

The Importance of Partial Discharge Monitoring in MV and HV Networks

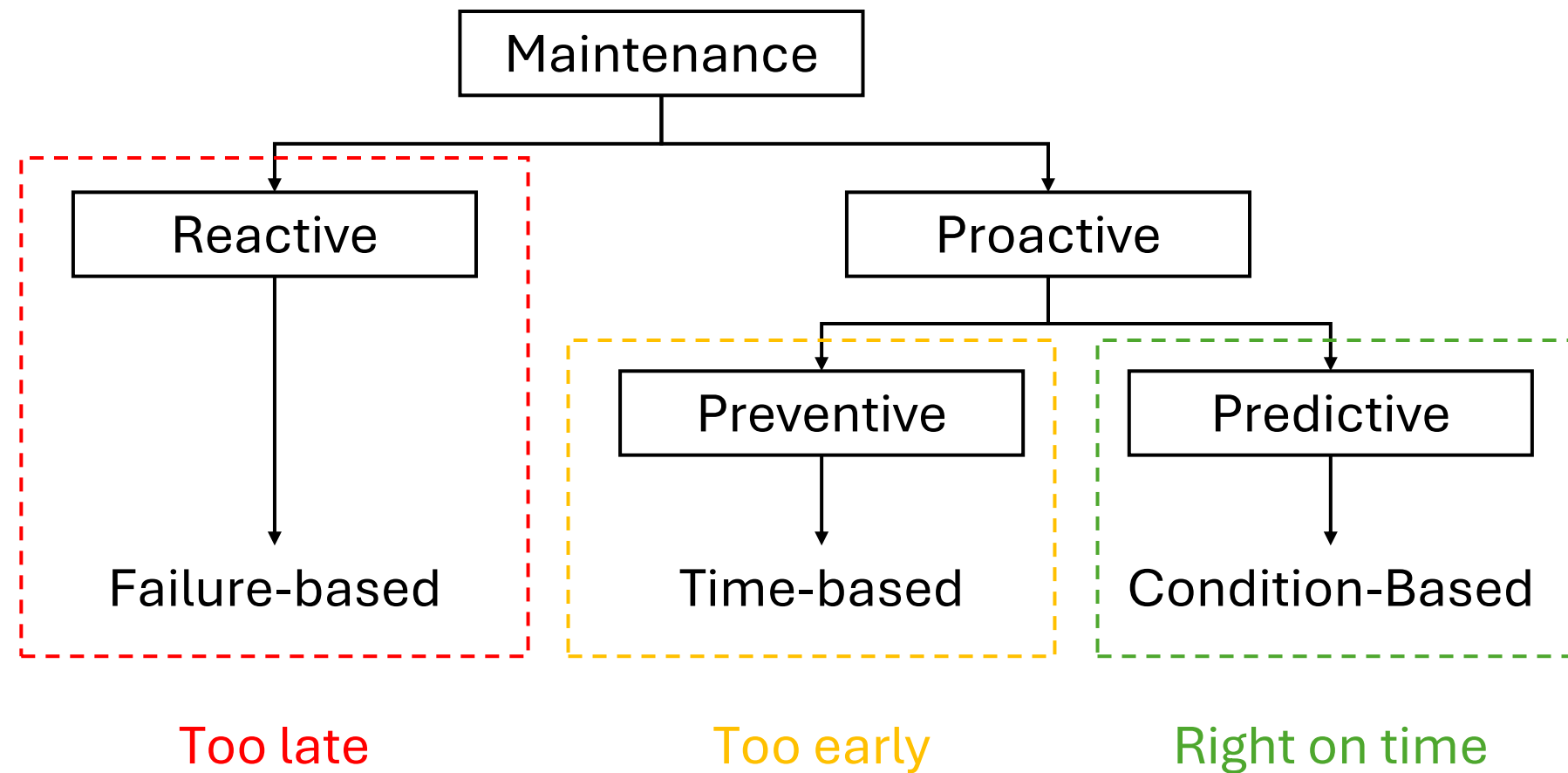
Giacomo Ciotti

OptMonitor Product Manager - [machinemonitor®](mailto:machinemonitor@machinemonitor.com)

giacomo.ciotti@machinemonitor.com



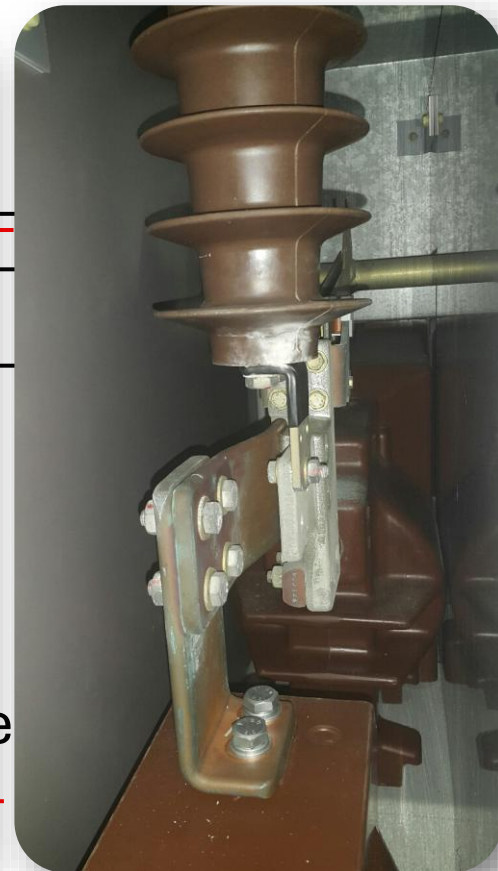
Introduction



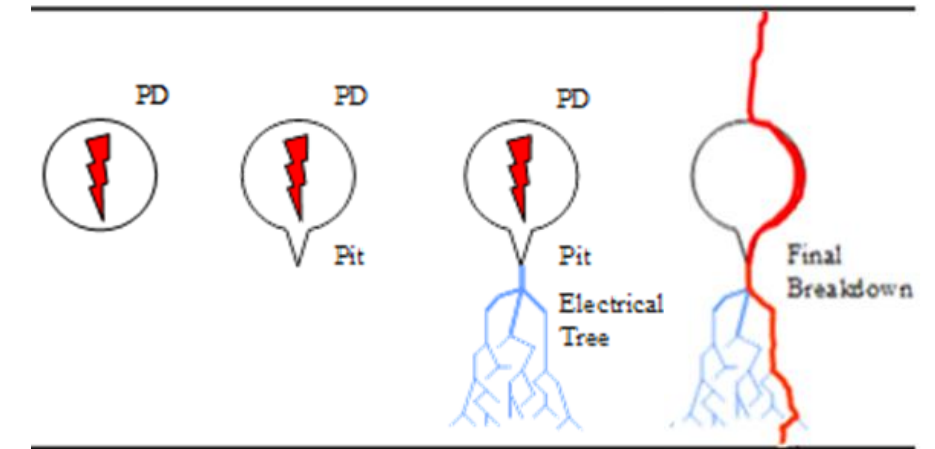
Introduction



Too late



Too early



Partial Discharge Analysis

- PD is related to **local defects** of the insulation system
- PD causes **insulation degradation**
- PD it is the initial stage of a **complete breakdown**



Summary of the presentation

1. Partial Discharge tests
 - Offline
 - Online spot
 - Online continuous monitoring
2. Online continuous PD monitoring: challenges
3. Online continuous PD monitoring: a novel solution
4. Case studies

Partial Discharge: introduction

Where can Partial Discharge activity occur?

Medium Voltage

High Voltage

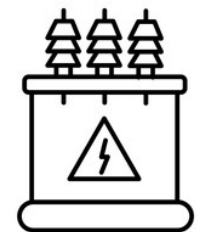
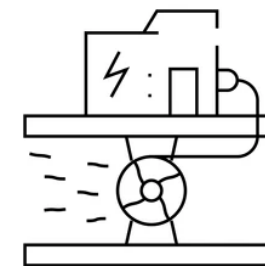
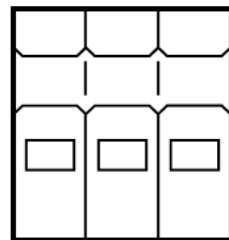
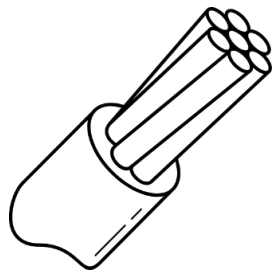
Cables

Switchgear

Motors

Generators

Transformers



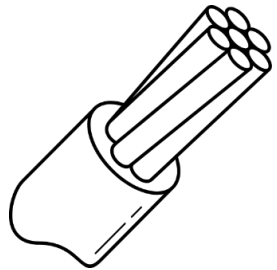
Partial Discharge: introduction

Where can Partial Discharge activity occur?

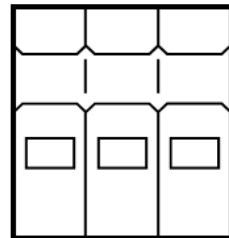
Medium Voltage

High Voltage

Cables



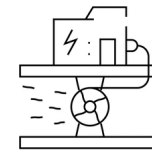
Switchgear



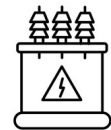
Motors



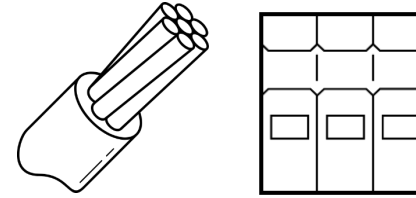
Generators



Transformers



Partial Discharge tests: distribution network

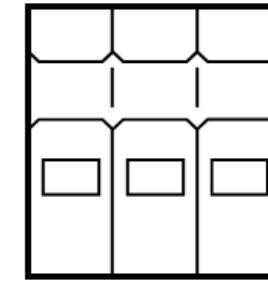
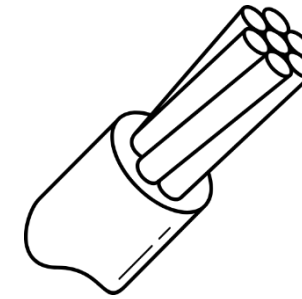


Offline

Online spot

Online monitoring

Partial Discharge tests: distribution network



Offline



PROs

- High signal to noise ratio

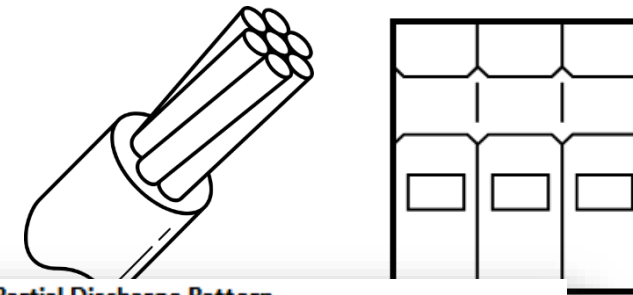


CONs

- Out-of-service required
- External generator required
- Time consuming
- Electrical asset not in real working condition
 - No current
 - Some components may be not considered



Partial Discharge tests: distribution network



Offline

Online spot

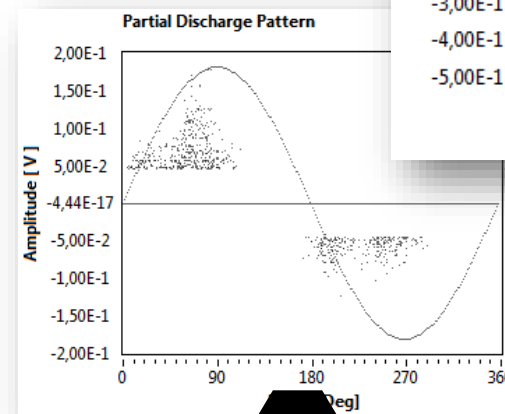
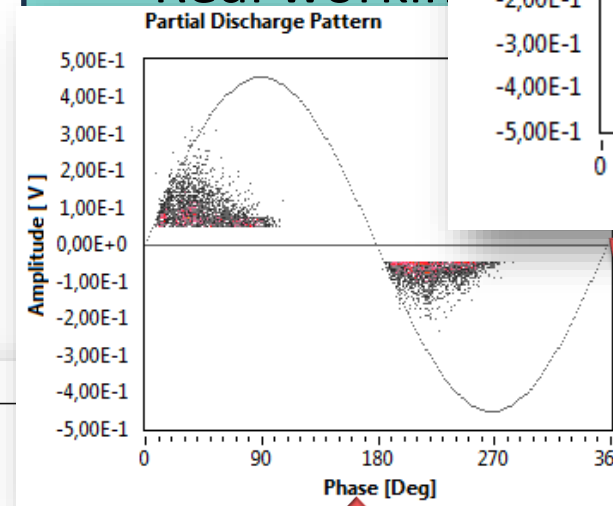
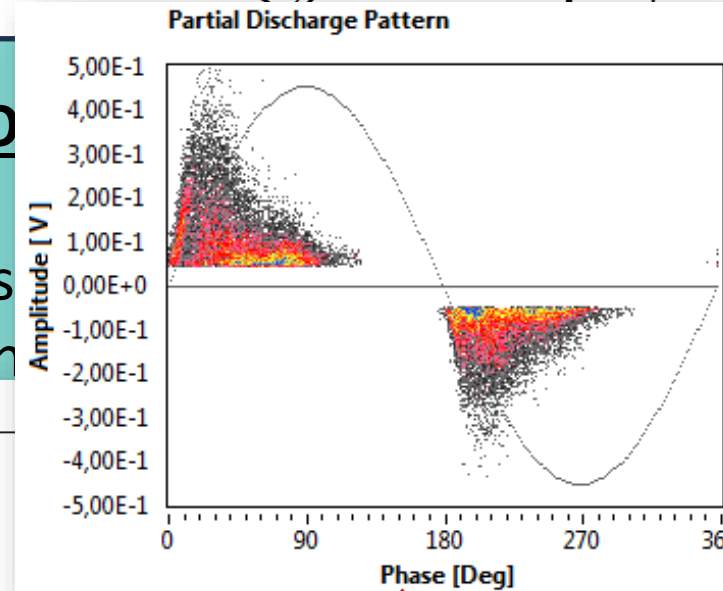
Online monitoring

PRO

- No out-of-s
- Real workin

CONs

- round noise & bances
- State of the art PD detection system
- Expertise in

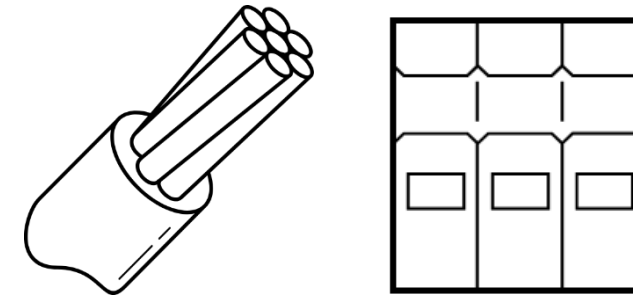


Qm
[mV]

T
[month]



Partial Discharge tests: distribution network



Offline

PROs

CONs

Online spot

Online monitoring

PD signal behavior over the time is key for condition assessment

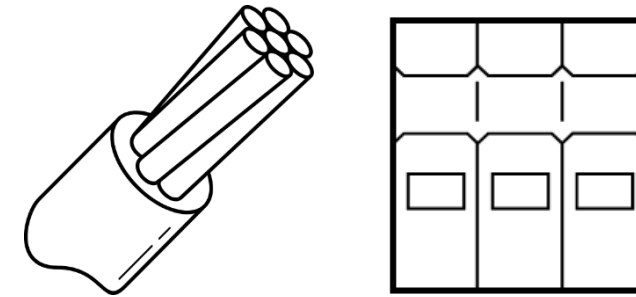
Q_m
[mV]



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use in
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current

Partial Discharge tests: distribution network



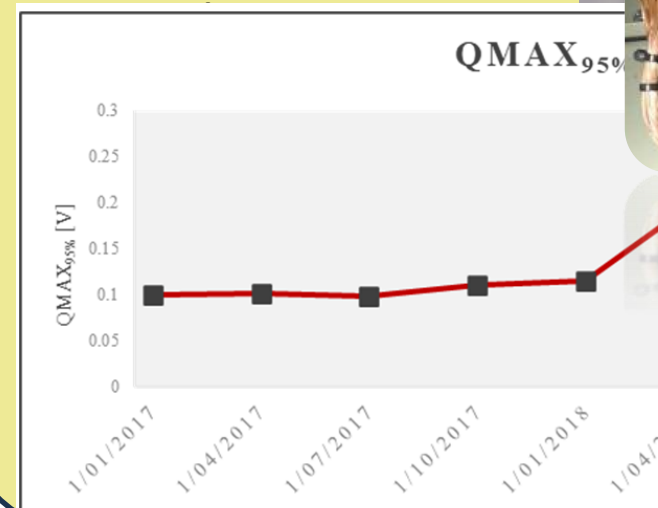
Offline

Online spot

Online monitoring

PROs

- No out-of-service
- Real working conditions
- Trend analysis
- Minimized influence of environmental

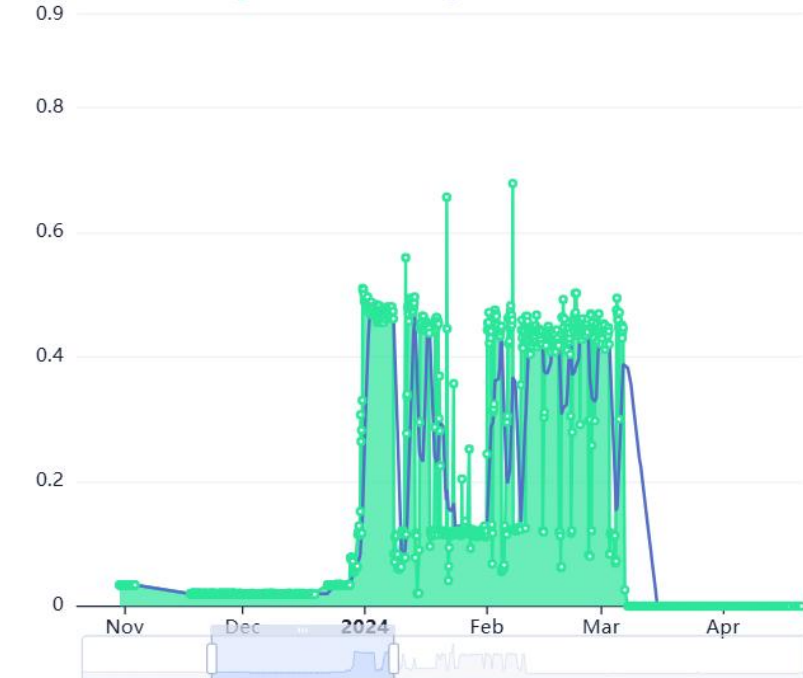


CONs

Realized
monitoring devices to

Trend

Amplitude [mV] Moving Average

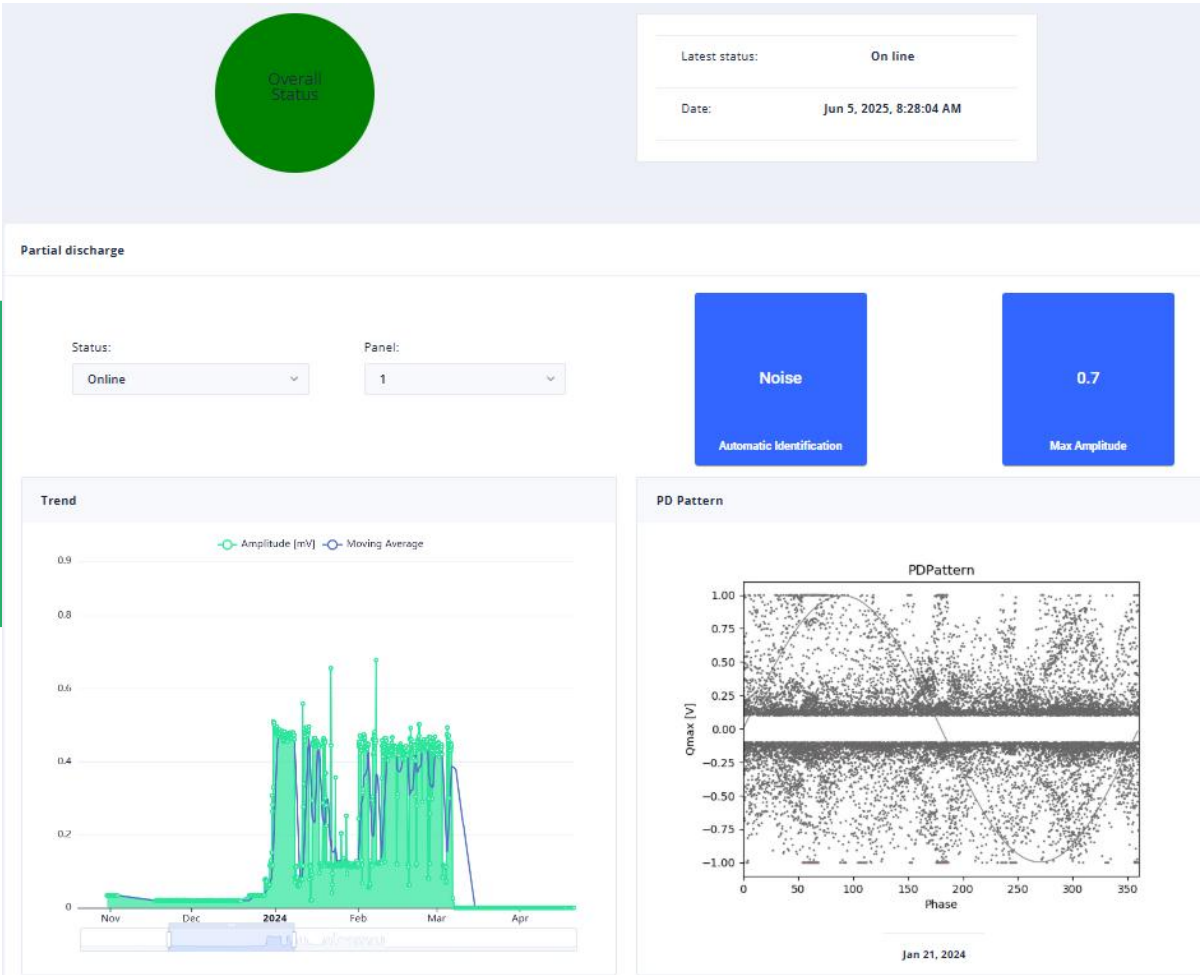




Online monitoring systems: current challenges

- Can I fully trust the AI algorithms used for data analysis?
- How reliable are the automatically generated alarms?
- What actions should I take when a red alarm is triggered by the monitoring system?

Online monitoring systems: a novel approach



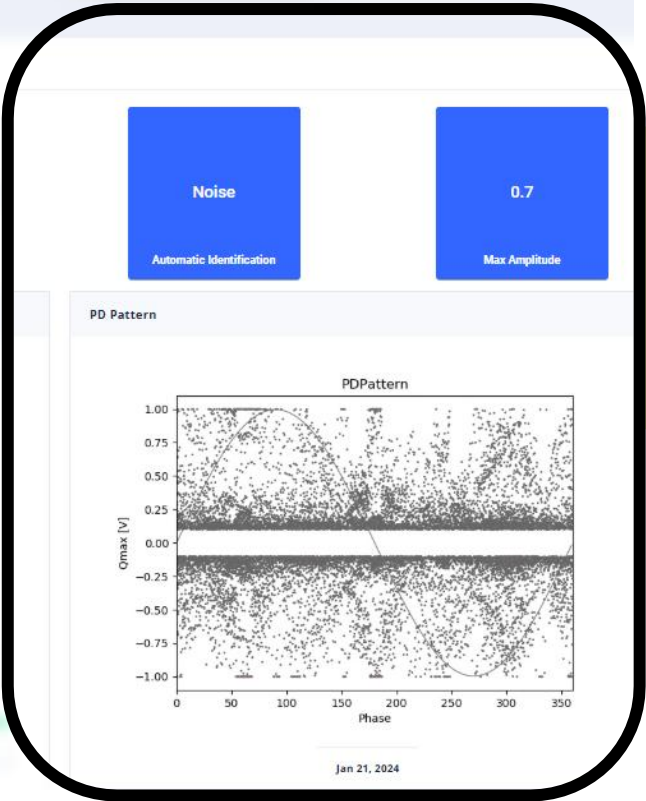
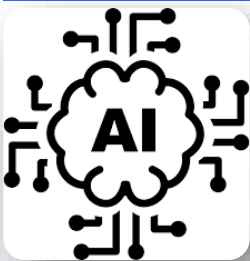
Online monitoring systems: a novel approach



Noise
Automatic Identification

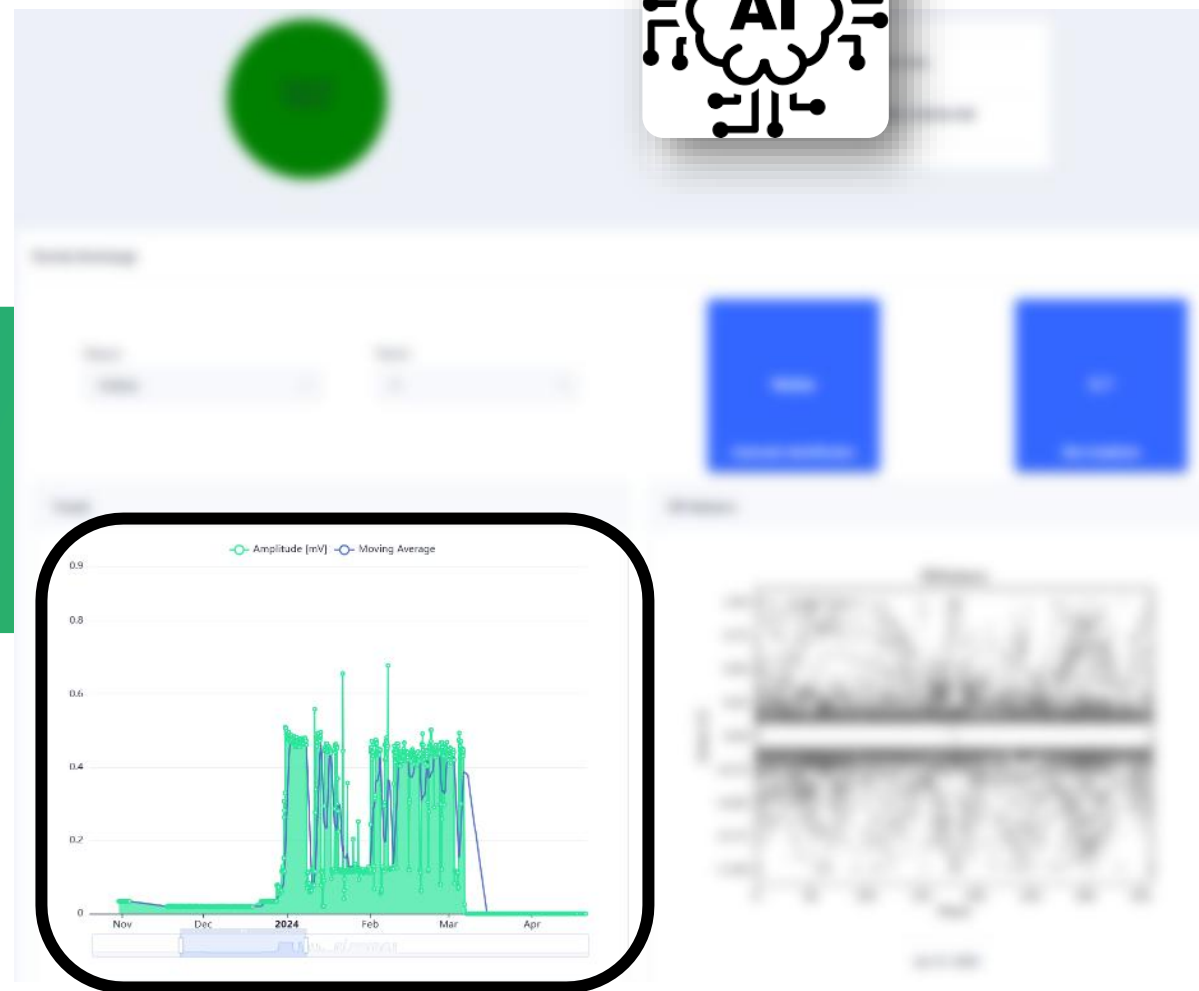
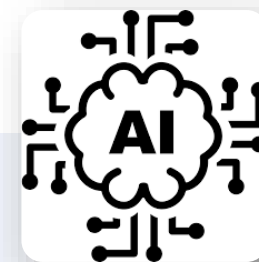
External disturbance
Automatic Identification

Signal to be analysed
Automatic Identification



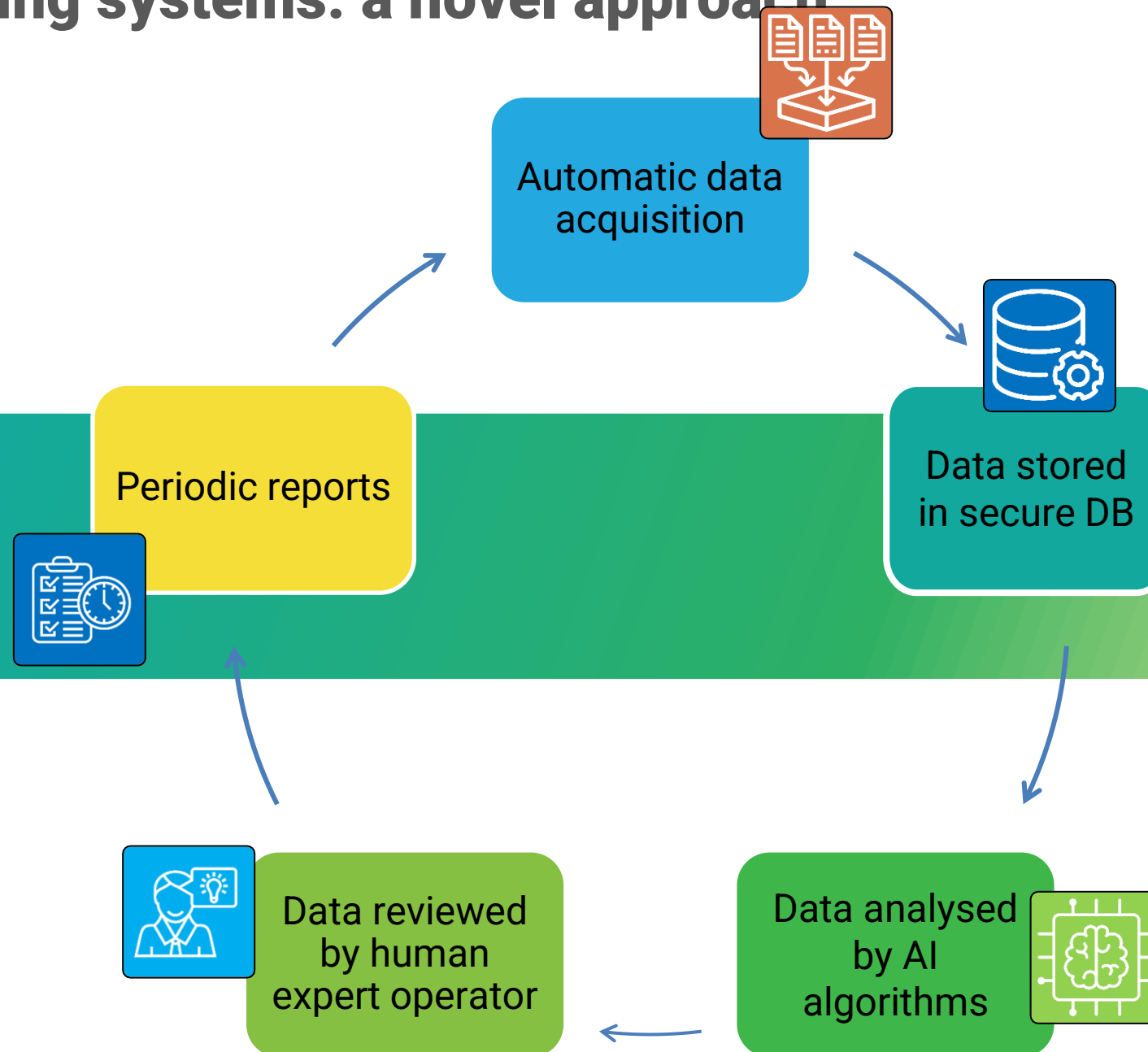
PD classification

Online monitoring systems: a novel approach



Trend analysis

Online monitoring systems: a novel approach

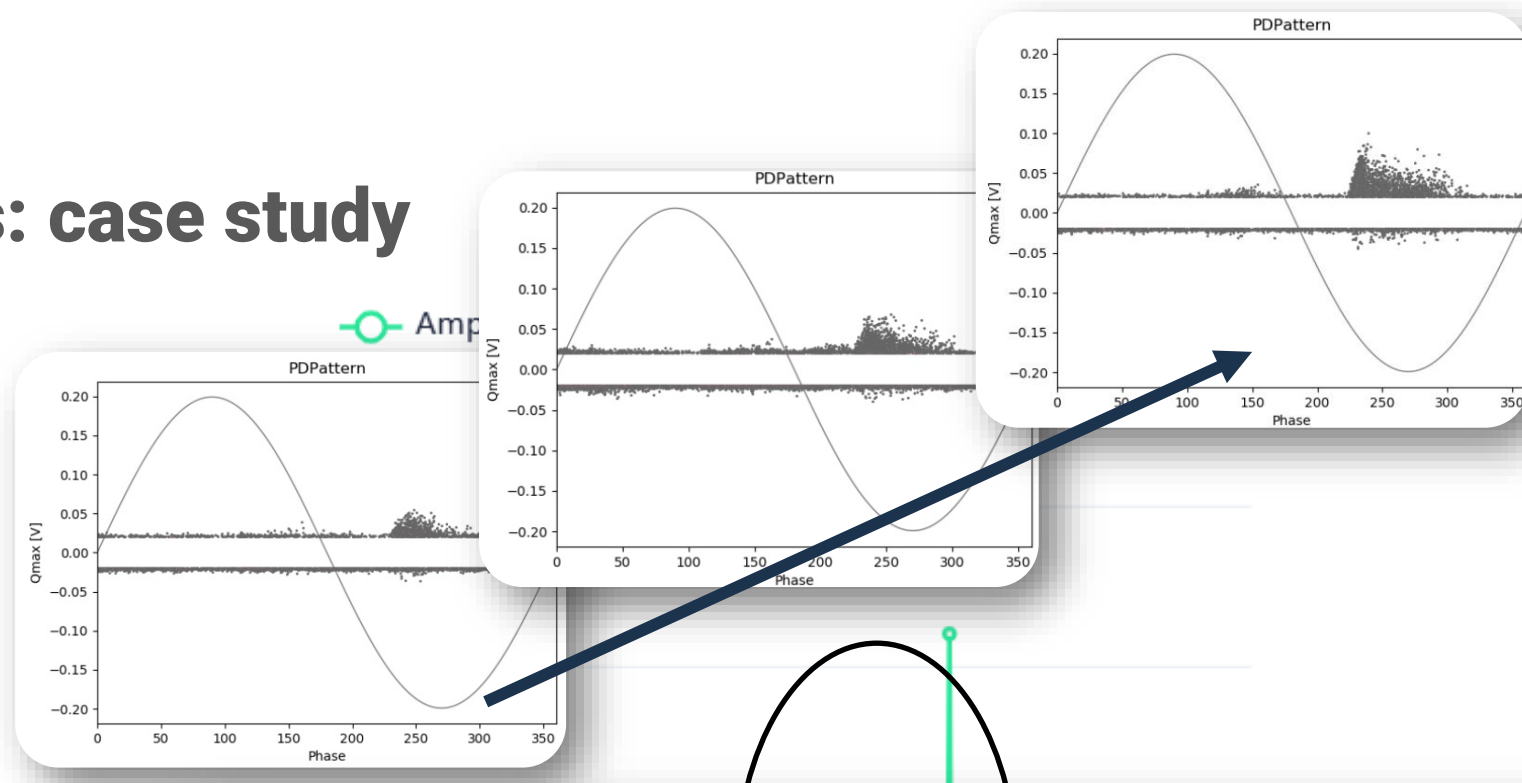


Online monitoring systems: case study

- Factory in QLD
- Two sites
- #11 acquisition units
- #62 HFCT sensors
 - Cables
 - Switchgear
- Rated voltage = 11kV



Online monitoring systems: case study



0.1 Optmonitor - Alarm notification on Continuous Monitoring



noreply@machinemonitor.com

Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

There is Alarm in Continuous Monitoring!

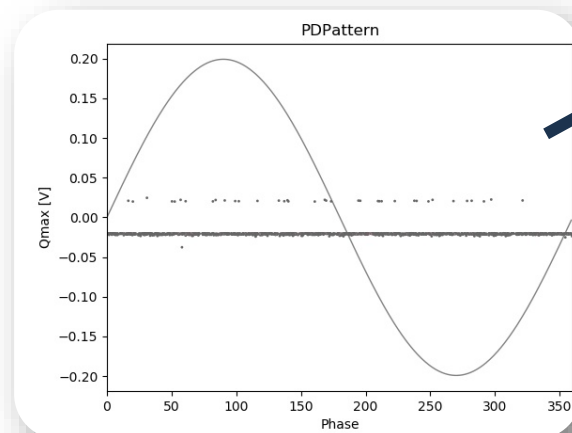
Serial Number: - Customer:
- Site:

There is PD alarm on the asset. Please check the machine status as soon as possible!

[Click here to go to OptMonitor - Continuous monitoring.](#)

If you have any questions, just reply to this email. We're always happy to help out.

Sincerely,
machinemonitor® engineering team





Conclusion

- **AI** is a powerful tool that can **support** expert engineers in **speeding up data analysis** and focusing on the **most relevant data**.
- Online monitoring systems based only on AI algorithms are prone to **false alarms**.
- The **synergy** between **AI and human experts** offers clients **comprehensive support**, not just diagnostic alerts, but **practical recommendations** for managing Medium and High Voltage assets.

Thank you for your attention!

Questions ?



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