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The Digital Transformation has begun!

Digitalization Use Cases Supporting Remote, Connected Workers

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Today's discussion will cover…

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- Digitalization use cases
- Use case #1: Predictive monitoring for assets & processes
- Use case #2: Control valve monitoring
- Use case #3: Control loop performance analysis
- Use case #4: Process event/alarm management
- Use case #5: Automation system health & lifecycle monitoring
- Q&A

Digitalization use cases in the process industries

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Digitalization can be applied to **greenfield and brownfield** applications.

For existing plants, often the **data is already available** to be analyzed and interpreted enabling decisions to be made that can **improve operations and maintenance.**

A **great entry point to digitalization** is to consider **real world use cases** requiring **low investment of time, money, and resources** for implementation.

Cloud-based tools and **remote connectivity** support **improved worker safety and performance**.

Chemical industry – Top reasons to digitalize…

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1. Improve uptime
2. Improve operating margins
3. Meet industry standards or regulations
4. Reduce time-to-market
5. Improve planning and decision making
6. Increase employee productivity
7. Enable move to a service-based offering
8. To keep up with our competitors
9. Pressure from suppliers and/or customers
10. Enable penetration of new markets
11. Improve safety

Source: Longitude Research study of over 40 manufacturers in the chemical sector

Digitalization applications/use cases for process industries

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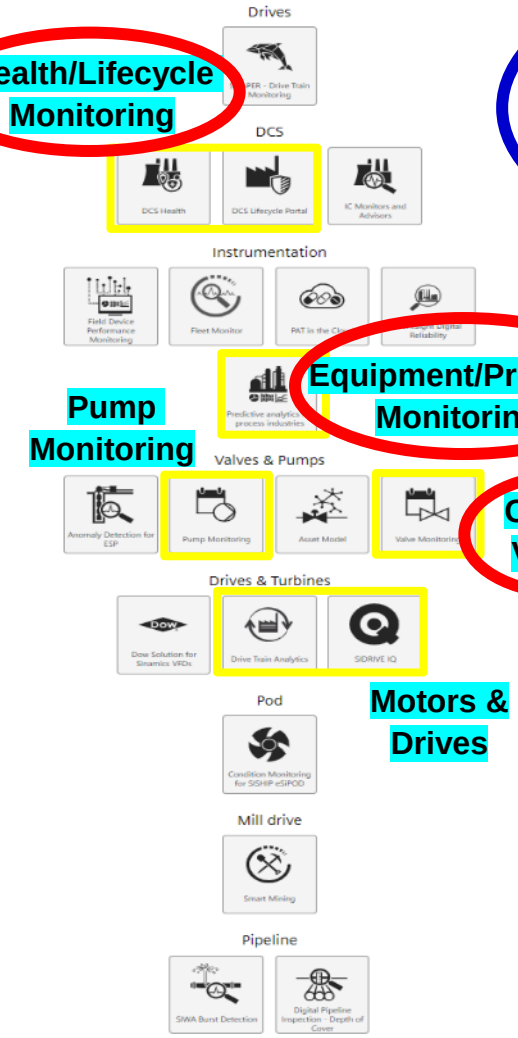
KEY: Speed | Flexibility | Quality | New Product | Efficiency | Worker Safety | Maintenance | Cyber Security

Engineering

Distributed/
Multi-user Engineering

Ensure Asset Uptime



Health/Lifecycle Monitoring

Pump Monitoring

Equipment/Process Monitoring

Control Valves

Motors & Drives

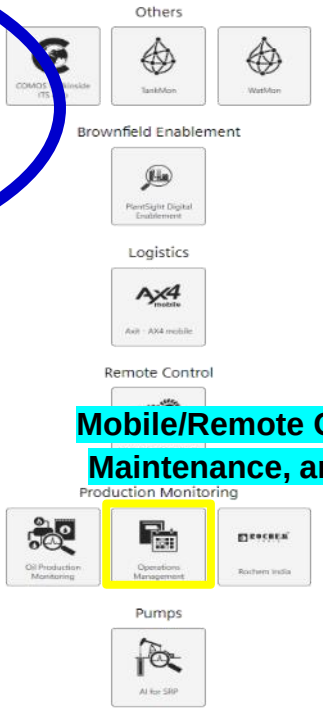
Improve Processes

Control Loops

Process Events /Alarms

Instrument Monitoring (e.g. Tank Farm)

Manage Operations



Mobile/Remote Operations, Maintenance, and Support

Digitalization applications/use cases for process industries

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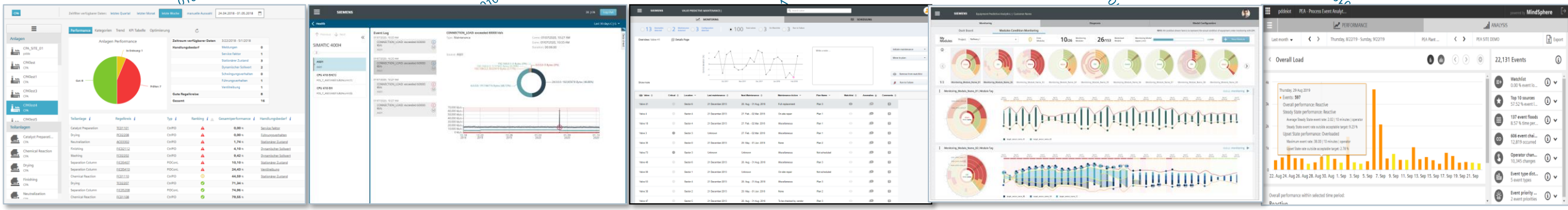
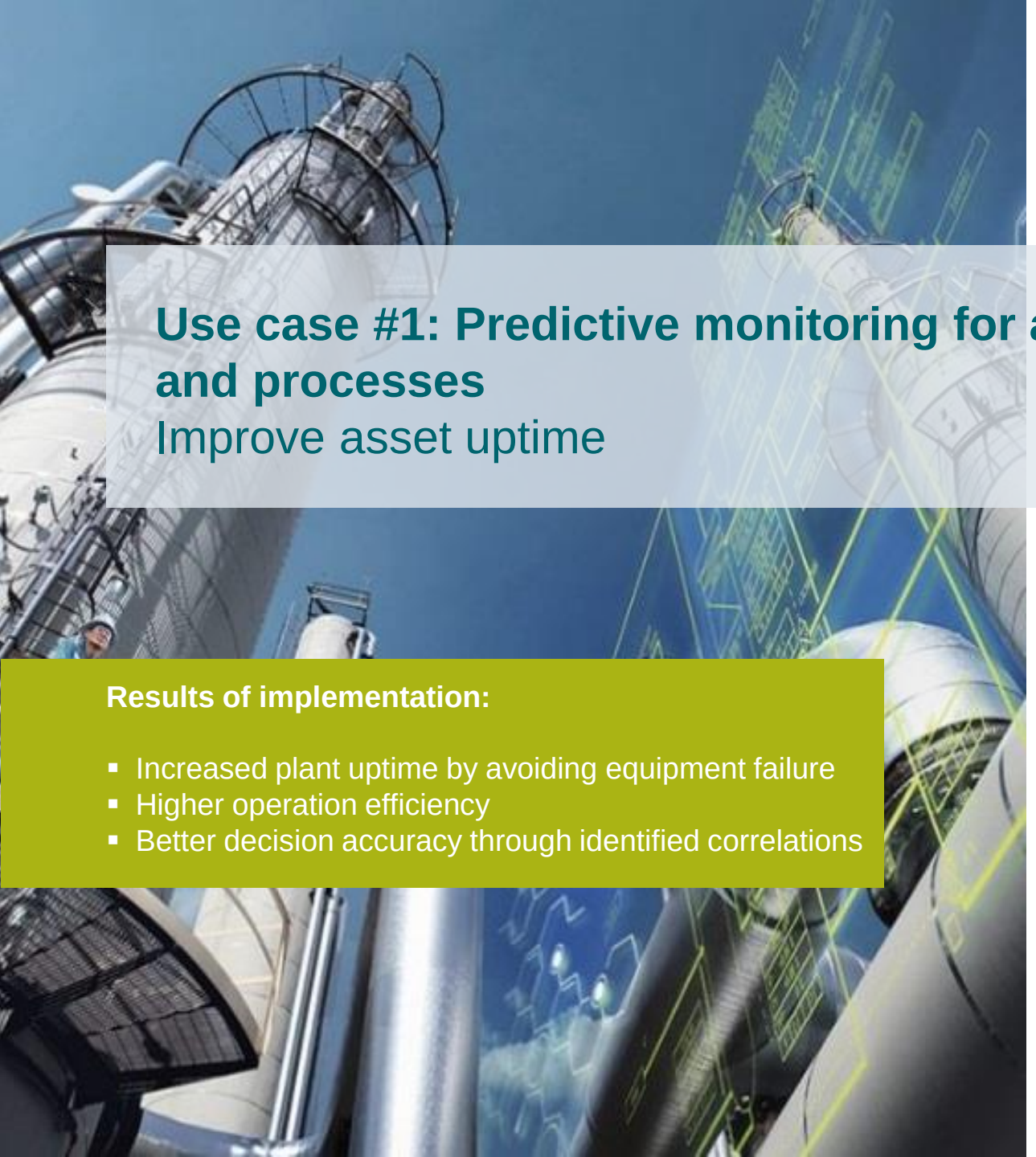
Process Industry Applications

Addressing operations, maintenance, and safety

- Control loop performance
- Automation system health and lifecycle
- Control valve monitoring
- Equipment and process monitoring
- Process event and alarm management





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Use case #1: Predictive monitoring for assets and processes

Improve asset uptime

Speed | Flexibility | Quality | New Product

Efficiency | Worker Safety | Maintenance | Cyber Security

Results of implementation:

- Increased plant uptime by avoiding equipment failure
- Higher operation efficiency
- Better decision accuracy through identified correlations

Issues:

- Inability to continuously and efficiently analyze processes and assets
- Limited resources with sufficient knowledge and competence on site for the transparency of operation.

Method to address:

- **Gather information** about and **complete analysis** of **process and assets**, **past anomalies,** and **maintenance events**
- Calculate the **correlation for the Process and Equipment DNA**
- Create meaningful **models based on DNA** and **domain know-how**
- Use the models for **predictive monitoring**

Predictive monitoring for processes and assets

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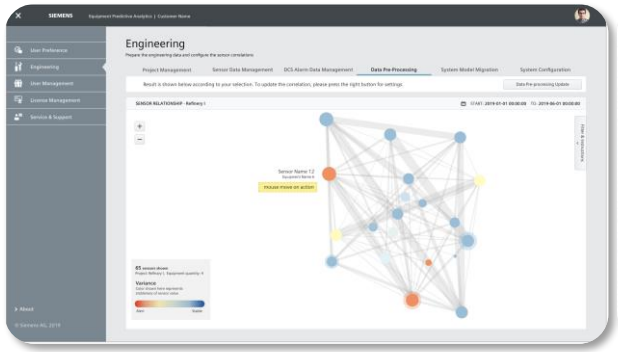
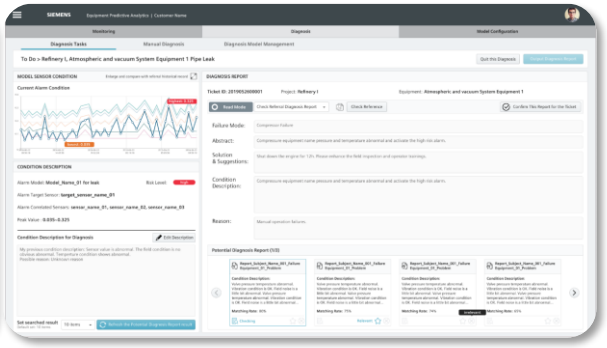
Configuration & Training → **Predictive** → **Monitoring**





Overall Equipment Effectiveness

Plant uptime	Increased plant uptime through avoidance of shut-downs by pre-alerting on failures
Operation efficiency	Higher operation efficiency through predictive monitoring
Decision accuracy	Better decision accuracy through identification of correlations hidden in data

- Data analysis
- Artificial intelligence
- Correlations
- Cloud-based
- Integrated Knowledge
- IT Security

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Use case #2: Control Valve Monitoring
Ensure asset uptime

Speed | Flexibility | Quality | New Product
Efficiency | Worker Safety | **Maintenance** | Cyber Security

Results of implementation:

- Increased plant uptime by avoiding valve failures
- Reduced maintenance and operational costs

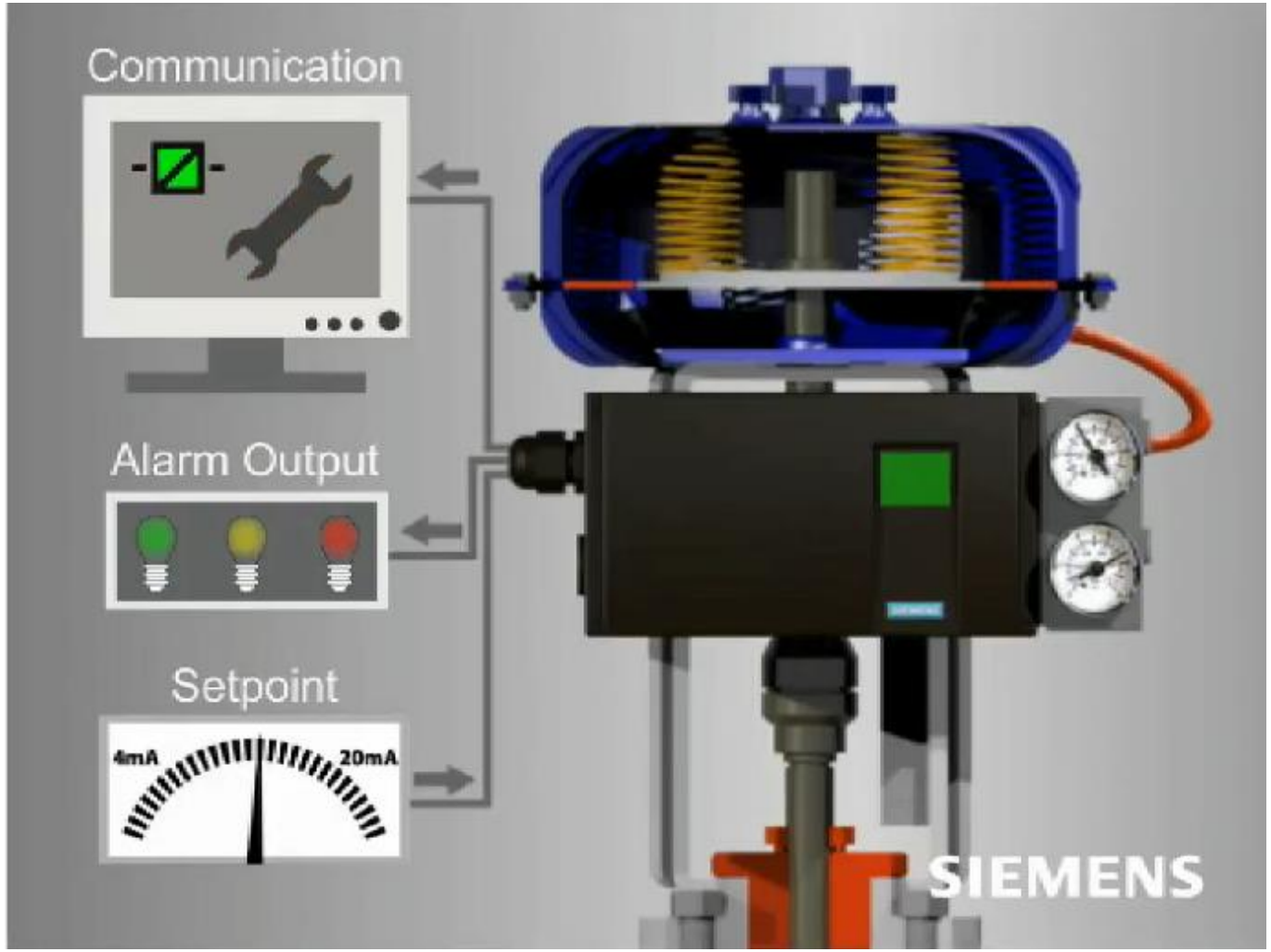
Issues:

- **High cost of unplanned downtime** due to control valve failures
- **High cost of maintenance** associate with control valves

Method to address:

- Gather information about and complete analysis on **anomalies, configuration issues,** and **maintenance events**
- Provide **diagnostic workflow** (e.g. KPIs, comments, asset log)
- Generate **recommended service date (condition-based)**
- Generate **maintenance plans** in accordance with shutdown schedule and asset condition

Pneumatic leak detection



Pneumatic leakage

- Higher costs to produce plant air
- Premature wear of air compressor
- Causes valve ‘oscillations’, and process upsets
- Pre-mature wear of actuator/valve shaft, and stem packing.

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Use case #3: Control Performance Analysis
Improve processes

Speed | Flexibility | Quality | New Product
Efficiency | Worker Safety | Maintenance | Cyber Security

Results of implementation:

- Increased product quality
- Increased throughput
- Reduced operator workload
- Optimized control loops result in financial savings without new investments
- Control loop monitoring of all control loops adds value to a process control system

Issues:

- **Many control loops** are **NOT optimized**
- **Poor performing loops** result in **quality degradation, energy & material losses, reduced equipment availability**
- **Lack of time/experienced personnel** to investigate/improve

Method to address:

- **Control performance analysis** provides detailed reports and **identifies control loops with "room for improvement"**
- **Optimization calculations** can be performed for **poor performing loops**

Control loop performance analysis…
Add a new level of transparency to process data

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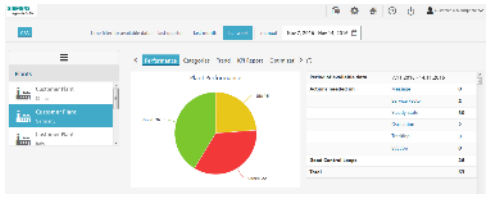
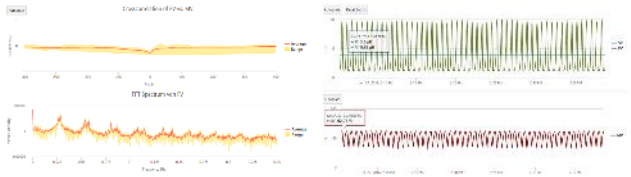
1. Plant Overview for overall transparency



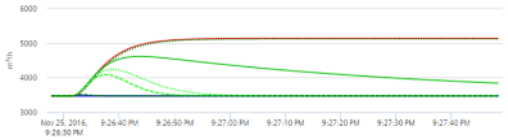
- Long-term plant overview of performance of all control loops allows tracking of results
- Visualization of important key performance indicators enables prioritized optimization actions

2. Detailed Analytics to identify causes



- Standard detailed sub-KPIs on the performance of each loop highlight the causes of poor behavior enabling the determination of optimization actions
- Visualization of the process data from relevant and analyzed time frames as well as characteristic diagrams like scatterplot, FFT spectrum, cross correlation, etc.

3. Optimization of the control loops to improve quality and process



- Automated calculation of optimized control parameters to increase control loop performance
- Simulation of expected behavior enables simplified decision regarding which parameter set to implement

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Use case #4: Process Event/Alarm Analysis
Improve processes

Speed | Flexibility | Quality | New Product
Efficiency | Worker Safety | Maintenance | Cyber Security

Issues:

- **Continuous overload** presented to operators
- **Alarm floods**
- **Redundant alarms**

Method to address:

- **Gain detailed transparency** into plant's event behavior
- **Evaluate problematic event characteristics**
- **Regular monitoring and assessment to maintain improved behavior**

Results of implementation:

- Better method of alarm management
- Data-driven plant & performance improvement

The alarm system…
Layer between normal operation and safety measures

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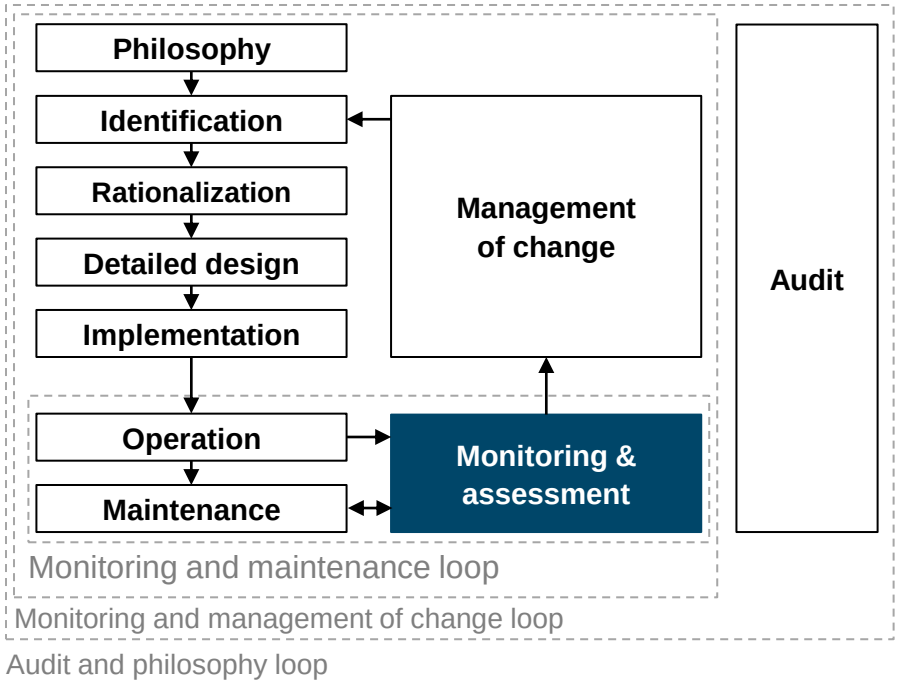
Priorities
Safety, Environmental & Asset Protection

Protection of normal operation

Priorities
Profitable production

Protection levels based on the IEC 61508/IEC61511

Alarm Management,
IEC 62682, Edition 1.0 2014-10



App demonstrations:

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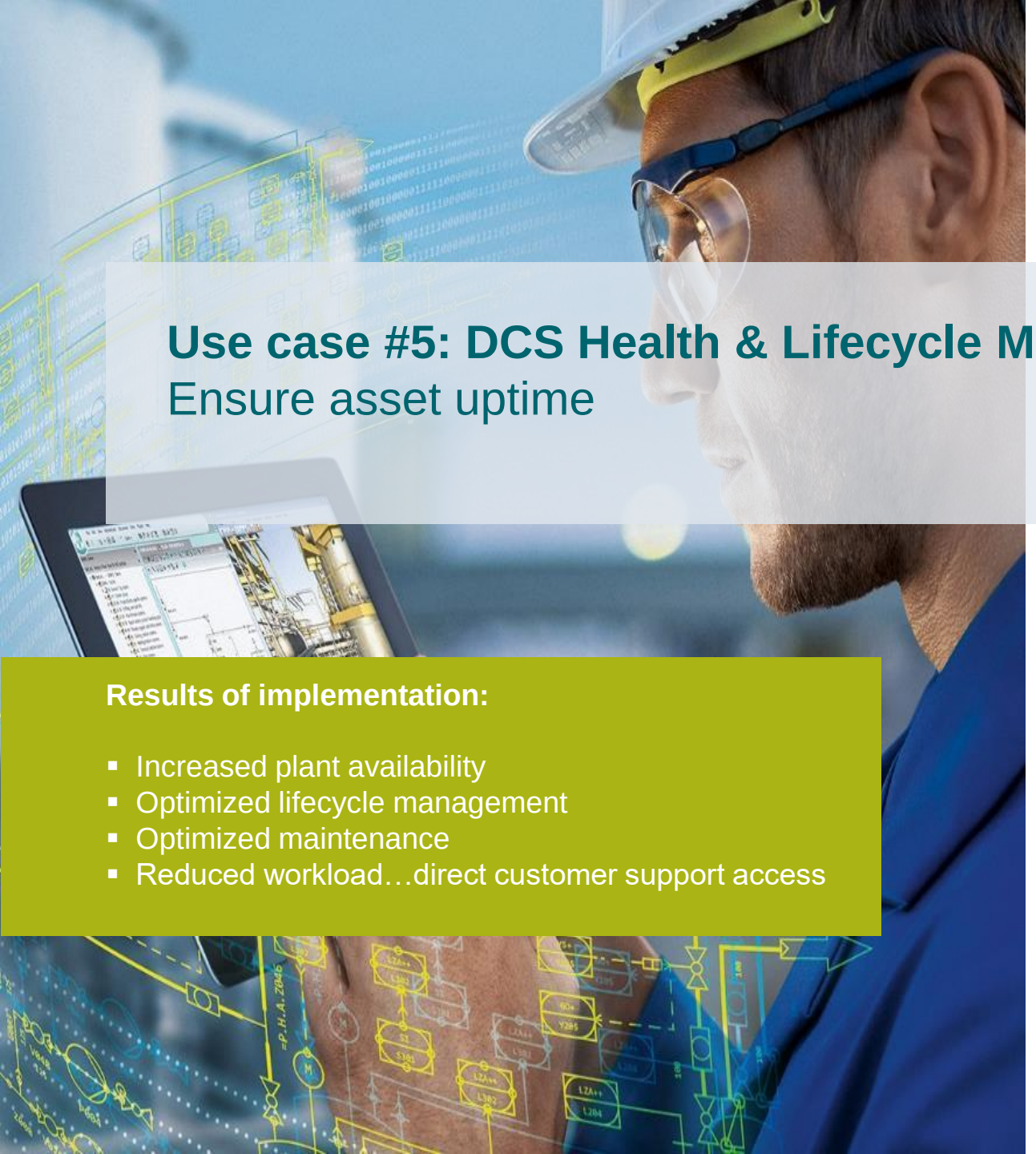
Let’s take a look!



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Use case #5: DCS Health & Lifecycle Monitoring

Ensure asset uptime

Speed | Flexibility | Quality | New Product

Efficiency | Worker Safety | Maintenance | Cyber Security

Results of implementation:

- Increased plant availability
- Optimized lifecycle management
- Optimized maintenance
- Reduced workload…direct customer support access

Issues:

- Difficult to…
  - make **informed decisions** regarding **obsolescence** and **optimization of spares**
  - **manage DCS fleet**
  - gain **transparency** about **DCS "health" status**
  - have **access** to **relevant product information**

Method to address:

- **Utilize "portal" to monitor…**
  - **system hardware/software inventory**
  - **health status**
  - **cyber security status**

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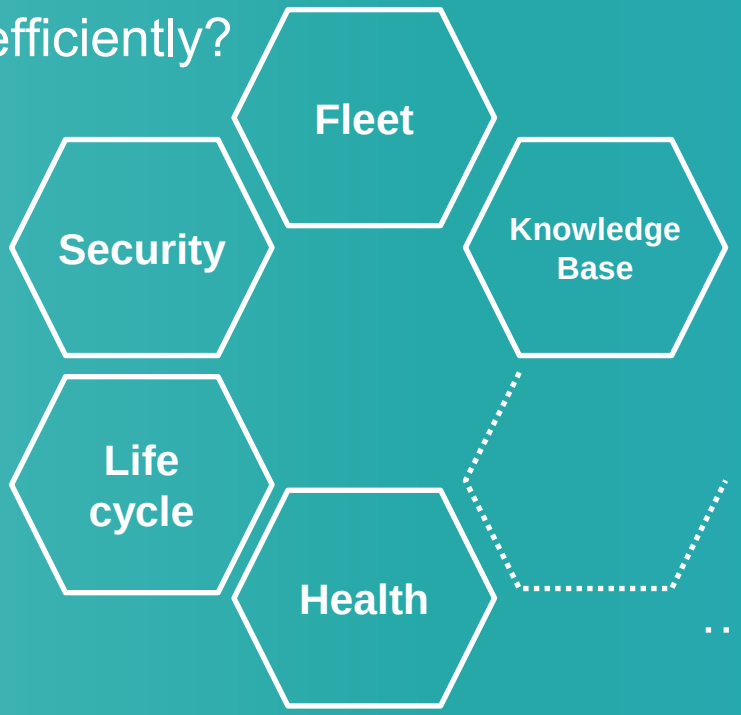
How can I

…manage my DCS fleet efficiently?

…be aware of the latest cybersecurity alerts?

…avoid obsolescence and optimize spares



… gain immediate access to support and product information?

…maximize my plant availability?

…have transparency about the health status of my DCS assets?

DCS Health & Lifecycle Monitoring…

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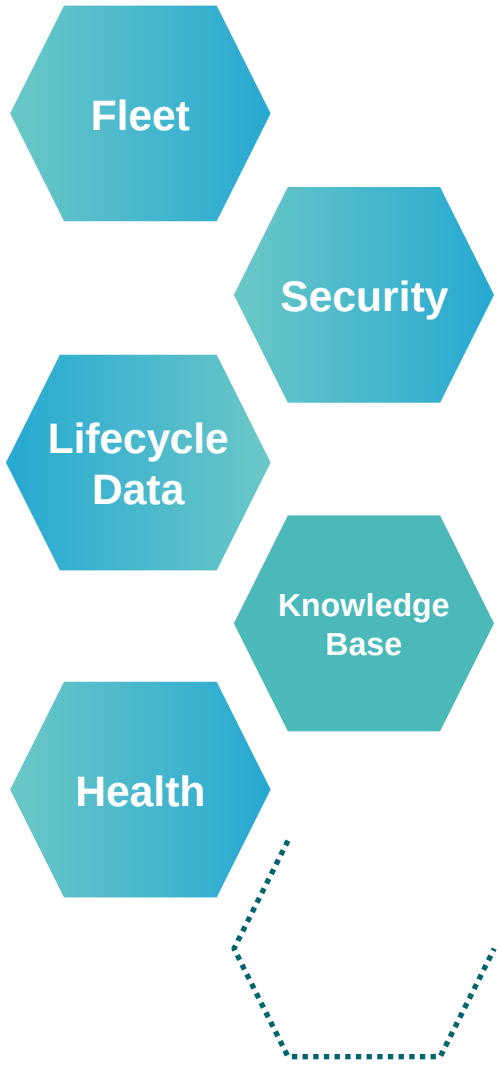

- **Cloud-based** monitoring of DCS fleet to mitigate risks plant-wide or enterprise-wide
- **Current security alerts** from **comprehensive CERT database**
- **Automated notification** of important **system updates**
- **Monitor the lifecycle of your plant**, including upcoming product discontinuation alerts
- Access to all relevant **product information**
- **Create and track technical support requests**, plant- or enterprise-wide
- **Live health data** of system components *(CPUs/controllers, workstations/computers)*
- **Performance KPIs** *(communication load, cycle time, memory)*

Key takeaways…

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1. Digitalization **can be applied to greenfield and brownfield** applications.

2. For existing plants, often the **data is already available** to be analyzed and interpreted enabling decisions to be made that can **improve operations and maintenance.**

3. A **great entry point to digitalization** is to consider **real world use cases** requiring **low investment of time, money, and resources** for implementation.

4. **Cloud-based tools** and **remote connectivity** support **improved worker safety and performance**.

Thank you for your attention!

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