Safety-I and Safety-II with Digital Transformation

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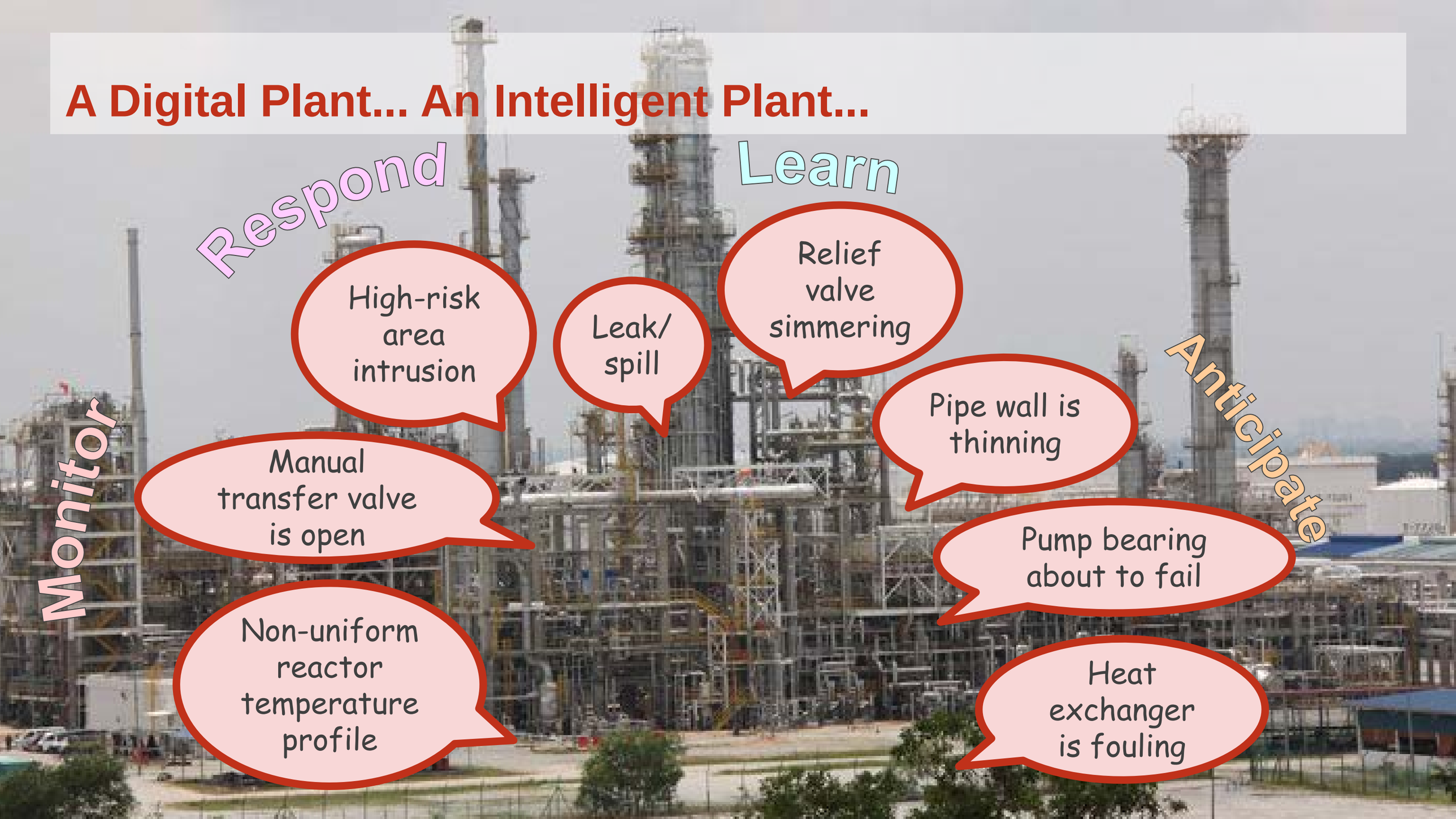
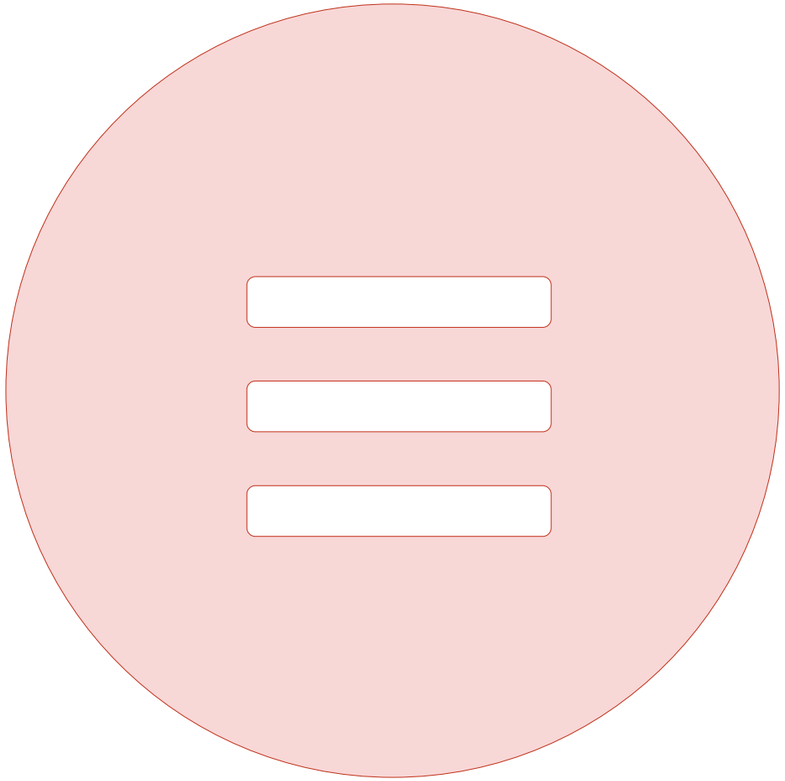
A Digital Plant... An Intelligent Plant...



Topics Covered

- ‘Things go wrong’ and ‘things go right’ for the same basic reason
- Safety-II and new digital ways of working
- Deploy new digital tools for safety and resilience



‘Things Go Wrong’ And ‘Things Go Right’ For the Same Basic Reason

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‘Things Go Wrong’ And ‘Things Go Right’ For the Same Basic Reason

- Things go wrong when people don’t follow procedures

- Things go right because people can and do adjust what they do to match the conditions of work

FAIL

SUCCESS

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Safety-II and New Digital Ways of Working

To Complement Safety-I

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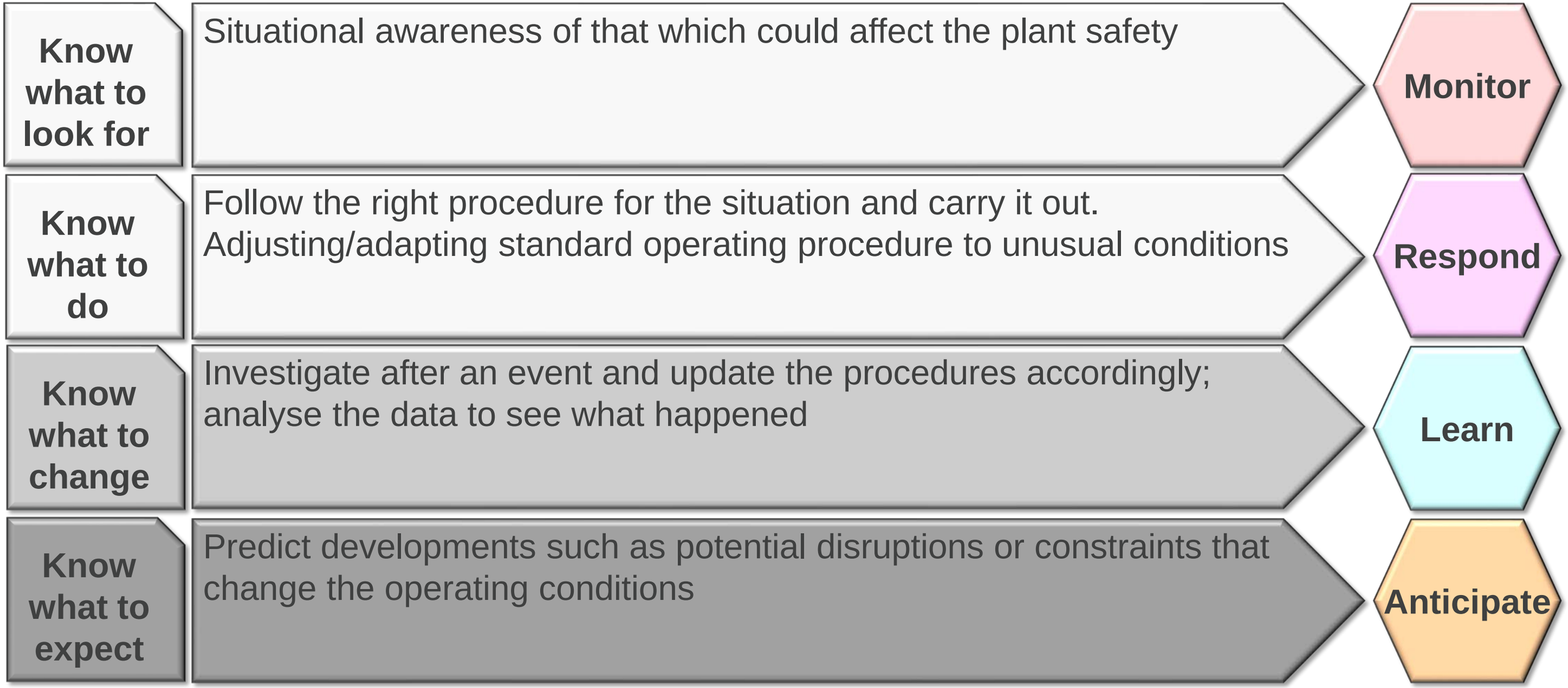
Complementary Safety-I and Safety-II Thinking

Safety-I	Safety-II
That as few things as possible go wrong	That as many things as possible go right
Reactive, respond when something happens or is categorised as an unacceptable risk.	Proactive, continuously trying to anticipate developments and events.
Humans are predominantly seen as a liability or hazard. They are a problem to be fixed http://erikhollnagel.com/	Humans are seen as a resource necessary for system flexibility and resilience. They provide flexible solutions to many potential problems.

Safety-II Resilience: Ability To



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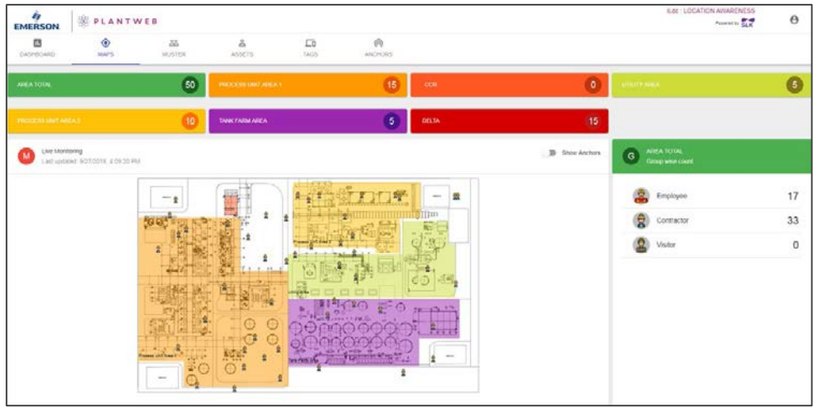
Situational Awareness

- Challenge
  - Hazardous situations not detected
    - Presence of flammable substances
    - Potential ignition sources like overheating or fault conditions
    - Etc.
  - Manual inspection may not be practical and too infrequent
- Solution
  - Digital sensors
- Result
  - Respond before there is an incident

- Corrosion
- Erosion
- Vibration
- Position
- Level
- Switchgear
- Level switch
- Discrete
- Flow
- Pressure
- Temperature
- Acoustic (e.g. PRV)
- Wireless Adapter
- Leak
- Gas
- etc.

Access Control

- Challenge
  - Personnel straying into unauthorized high-risk area
- Solution
  - Location awareness software, anchors, and tags
    - Alarm on entry to unauthorized areas (geofencing)
    - Automatic headcount at the mustering points
    - Person's location indicated on a plot plan
    - Man-down detection and manual distress call button
- Result
  - Access control
  - Faster mustering headcount
  - Minimal rescue team



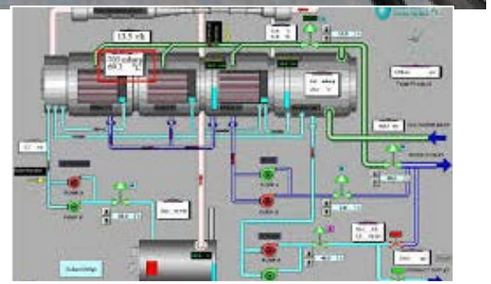
Singapore use case (8 min):
https://www.youtube.com/watch?v=upbJez07O6E

Manual Valves

- Challenge
  - Manual valve in the wrong position
- Solution
  - Wireless position feedback
    - Manual bypass, isolation, and transfer valves...
- Result
  - Greater situational awareness, reduced incidents
  - Positive confirmation
  - Reduced burden for manual confirmation and checks
  - Audit trail to learn from and adjust procedures

Singapore use case

https://emersonexchange365.com/iiot-digital-transformation/f/iiot-digital-transformation-forum/7478/how-solvay-implemented-a-digital-transformation



Forensics

- Challenge
  - Insufficient data for forensics after an incident
  - Inability to learn how to avoid reoccurrence
- Solution
  - Digital sensors
    - Level monitoring
    - Loss of pressure
    - Toxic and flammable gas detection
    - Leak detection
    - Discharge into water
- Result
  - Learn and adjust procedures

- Corrosion
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- Gas
- etc.

Equipment Failures and Fouling

- Challenge
  - Equipment failure and fouling may lead to hazardous situations
  - Manual inspection too infrequent
- Solution
  - Predictive analytics condition monitoring software
    - Pumps, heat exchangers, compressors…
  - Wireless sensors; vibration, temperature, etc.
- Result
  - Anticipate issues resulting from to equipment failure and fouling
  - Maintenance more predictive

Corrosion and Erosion

- Challenge
  - Causes of failure pipe and vessel failure include corrosion and erosion
  - Manual inspection may not be practical
- Solution
  - Analytics software
  - Wireless corrosion and erosion sensors
- Result
  - Anticipate loss of containment
  - Reduced burden on inspection team
  - More accurate determination of corrosion rate

Deploy New Digital Tools for Safety and Resilience

Digital Operational Infrastructure (DOI)

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Safety-II Enabling Tools: Automation Requirements

Monitor	Add-on sensors to monitor that which could affect the plant safety
Respond	Automated workflow software to guide to correct response
Learn	Add-on sensors to capture data of what happened during the event and what led up to the event so you can investigate and learn from it, like a flight data recorder
Anticipate	Predictive analytics to help anticipate possible disruptions such as equipment failure, or constraints such as due to equipment fouling, to be proactive

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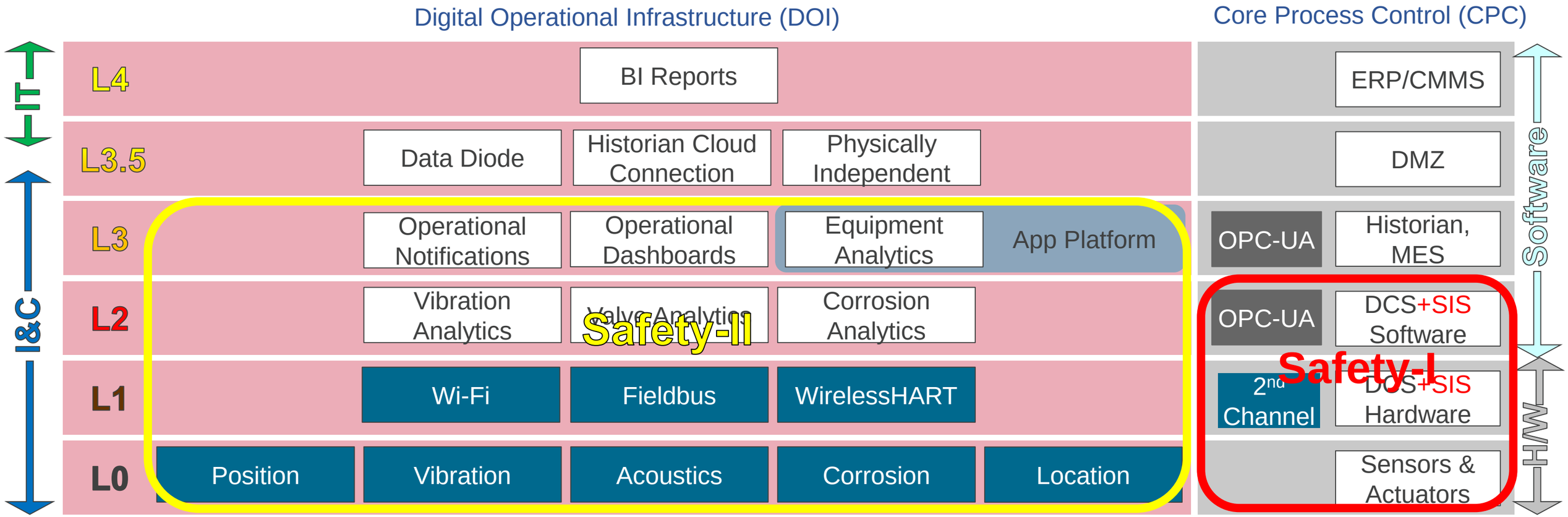
Second Layer of Automation Modelled on NAMUR Open Architecture (NOA) Supports Safety-I and Safety-II



- Digital Operational Infrastructure (DOI) for Industrie 4.0 and Digital Transformation (DX)
- Ideal platform for Safety-II enabling tools
- Also for digital transformation of reliability/maintenance, energy/emissions, and production

Conclusion

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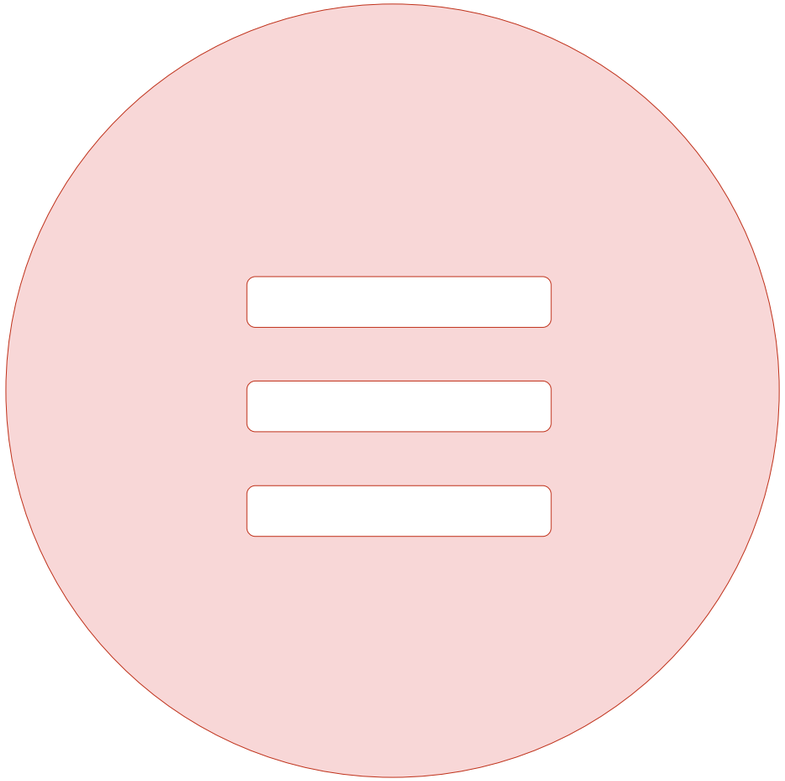
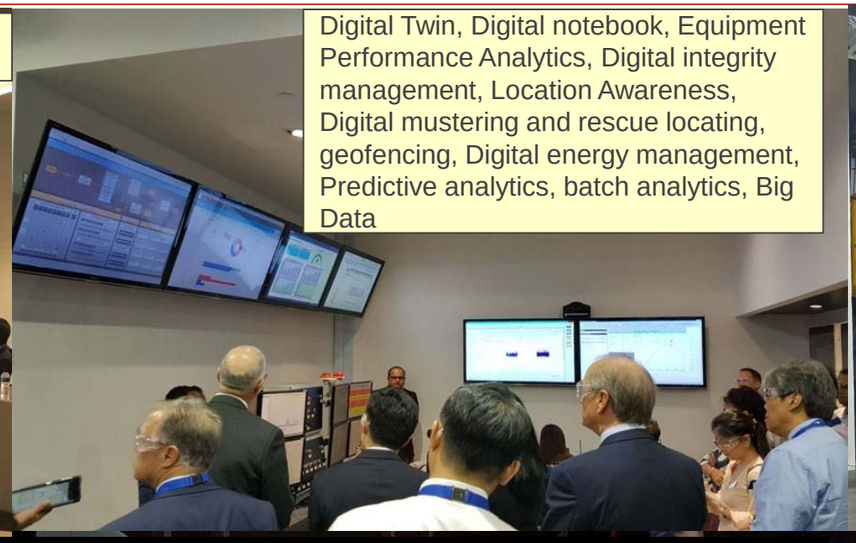


Experience the New Digital Ways of Working in a Digital Plant in the Emerson Solutions Center in Singapore

Digital plant visioning, Mobile notifications, KPI dashboards on tablets



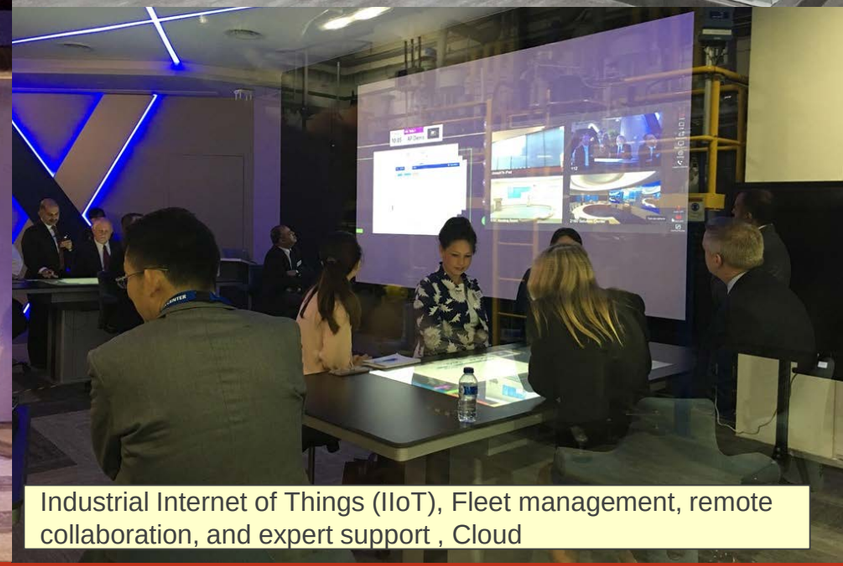
Digital Twin, Digital notebook, Equipment Performance Analytics, Digital integrity management, Location Awareness, Digital mustering and rescue locating, geofencing, Digital energy management, Predictive analytics, batch analytics, Big Data

Digital reporting, Digital inspection, Mobile operator, RFID, Wearable video conferencing, Wireless Infrastructure, Augmented Reality (AR), Non-intrusive wireless sensors, Edge Analytics

https://www.youtube.com/watch?v=Boy0fuNEgZQ

Operational Certainty Discovery Session, Design Thinking

Virtual Reality (VR), Success sharing



Industrial Internet of Things (IIoT), Fleet management, remote collaboration, and expert support , Cloud

I’m Listening...

- Jonas Berge

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PLANTWEB

LinkedIn

http://www.linkedin.com/in/smartdigital

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Learn. Share. Network.

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