How to integrate IoT & motors

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Housekeeping

- Today's webinar is being recorded and will be available next week at pumpsandsystems.com/webinars.

- The presentation will last about 45 minutes, and there will be a short question and answer session at the end.

- Enter your questions in the chat feature at the lower left side of your screen.

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Agenda

IoT & pumping system definitions

IoT architecture

Use cases by user type

Questions & answers

Poll question

- What type of organization do you represent?

  - Manufacturer

  - Consulting engineer

  - Distributor

  - Contractor

  - Systems integrator

  - Service provider

  - End user

  - Other

Definitions of IoT pumping systems
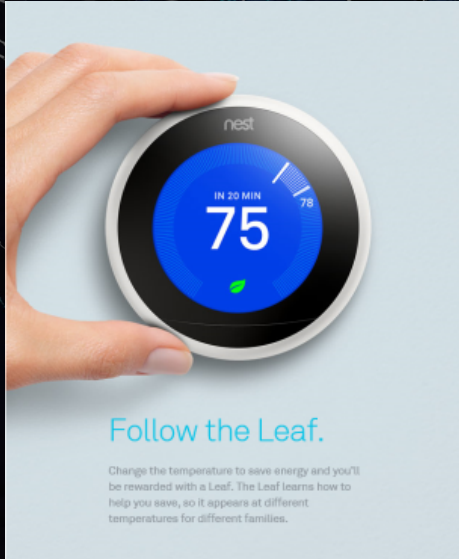
Definitions

Internet of Things (IoT)

- Network-connected devices that can produce, analyze and exchange data

Pumping system

- Pump, motor, starter and controls

Consumer examples

Poll question

- According to a Gartner study, how many connected devices will be installed in 2020?

  - 3 billion

  - 12 billion

  - 26 billion

  - 54 billion

IoT architecture

IoT architecture

Hardware
(Data collection)

⟷

Data
transmission

⟷

Cloud
(Data analysis +
storage)

⟷
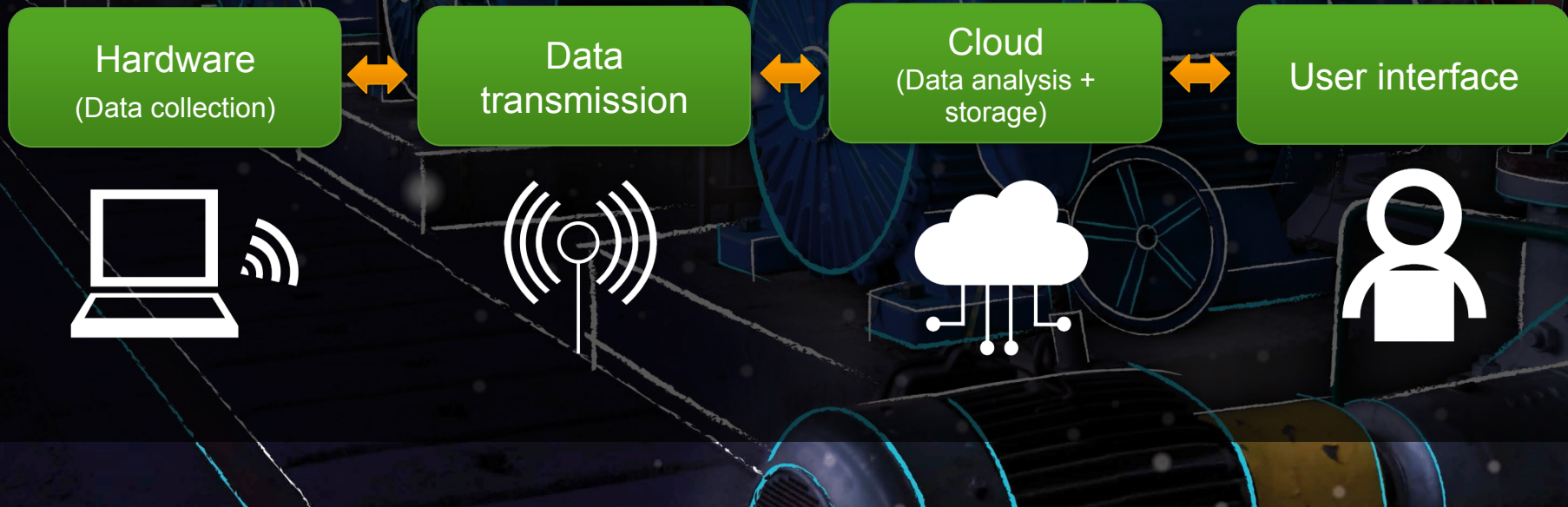
User interface

Hardware
Data collection

Consumer

Industrial

Data transmission

Cloud
Data analysis + storage

"Now" Analytics   "Past" Analytics   "Future" Analytics

Consumer

Industrial
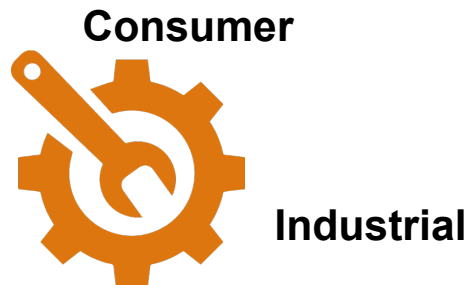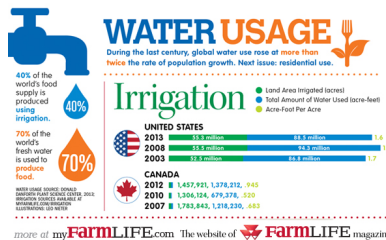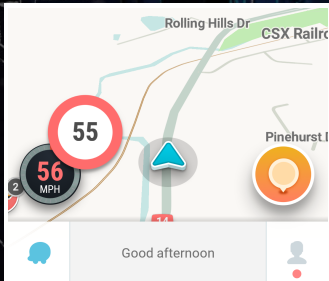
User interface
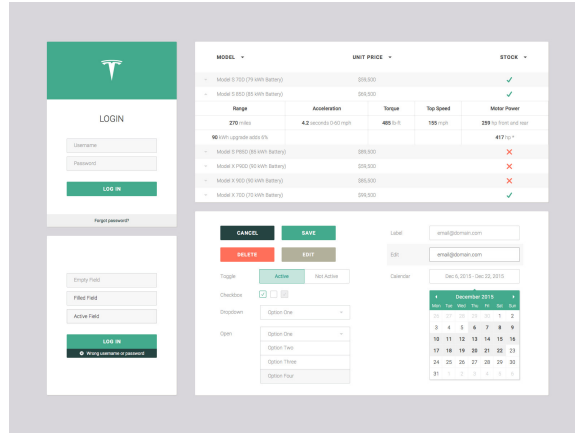
Poll question

- How would you describe your organization's engagement with IoT?

  - Our pumping systems are IoT enabled

  - We see the value of IoT but haven't installed devices onto our system yet

  - We need to learn more about IoT

  - We don't clearly see the value or business justification of IoT

Use cases by user type

Equipment manufacturers
Value

Remote troubleshooting & diagnosis

Data analytics & product development

Enable downstream value chain

Equipment manufacturers
Architecture

Traditional systems
- Irrigation pump
- Operator discovers failure
- Calls OEM for troubleshooting support
- Orders parts
- Drives back to pump for installation
- Operator installs parts

3 days, 8 labor hours

Connected systems
- Irrigation pump
- Data analytics predict potential failure
- System alerts OEM as part of premium technical support
- OEM proactively advises preventative maintenance and sends replacement parts
- Operator receives parts and installs

0 days, 1 labor hour
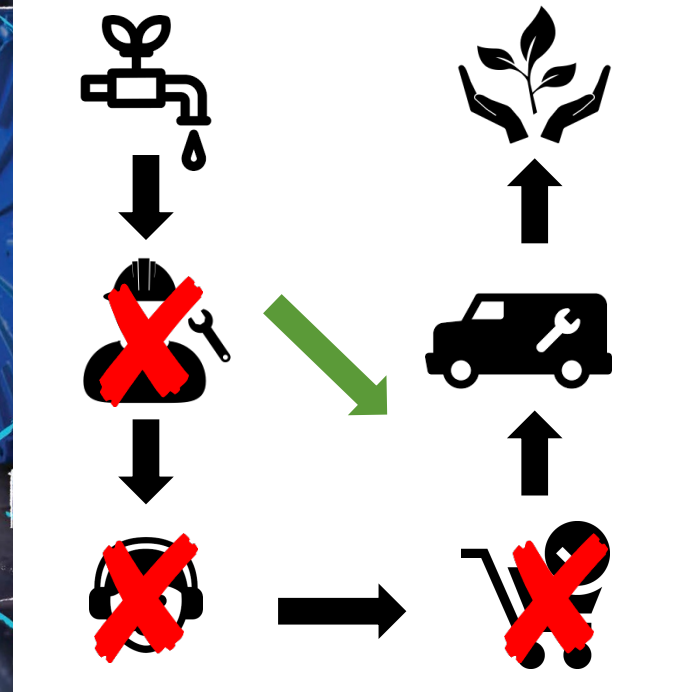
Equipment distributors
Value

Replacement parts

Predictive

Get the right parts at the right time

Equipment distributors
Architecture

Traditional systems

- Distributor sells VFD pump system
- System begins to run poorly
- Operator discovers failure
- Calls OEM for troubleshooting support
- Services finds broken seal
- Sends PO to distributor
- Distributor orders replacement parts

2 days, 6 labor hours

Connected systems

- Distributor sells connected VFD pump system
- VFD auto detects decline in system performance
- VFD predicts seal failure based on data analytics
- Error note is sent to user
- PO is sent to distributor automatically

0 days, 0 labor hours
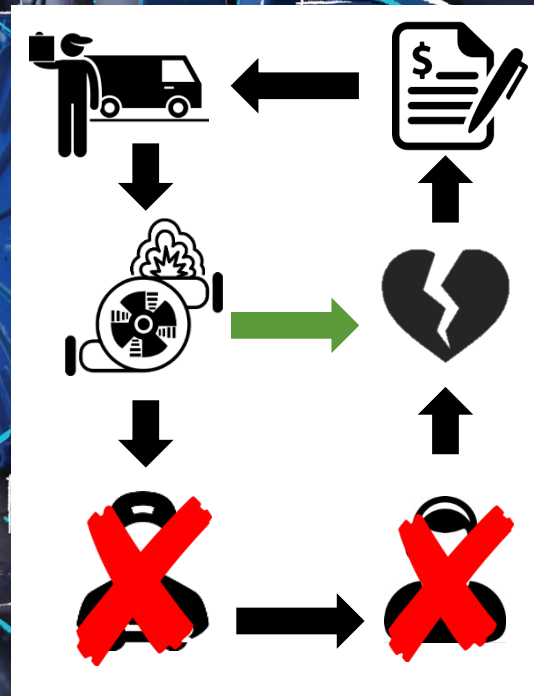
Service providers
Value

Remote monitoring

Predictive diagnostics

Solve problem in one trip

Service providers
Architecture

Traditional system

- SP performs startup and commissioning on system
- Cooling fan nearing end of life begins to cause system to slowly deteriorate
- System fails causing unscheduled downtime
- User calls SP to get them on site
- SP travels to site to find a failed cooling fan after hours of troubleshooting
- Drives to distributor to pick up replacement part
- Drives back to user to install part and get user running again

1 day, 12 labor hours

Connected system

- SP performs startup and commissioning on system
- Cooling fan nearing end of life begins to cause system to slowly deteriorate
- Connected VFD sends alert to SP notifying them of system performance
- SP remotely monitors system to determine severity
- System automatically orders replacement part
- SP gets planned downtime schedule from user
- SP installs replacement cooling fan on one visit and without unplanned downtime

1 days, 2 labor hours
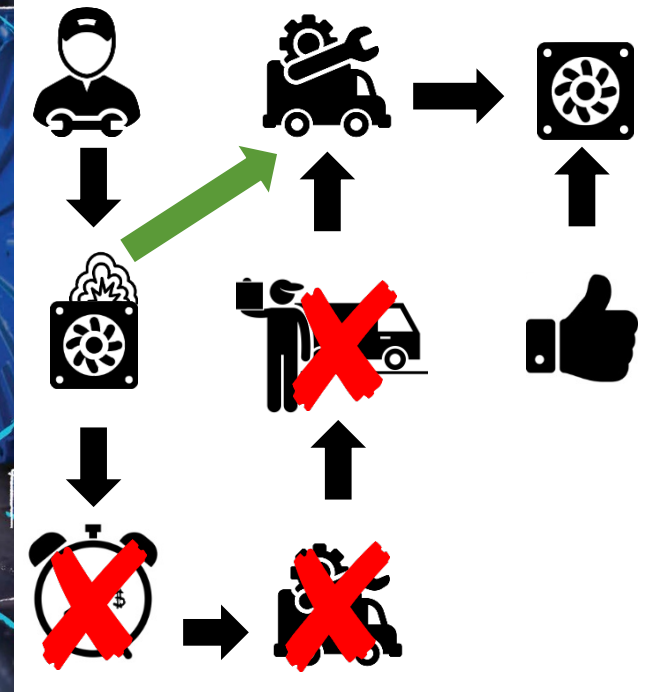
System integrators
Value

Startup & commissioning

Troubleshooting

Labor savings

System integrators
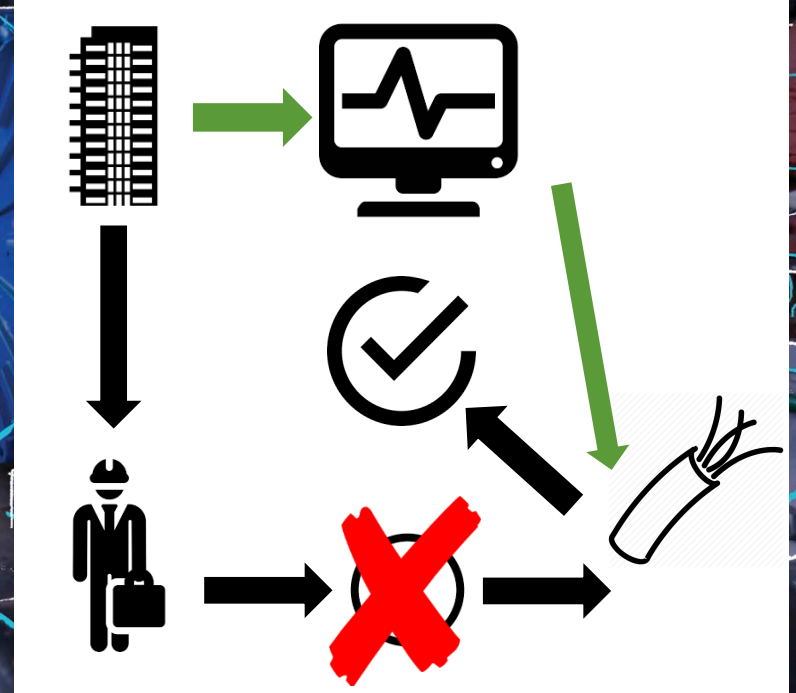## Architecture

Traditional system

- New booster pump system arrives at commercial high-rise building
- Field engineer arrives for startup & commissioning
- System checks fail and field engineer pulls up VFD, pump, motor and sensor manuals to troubleshoot
- Field engineer finds loose wire and restarts system checks

1 day, 8 labor hours

Connected system

- New booster pump system arrives at commercial high-rise building
- Field engineer arrives for startup & commissioning
- Connected HMI performs system check when powered on
- Connected HMI detects loose connection between pressure gage and VFD
- Field engineer corrects wiring and completes startup

0 days, 1 labor hour

End users
Value

Predictive diagnostics (downtime)

System optimization (efficiency)

Reduce total cost of ownership

End users
Architecture

Traditional system

- Water treatment facility has 10 VFDs installed on critical pumps
- 3 VFDs continue to display faults
- Electricians work to troubleshoot and find root cause through trial and error
- Faults cleared and reset but VFDs continue to fault

10+ days, 40+ labor hours

Connected system

- Water treatment facility has 10 VFDs installed on critical pumps
- Connected VFDs with health & wellness algorithms send data to server for analytics
- Data analytics identify cavitation as potential failure mode
- System alerts electrician with recommended preventative maintenance

0 days, 1 labor hour
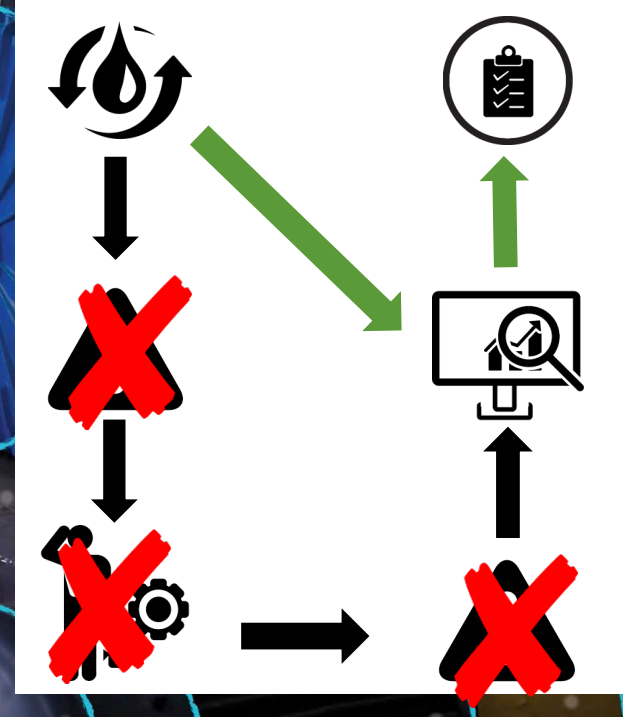
Poll question

- Where do you see the most value for IoT in pumping?

  - Collecting performance data for analytics

  - Alarming and notifications of system status

  - Predictive diagnostics and failure prevention

  - Startup and commissioning

  - Remote troubleshooting

  - Artificial intelligence and machine learning

The Eaton solution

Eaton solutions

PowerXL™ VFD family

- Active Energy Control™
- Single-phase applications
- Multi-pump control
- Flying start
- Built-in communications
- Dual PID control
- Expandable I/O

Advancing your pumping system

The PowerXL™ drives family is engineered to provide a complete solution for your demanding pumping applications. The PowerXL DE1, DC1, DA1 and DG1 provide the reliable performance you need while also generating the energy savings you want. With advanced yet easy-to-use features, precise system control and dedicated product support, the PowerXL drives are designed to optimize your pumping systems.

DC1   DA1   DE1   DG1

Eaton solutions

CPX9000 Clean Power VFD

- 40 to 800 hp @ 480 V, 50 / 60 Hz
- 18-pulse low harmonics VFD
- 0.1 to 400 Hz frequency range
- Smallest footprint in the industry
- Guarantees IEEE® 519 compliance < 5%THD
- Customizable power and control options

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