documented (*Milieu aspecten analyse*)

Turned into
Event Frames

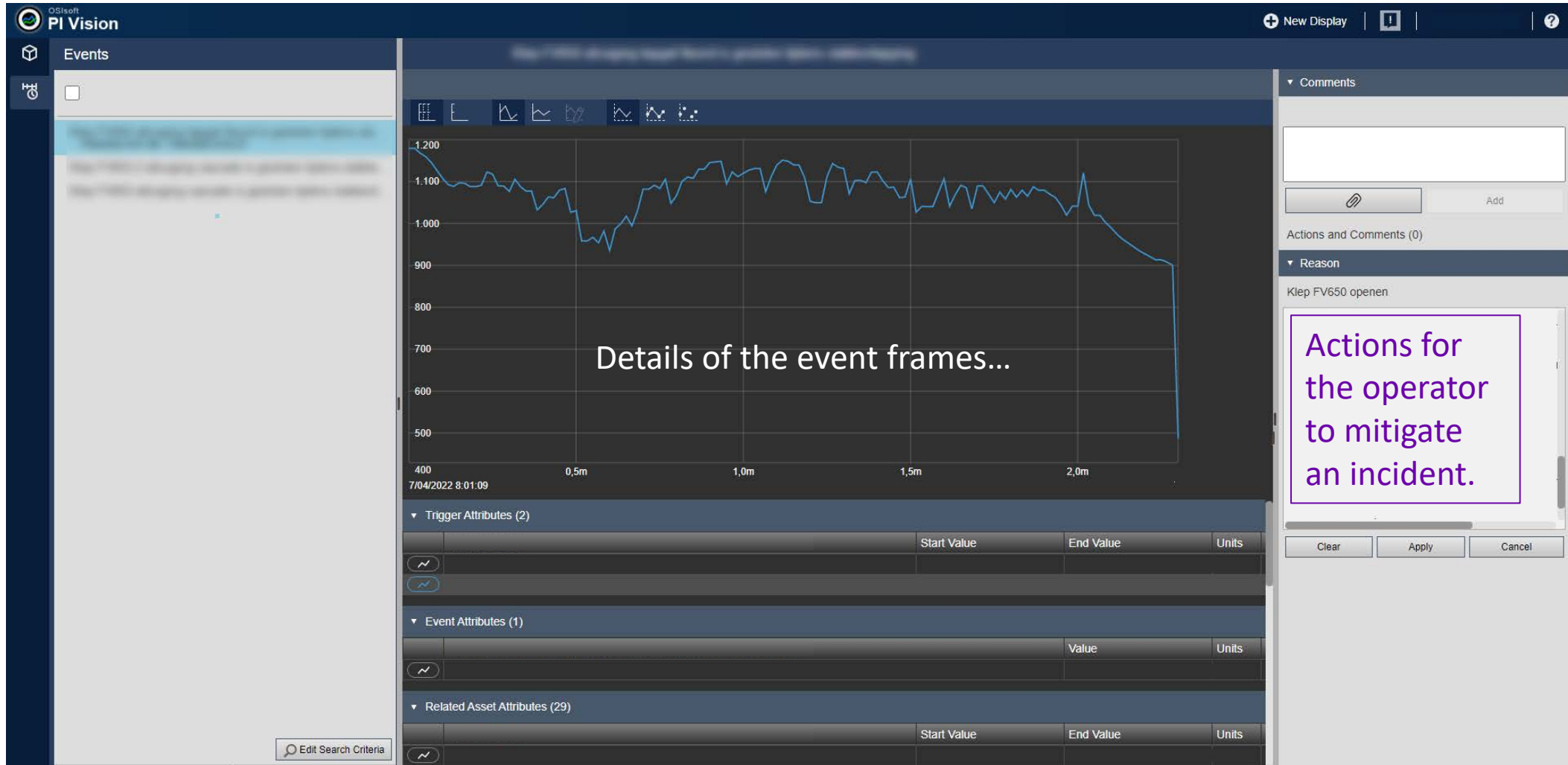
Incorporated
in “Reasons”

Mitigations & Action plans for operators

Solution: Implementing Wave 1: CBE Dashboard

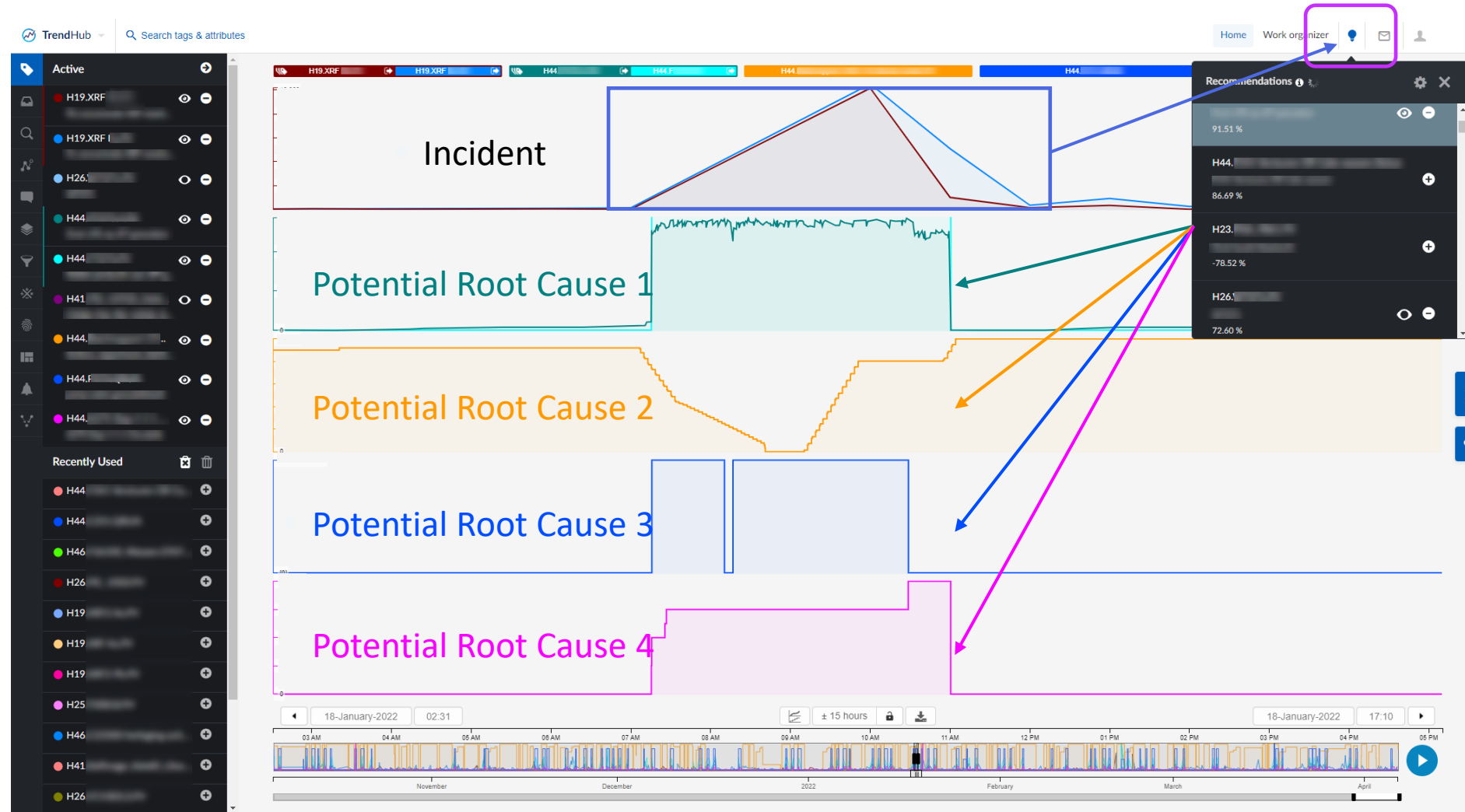


Solution: Implementing Wave 1: Instruct the operator



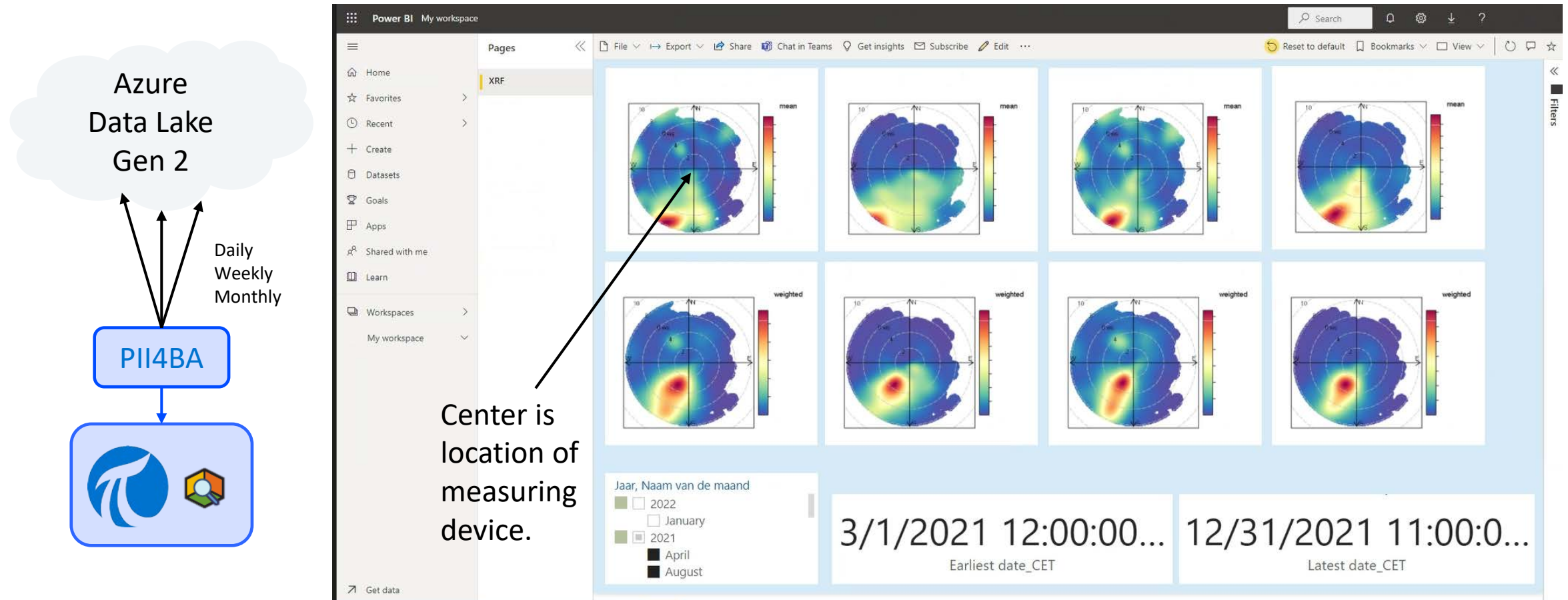
Solution: TrendMiner for advanced root cause analysis

Self-Service analytics allow to gain quick new insights if an environmental tag spikes without CBE-events



Solution: PI Integrator for Business Analytics and PowerBI

Advanced reporting and Machine Learning (inc. weather data) for locating emission sources.



Benefits

- Systematic follow-up => Very effective PDCA.
- Alerts / Acknowledgements and mitigation plans via reasons
- PI solution (even complex event frame definitions could be built in System explorer)
- Extra info can be given when an event occurs (who to contact, what to check/do...)
- End Users can create their own view (Focused in Operations, General overview for Environment manager)
- Agile/easy way to mitigate incidents and to implement new events (Go for Zero)

=> Less emission incidents



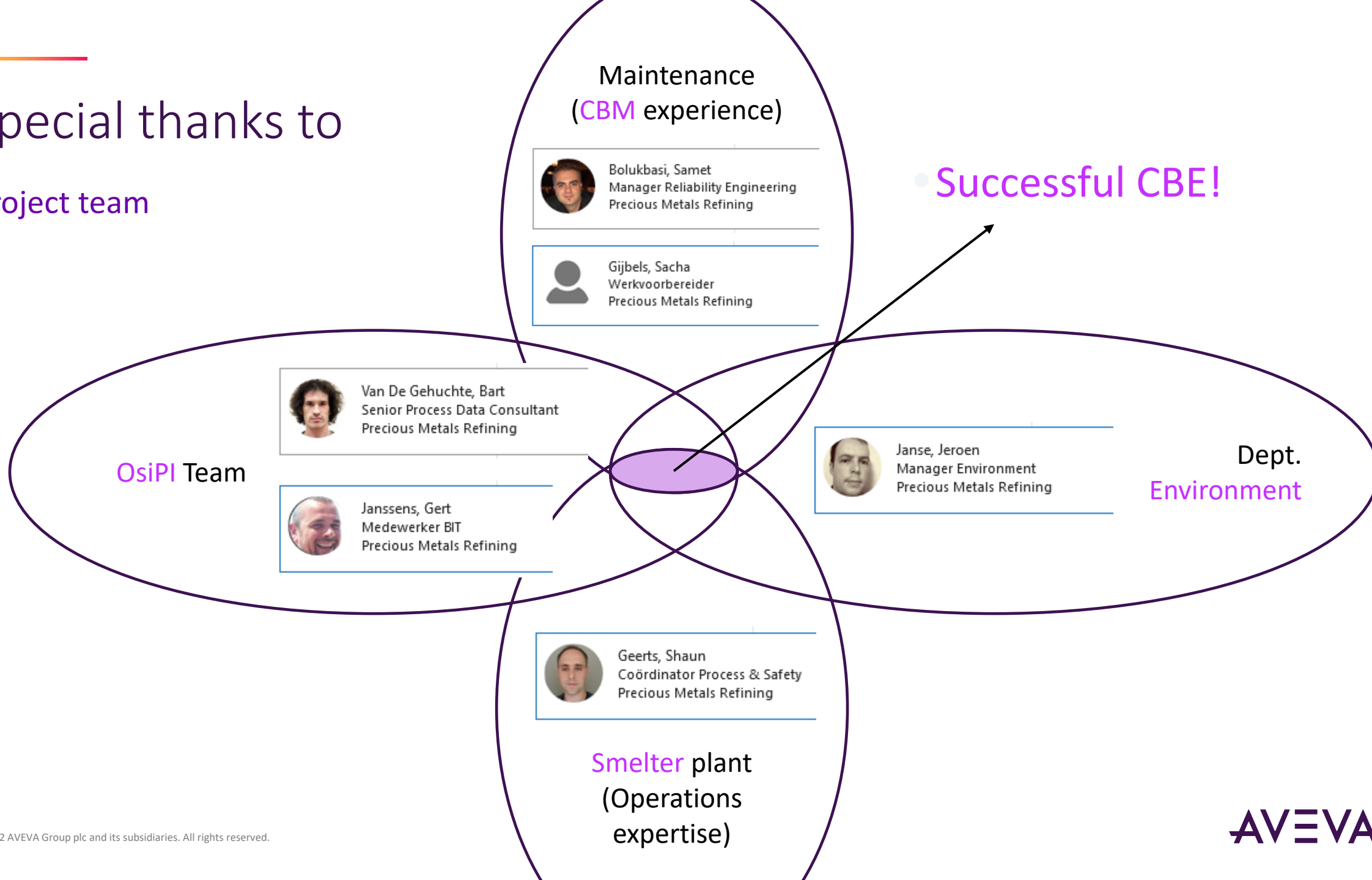
Outlook

Next steps

- Further roll-out through the whole site (currently implemented in 1 plant)
- Improve the system by learning from environmental tags without a known CBE Event Frame => build new event frames.
- We need to capture more data by adding new IIoT sensors.
- Additional Machine learning in Azure to predict events based on environmental factors (rain, wind,...) and optimize our operations accordingly.

Special thanks to

Project team



Questions?

Please wait for the microphone

- State your name and company



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- Navigate to this session in the mobile agenda for the survey

