Using Energy Monitoring Data to Drive Continuous Improvement

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Using Energy Monitoring Data

To Drive Continuous Improvement

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To Drive Continuous Improvement

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A FRIENDLY

REMINDER

- Please silence your cell phones
- Please do not enter or exit sessions after five minutes past the start time

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Agenda

- Industry drivers for metering & monitoring
- Overview of meter types (electric, gas, etc.)
  - How to use meter data to drive savings?
  - Examples of how that data can save your money
- How does automation play into driving energy conservation?
- Practical next steps you might take

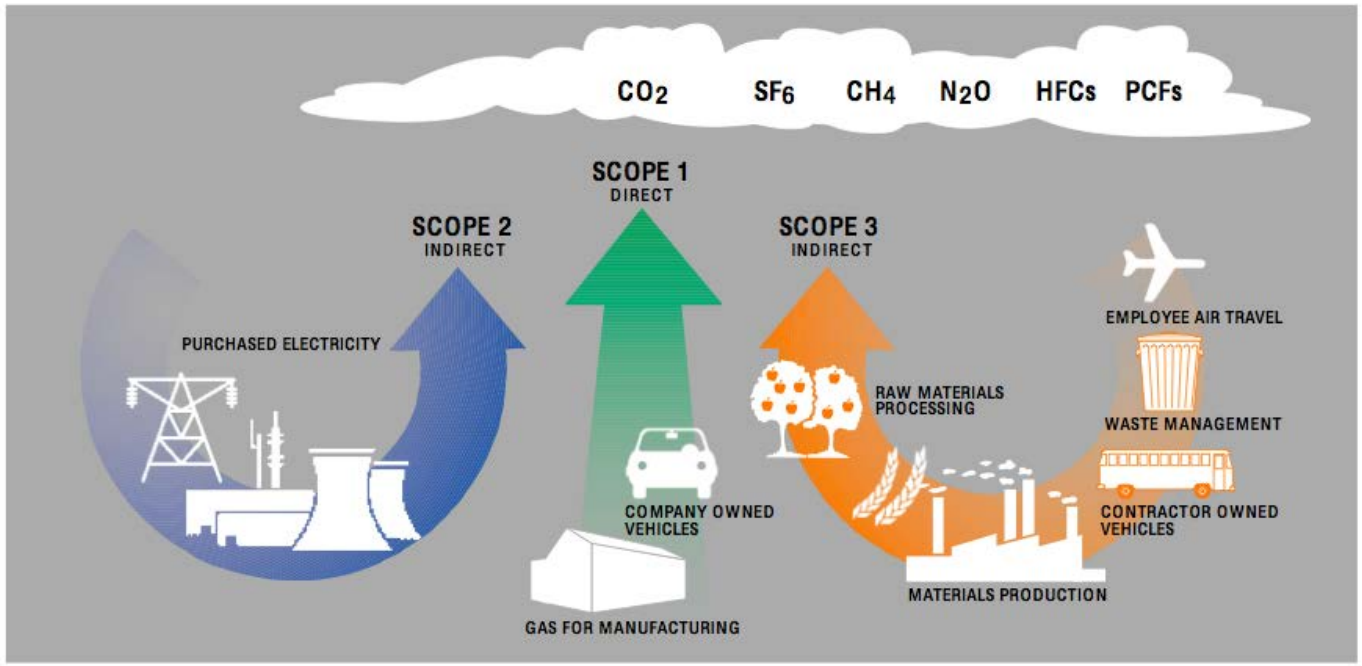
Quick Poll

1. How many of you have electrical or gas meters, other than the utility meters?
2. If so, do you use them and how?

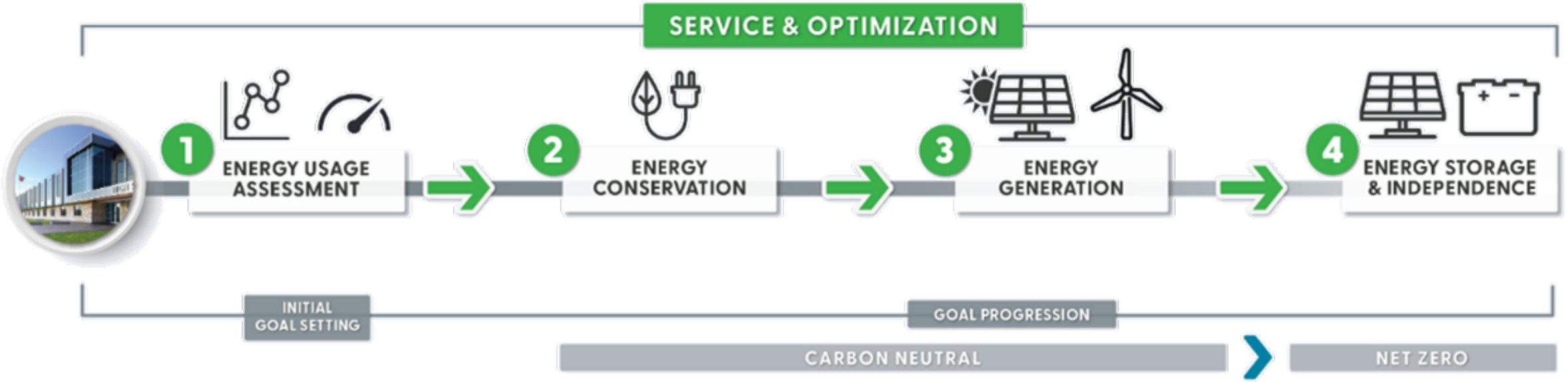
Industry Drivers for Metering / Monitoring

Sustainability / Environmental

- Scope 1, 2, & 3 greenhouse gas emission (GHG) reductions as part of a larger, multi-year goal
- Plans for renewable energy resources (like solar)
- Electric Vehicle (EV) charger installation to support fleets or local equipment



Industry Drivers for Metering / Monitoring



Industry Drivers for Metering / Monitoring

Operations

- Fighting rising energy costs
- Equipment protection
- Downtime prevention

Energy Management Software

Energy Management Software gives you usable info on your electrical & other energy use data and allows you to pass that data onto other systems as needed.

- How much energy am I using in various parts of my facility and when?
- Where can I grow my electrical usage with the infrastructure I have?
- Do I have similar pieces of equipment using different amount of energy?
- What happened yesterday at 4:00 pm? Was it us or the utility?
- Track savings as updates are made – to justify more updates
- How much solar am I generating vs. my site usage?
- Is my utility treating fairly with my bill?
- How much gas or electricity do I use per 10,000 bushels?

Meter Types

Power Quality Meters

Power quality meters help the user to:

- Historically track & trend power to find peaks
- Historically track & trend power quality at the utility connection to protect equipment and solve unseen issues
- Capture waveforms of poor power quality or utility events to diagnose the cause (you or the utility?)
- Understand future system expansion capacity

Power Quality Meters

How can they save me money?

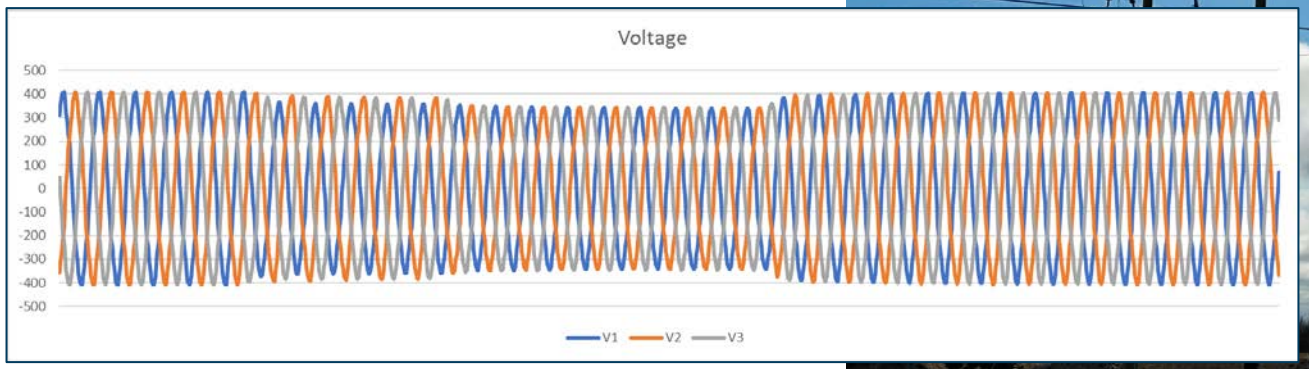
Power quality meters at a switchboard main help the user to:

- Identify peaks in electrical usage
- Capture waveforms of poor power quality issues that might damage equipment to help
  - Diagnose the cause
  - Give insight into how to fix it
- Understand future system expansion capacity

Power Quality Meters

Real life example – Cheese Plant

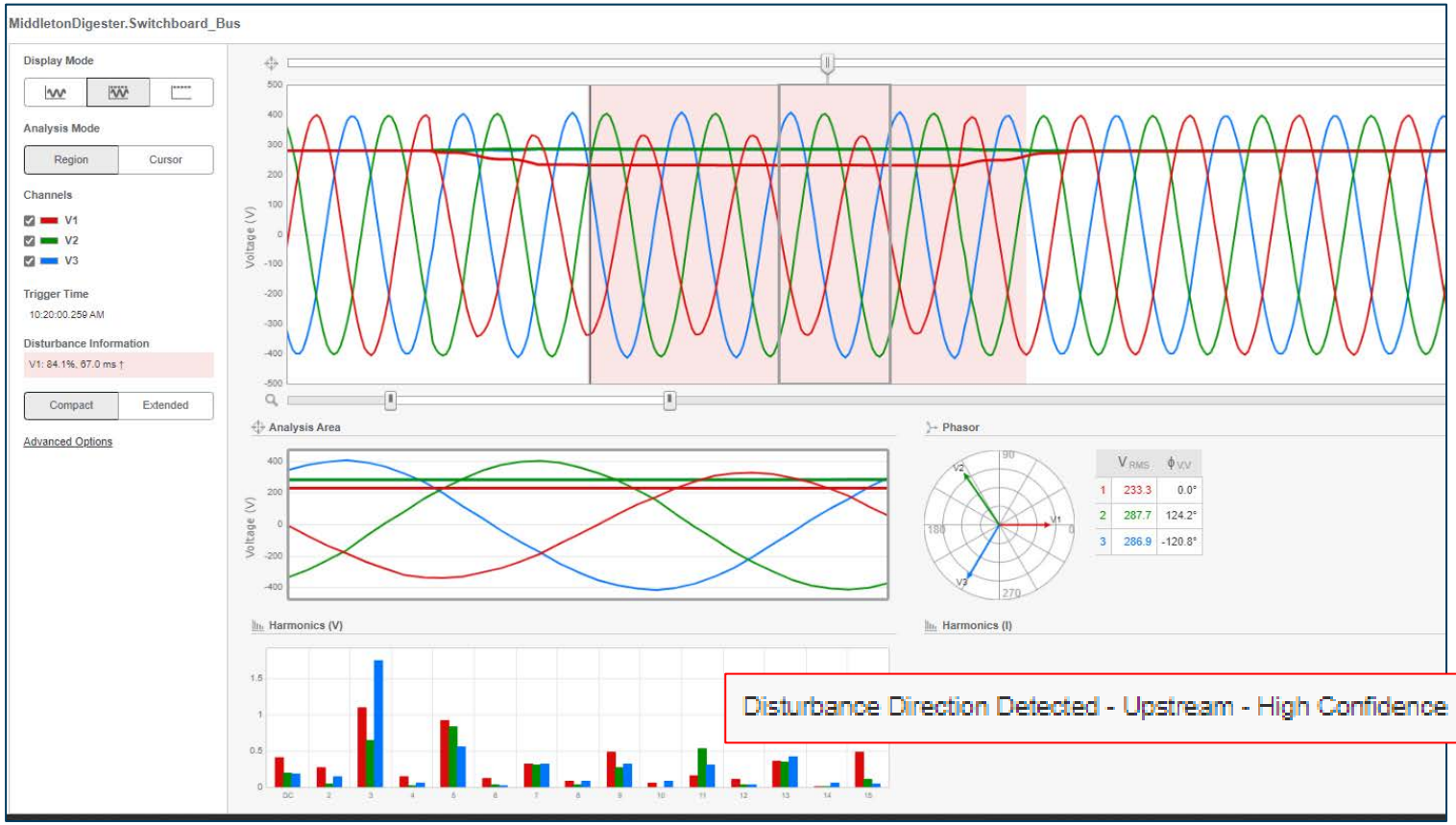
- Facility at end of 34.5 kV line
- Voltage sags once a month
- Using the data, able to identify and budget the equipment that would be needed to “prop them up”.



Power Quality Meters

Real life example – Renewable Natural Gas Site

- 10:20 AM on a Friday
- Drives shut down
- PLCs reset*
- Process stops
- We prove the utility was at fault
- We use the data to justify UPS



*should have been on UPS

Power Quality Meters

Real life example – Cancer Detection Laboratory

- (2) 4000 Amp services in Building #1.
- Based on the information from their meters, they could support the new smaller building with their existing switchboards and UPS units.
- The design engineer was planning on a new service and new UPS equipment.
- This data saved them $500,000 on new equipment!!

Basic Electrical Energy Meters

If you have something downstream of your electrical main that you want to measure, **single or multi-point meters** can be installed. They help the user:

1. Historically track & trend power usage to optimize power usage
2. Understand system expansion capacity
3. Alarm for outages and acute or underlying electrical issues to prevent down time
4. Understand how facility power is used in production or by load type

Typical applications:

1. Key process equipment
2. Large single loads
3. Groups of devices or process sections

Basic Electrical Energy Meters

How can they save me money?

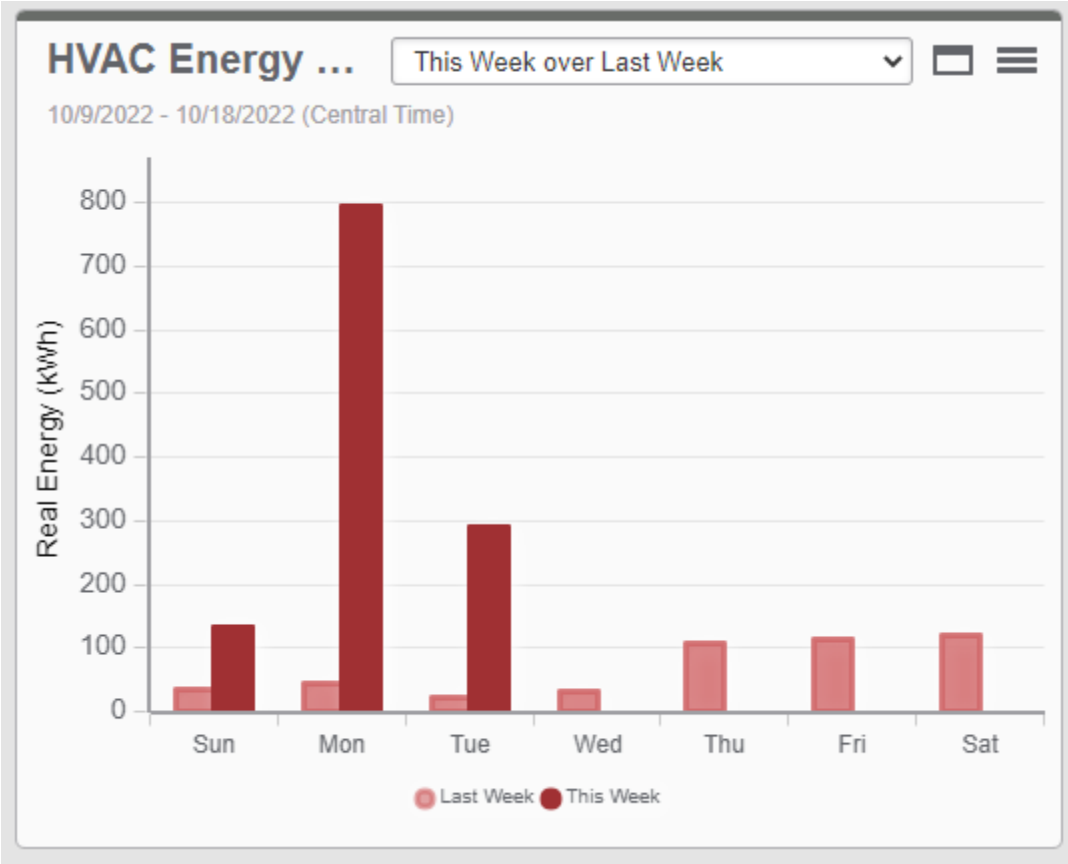
Basic Electrical Energy Meters help end-users find:

- What is causing their peaks in electrical usage
- Equipment that is running when it doesn’t need to be
- Equipment that might be optimized with automation to lower peaks or overall usage
- Understand future system expansion capacity

Basic Electrical Energy Meters

Real life example – Conference Facility HVAC

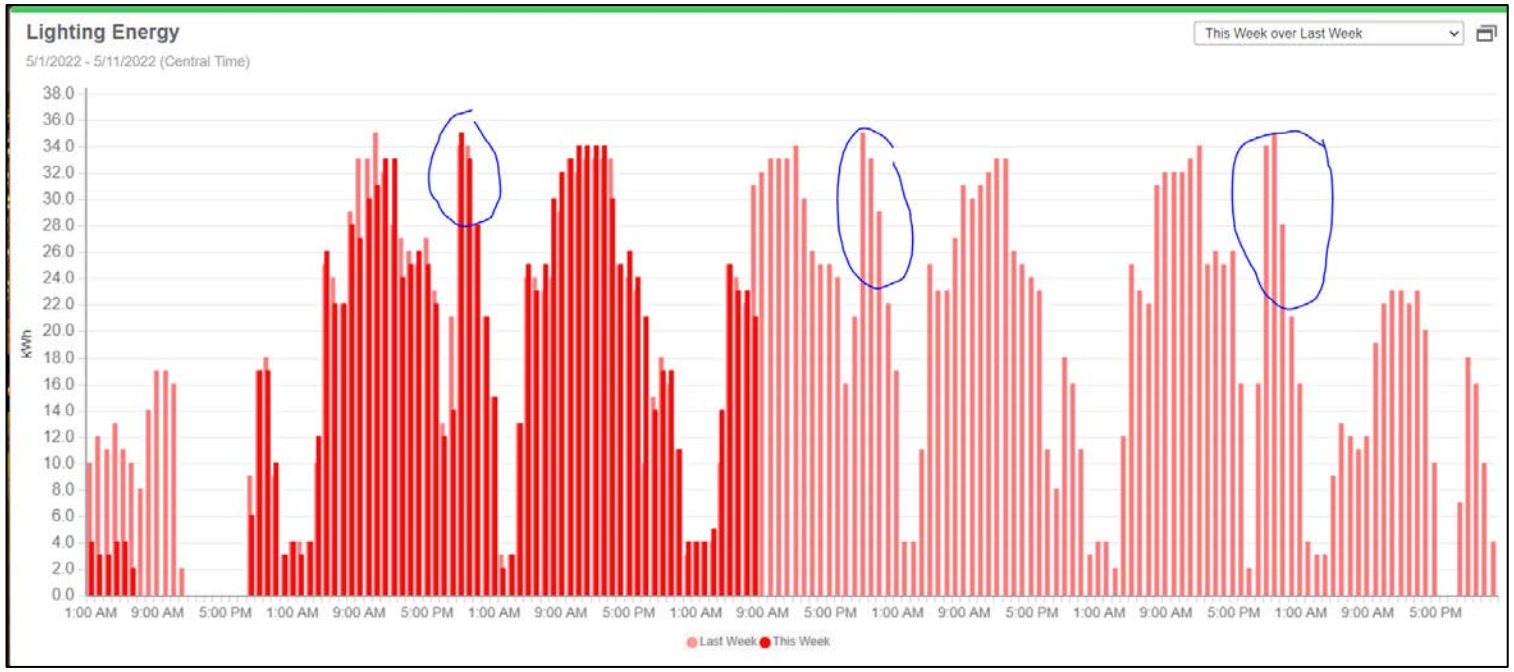
- New facility has large electric heat load that had not experienced cold weather yet.
- Spike in HVAC usage vs. historical
- Controls were not set up correctly and the temperature dipped into the 50’s with no occupancy.
- First cold snap of the year
- Result – we needed to optimize our HVAC settings to avoid peaks.



Basic Electrical Energy Meters

Real life example – Auto Body Shop / Dealership

- Lights were on frequently at 11 pm
- Security / sales focused
- Motion sensor driven…so it could be a person or an animal.
- LED lights had dimmer controls.
- By suggesting a nighttime power setting of 80%, customers could see cars, cameras could see customers, and the dealership could save $800 a year.



Gas Meters

Gas Meters at various points in the system help the user to:

- Historically track, trend, & optimize gas usage
- Understand future system expansion (flow capacity)
- Track gas usage on dryers compared to the volume put through
- Identify when processing variables impact gas usage
- When might it make financial sense to upgrade your facility dryer based on the gas your old dryer uses?

Driving Change – Practical Steps

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Quick Poll

How often when you ask your operator to change how they do something do they remember?

- 75% or more?
- 50%?
- 25% or less?

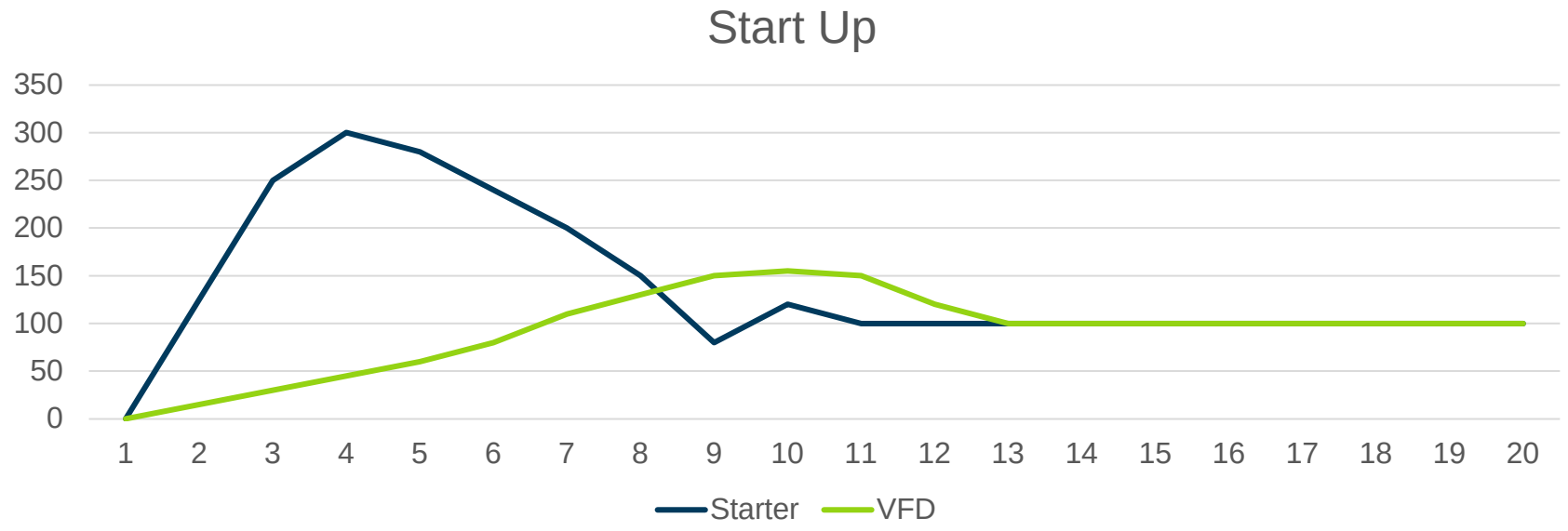
Practical steps you might take *Automation*

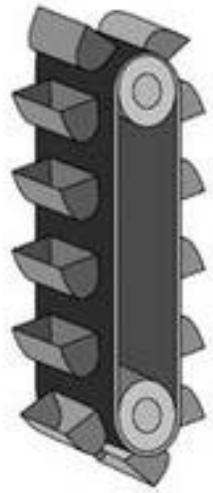
Typical items that are automated and can save you energy:

1. Product movement automation with efficiency of use monitoring
2. Dust collection control
3. Aeration control
4. Lighting automation

Practical steps you might take *Conveyance*

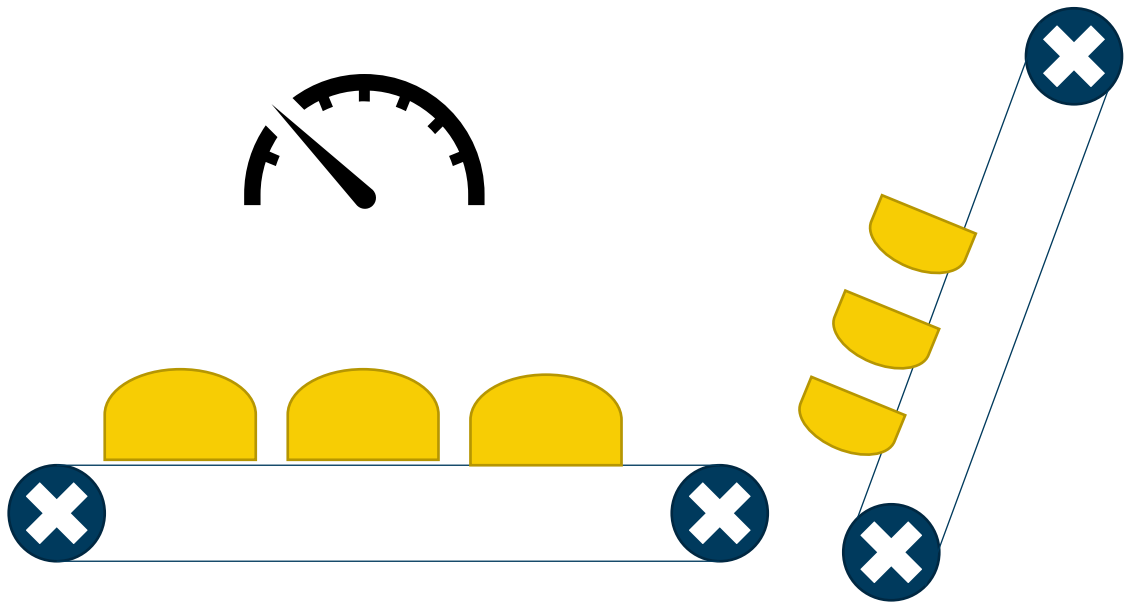
- Put conveyors and elevators on VFDs for smoother starts and stops, making it easier to automate when they should run and at what speed.
- VFDs also allow you to move a bucket elevator slowly in order to inspect your cups / buckets.





Practical steps you might take *Conveyance*

- Slowing elevators and conveyors on VFDs down as the load lightens saves electricity.



VFD Load (kW)
20 kW

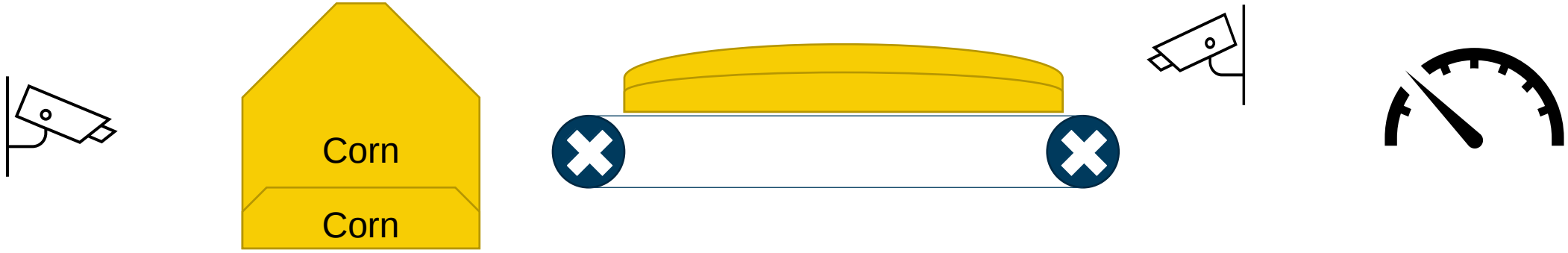
VFD Load (kW)
56 kW

VFD Load (kW)
36 kW

VFD Load (kW)
28 kW

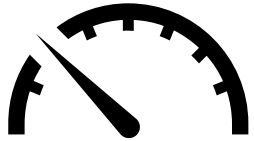
Practical steps you might take *Conveyance*

- Use sonar, radar, bindicators, and proximity switches to sense when material is present that needs to be moved so that equipment can be turned off after your conveyors and elevators empty out.
- Use truck sensors or photo eyes to start equipment prior to offloading into your pit



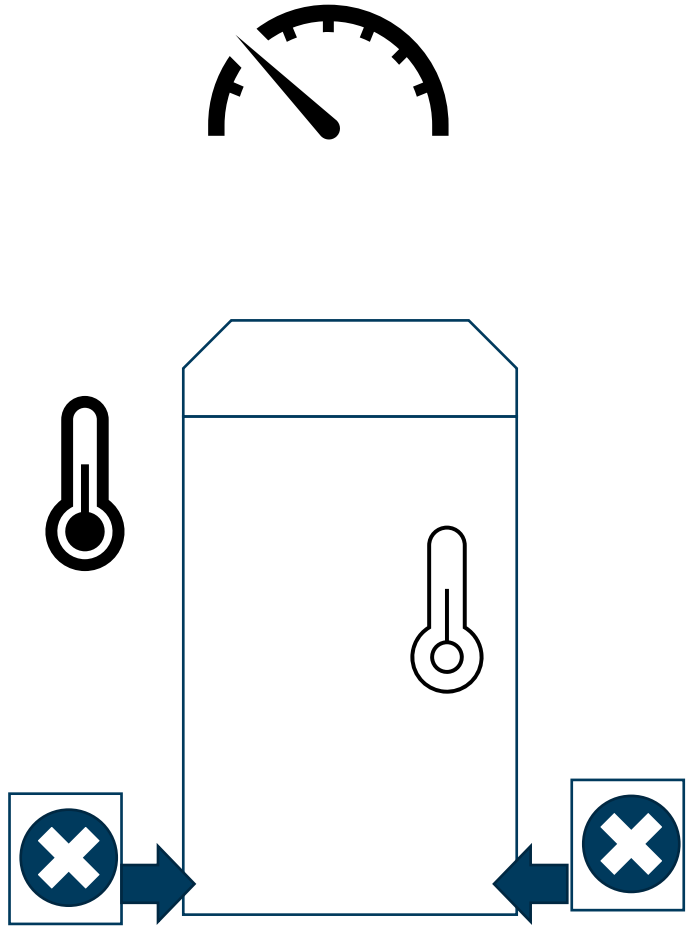
Practical steps you might take *Dust Collection*

- Group things that run all the time together on one dust system. This allows you to shut off the dust collection for intermittently operating areas.
- Put fans on a VFD to soften starting & stopping.
- Monitor when things are moving in your system or when trucks arrive. Follow your manufacturer's process for shutting off your vacuum & cyclones to prevent plugs or incomplete cleaning.



Practical steps you might take *Aeration*

- A controller, like an AGI BinManager, can monitor your product and ambient air temperature / humidity to save on energy and over drying of product.
- These systems support VFDs for Axial Fans as well, so that you scale back fan speeds when it makes sense to save energy.
- As a failsafe, you can also monitor CO_2 to identify spoilage.



Practical steps you might take
Lighting

LED lighting pays for itself typically in 1 to 5 years, depending on fixture type.

Practical steps you might take *Lighting*

Things to consider when you update your lighting to LEDs:

- Don’t just re-lamp your existing T8 fixtures. Ballasts fail with time and consume a small amount of energy too! Take the opportunity to replace entire fixtures - the most efficient solution.
- As lights age, their output dims. Take this opportunity to look at lighting design as well to ensure your people are safe. Add a few fixtures in dim areas.
- Automated lighting control – motion sensors, dimming, outdoor photo controls
- Lighting rebates and tax credits are available in most areas when you upgrade

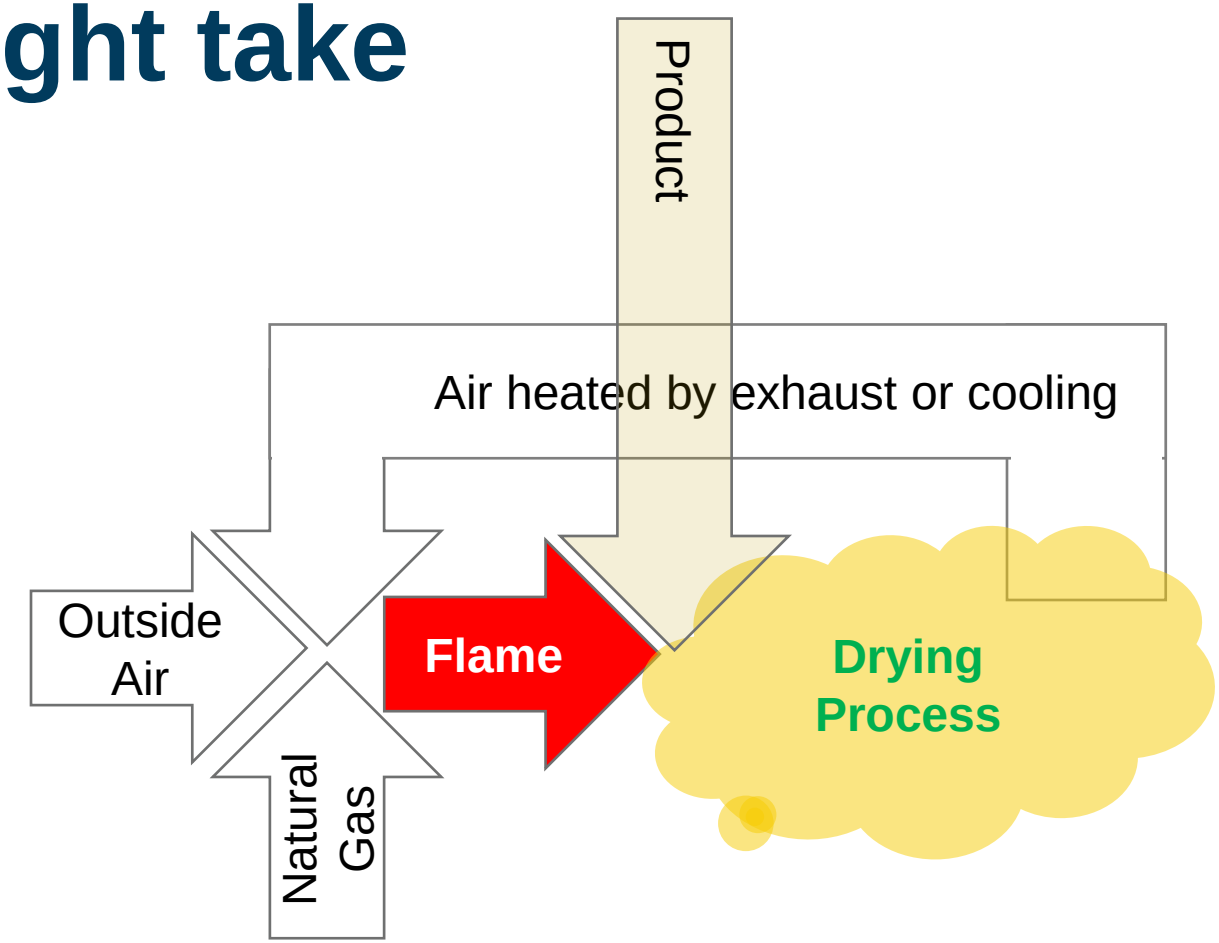
Practical steps you might take *Drying*

Waupaca Foundry facility

- Dry their air prior to heating it for melting – reduced fuel usage by 2.5%.
- Also preheat the iron that is to be melted.

Similar things that can be done for corn or grain dryers:

- Heat recovery off exhaust to preheat incoming air
- Heat recovery off grain cooling section of dryer to preheat incoming product or air
- Dryers that exhaust moisture mid-process to lower heating load



Practical steps you might take *Equipment Updates*

Update old motors (that are going to fail anyways)

- 50 HP 480 V motor - ***1990***
  - 1460 hours a year
    - 4 hours / day
  - 36.7 kW
  - 53,582 kWH
  - 4.3% = 2304 kWH
  - **$299 / year**

($0.13 / kWH all in cost)

History of Motor Efficiency Improvements (full-load efficiency in %)							
hp	1944	1955 U-Frame	1965 Standard Efficiency	1980 Standard Efficiency	1994[1] Standard Efficiency	2004[2] Energy Efficiency	2012[3] Premium Efficiency
7.5	84.5	87.0	84.0	-	85.5	89.5	91.7
15	87.0	89.5	88.0	86.5	86.6	91.1	92.4
25	89.5	90.5	89.0	88.0	89.3	92.4	93.6
50	90.5	91.0	91.5	90.4	91.3	93.2	94.7
75	91.0	90.5	91.5	90.8	91.7	94.1	95.4
100	91.5	92.0	92.0	91.6	92.3	94.5	95.4

Practical steps you might take
Walk your facility during operations

- Where are your largest loads?
- What is on when it doesn’t need to be?
- Look at equipment schedules – like on HVAC
- Look for large motor loads that are not on a VFD or soft start
- Any non-LED lights?
- Identify old inefficient equipment that could be replaced

Further Questions

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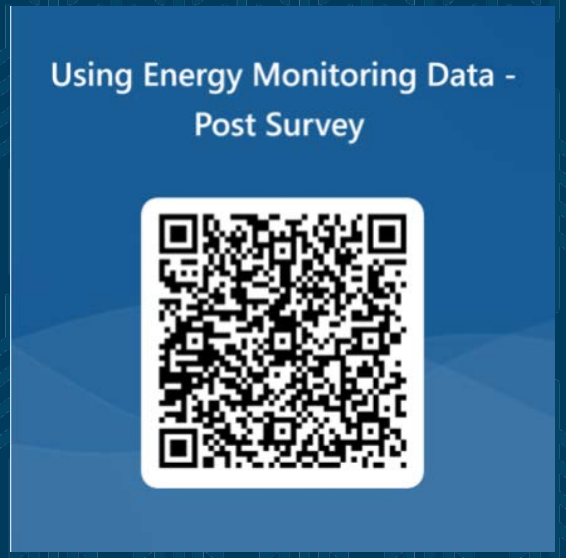
Win a GEAPS Prize Bundle!



SCAN FOR SURVEY

Please take a short survey for this session to help us plan for next year.

For every survey you submit you will be entered into a drawing.

GEAPS Prize Bundle

- **$200 Visa Gift card and free registration to Leadership Conference**
- **Raffle will be drawn at Closing Celebration, Tue 2/28**

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