Before we get started…

Join at: **www.menti.com**

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What kinds of energy-saving opportunities are you pursuing?

OCTOBER 8, 2024

Energy-saving opportunities in the manufacturing sector

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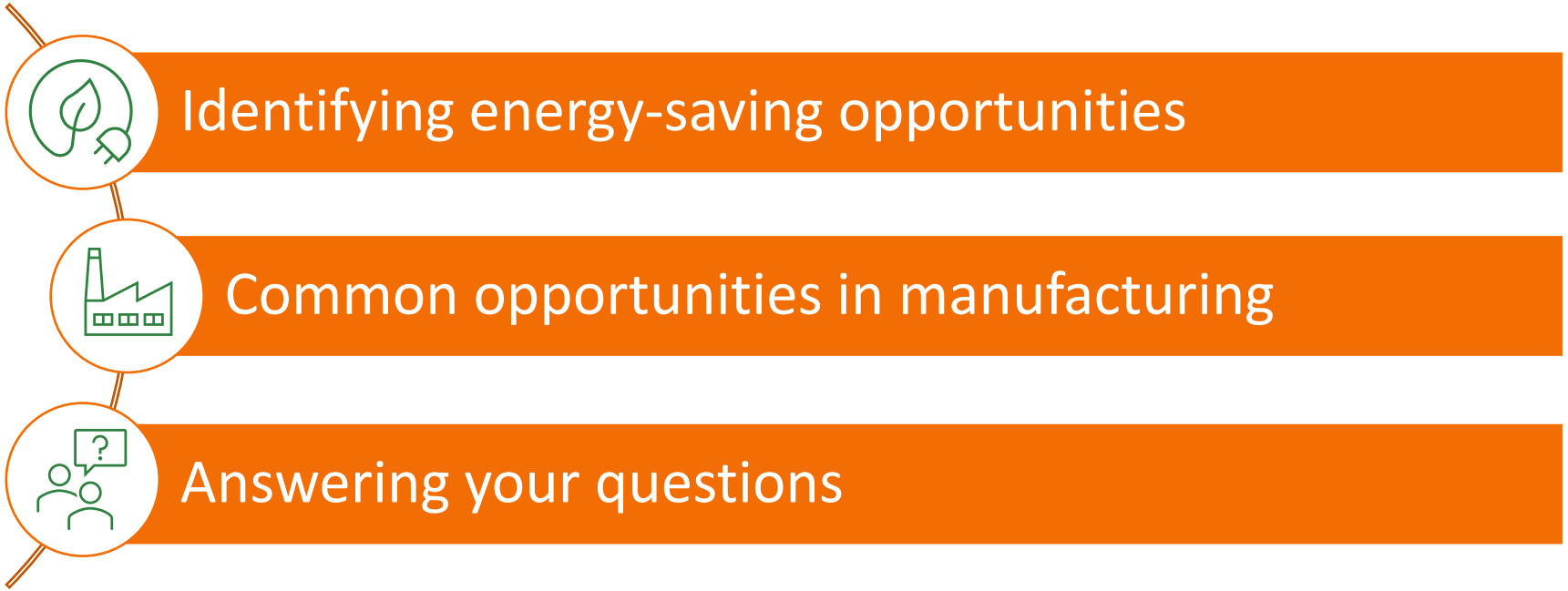
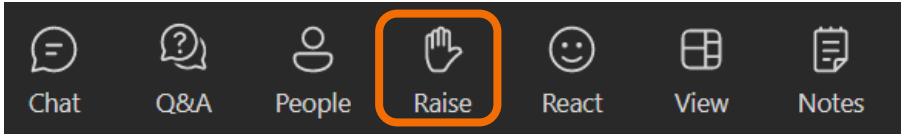
Today's Objective: help you find opportunities!



Participate in the discussion!

Raise hand or use the chat or Q&A to comment or ask questions.



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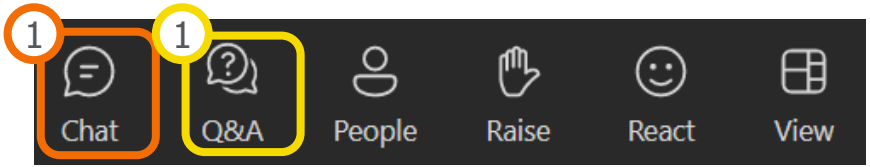
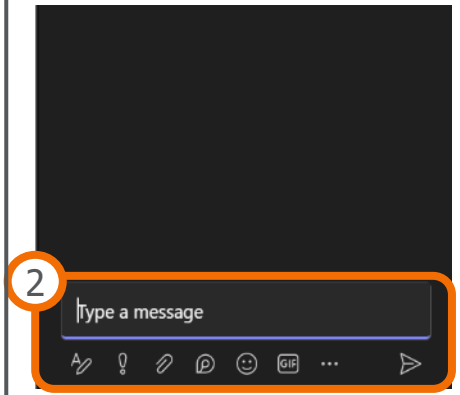
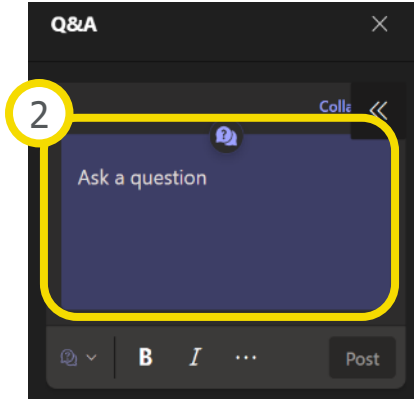






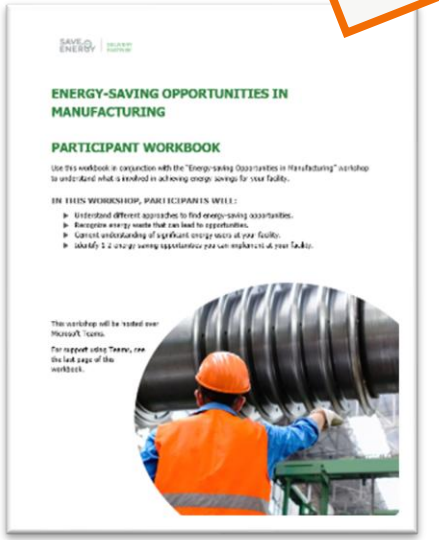
Follow along in your workbook

Have the workbook open or printed out

We will be using the participant workbook to summarize and reinforce key points and record your key takeaways.

Where to find the workbook:

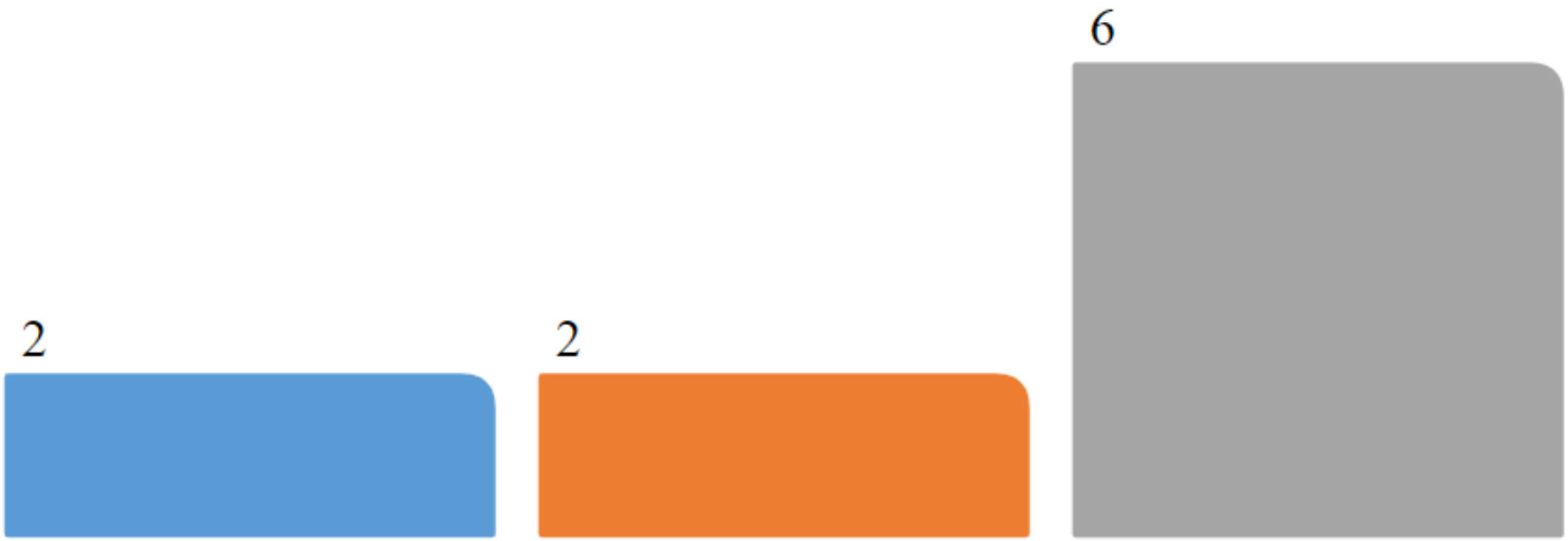
- Included in the invitation
- In the chat



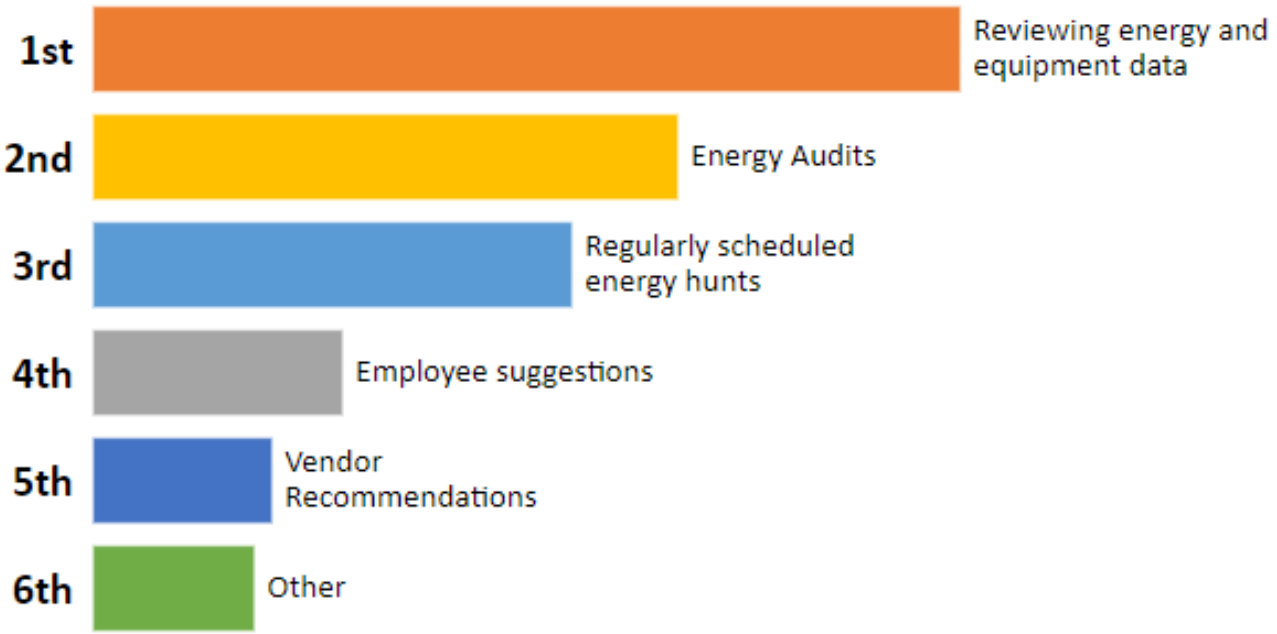
Watch for this icon to help follow along

Pg. 1

What kinds of energy-saving opportunities are you pursuing?



What do you do to find opportunities?



Practices to identify opportunities

Data analysis

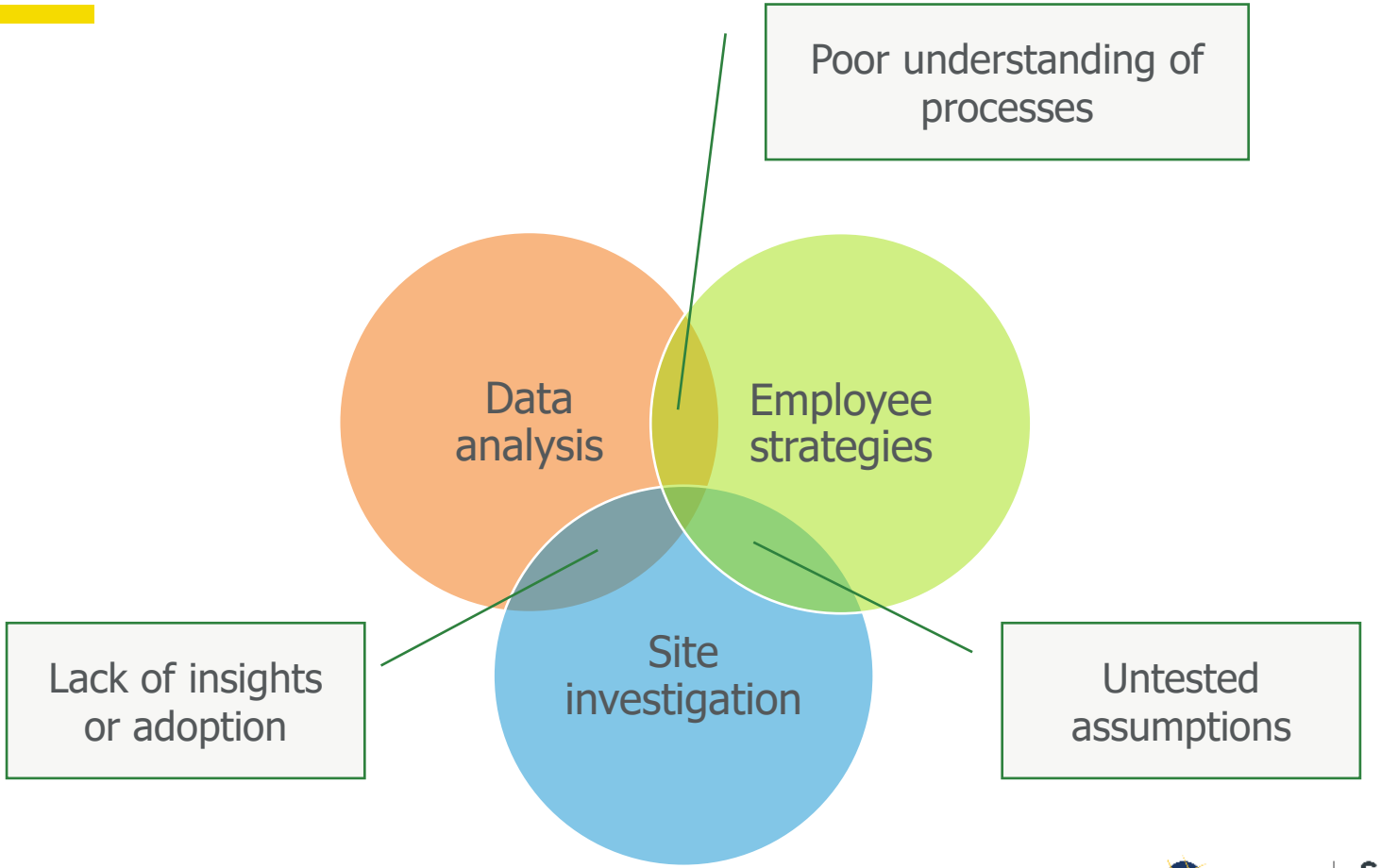
- Energy baseline models
- Interval data analysis
- Benchmarking

Site investigation

- Energy audit
- Energy hunt
- Discussions with operators

Employee strategies

- Energy training sessions
- Suggestion box
- Reviewing capital plans


Poor understanding of processes
Data analysis
Employee strategies
Site investigation
Lack of insights or adoption
Untested assumptions

How do you find your energy-saving opportunities?

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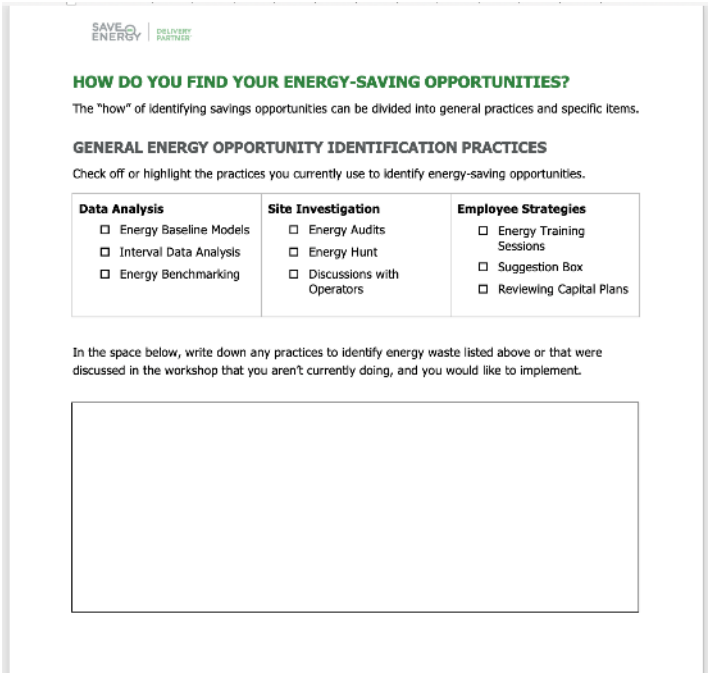
What strategies do you currently use at your facility and what future strategies you would like to implement.



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HOW DO YOU FIND YOUR ENERGY-SAVING OPPORTUNITIES?

The "how" of identifying savings opportunities can be divided into general practices and specific items.

GENERAL ENERGY OPPORTUNITY IDENTIFICATION PRACTICES

Check off or highlight the practices you currently use to identify energy-saving opportunities.

Data Analysis	Site Investigation	Employee Strategies
☐ Energy Baseline Models	☐ Energy Audits	☐ Energy Training Sessions
☐ Interval Data Analysis	☐ Energy Hunt	☐ Suggestion Box
☐ Energy Benchmarking	☐ Discussions with Operators	☐ Reviewing Capital Plans

In the space below, write down any practices to identify energy waste listed above or that were discussed in the workshop that you aren't currently doing, and you would like to implement.

Nine types of energy wastes review

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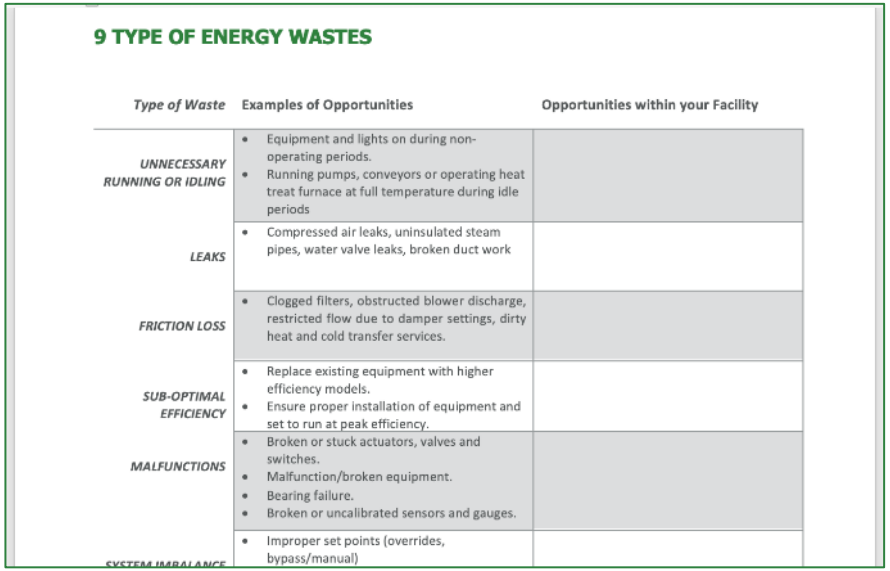
As we go through this next section, take notes on where this type of waste is likely occurring in your facility.

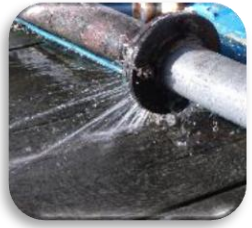


9 TYPE OF ENERGY WASTES

Type of Waste	Examples of Opportunities	Opportunities within your Facility
UNNECESSARY RUNNING OR IDLING	• Equipment and lights on during non-operating periods. • Running pumps, conveyors or operating heat treat furnace at full temperature during idle periods	
LEAKS	• Compressed air leaks, uninsulated steam pipes, water valve leaks, broken duct work	
FRICTION LOSS	• Clogged filters, obstructed blower discharge, restricted flow due to damper settings, dirty heat and cold transfer services.	
SUB-OPTIMAL EFFICIENCY	• Replace existing equipment with higher efficiency models. • Ensure proper installation of equipment and set to run at peak efficiency.	
MALFUNCTIONS	• Broken or stuck actuators, valves and switches. • Malfunction/broken equipment. • Bearing failure. • Broken or uncalibrated sensors and gauges.	
SYSTEM IMBALANCE	• Improper set points (overrides, bypass/manual)	

Nine types of energy waste

Unnecessary running or idling



Leaks

Friction loss

Sub-optimal efficiency

Malfunctions

System imbalance

Misapplication

Underutilization

Traditional lean waste

Energy waste examples (1/3)

Unnecessary running or idling
Keeping ovens on when there is no product in the oven

Sub-optimal efficiency
Poor sequencing of chillers (e.g., the least efficient chiller is the baseload chiller)

Misapplication
Using compressed air for cleaning or personal cooling

Energy waste examples (2/3)

Leaks
Leaks in wash water systems, refrigerant leaks

Malfunctions
Broken seals on refrigerant doors

Underutilization
Oven space not fully utilized

Energy waste examples (3/3)

Friction loss
Product build-up on pipe interiors

System imbalance
Mismatch between what's needed and what's being delivered

Traditional lean waste

Traditional lean wastes are actions or steps in a process that do not add value to the customer. In many situations, these lean waste often have a significant energy component.

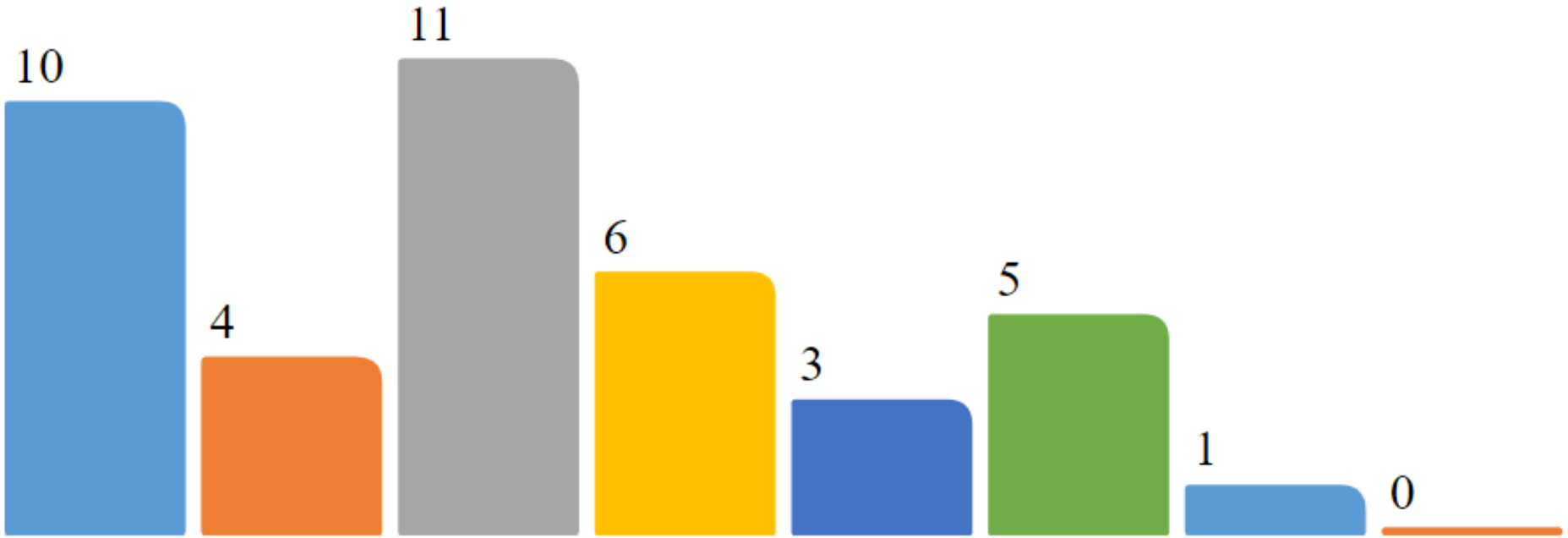
Traditional lean waste examples:

- Reducing amount of scrap products or materials
- Reducing product overwork
- Reducing unnecessary transportation of materials

Where might Lean waste be occurring (or where you've found it occurring) in your facility?

17 responses

What are your three largest energy users?



Managing your SEUs

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- Identify SEUs
- Identify variables and people affecting it
- Submeter SEUs
- Establish KPIs
- Establish SOPs
- Monitor and pursue corrective action when needed

Dan Josling and Jon Feldman

Daniel Josling – Director, Business Development, CEM, CMVP

Jon Feldman – Senior Energy Advisor, B.Sc. Eng. (Chem.), CEM, CMVP, 50001 CP

Jon and Daniel on the “all in” approach

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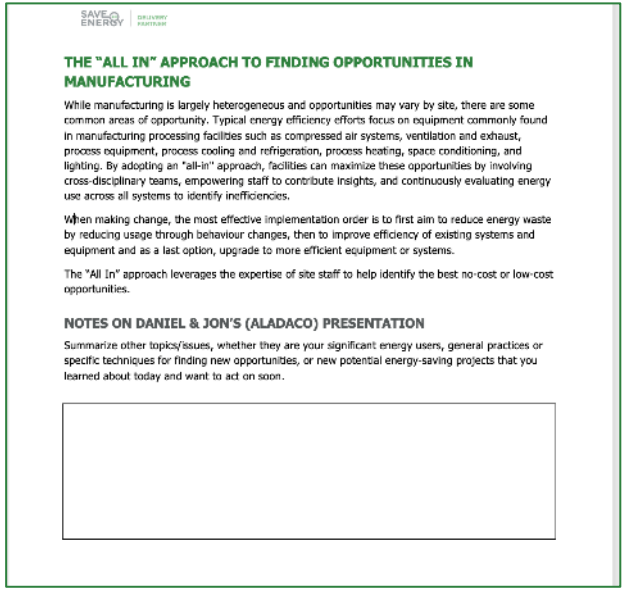
Take some time to identify energy-saving measures applicable to your facility in your workbook



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THE “ALL IN” APPROACH TO FINDING OPPORTUNITIES IN MANUFACTURING

While manufacturing is largely heterogeneous and opportunities may vary by site, there are some common areas of opportunity. Typical energy efficiency efforts focus on equipment commonly found in manufacturing processing facilities such as compressed air systems, ventilation and exhaust, process equipment, process cooling and refrigeration, process heating, space conditioning, and lighting. By adopting an "all-in" approach, facilities can maximize these opportunities by involving cross-disciplinary teams, empowering staff to contribute insights, and continuously evaluating energy use across all systems to identify inefficiencies.

When making change, the most effective implementation order is to first aim to reduce energy waste by reducing usage through behaviour changes, then to improve efficiency of existing systems and equipment and as a last option, upgrade to more efficient equipment or systems.

The "All In" approach leverages the expertise of site staff to help identify the best no-cost or low-cost opportunities.

NOTES ON DANIEL & JON'S (ALADACO) PRESENTATION

Summarize other topics/issues, whether they are your significant energy users, general practices or specific techniques for finding new opportunities, or new potential energy-saving projects that you learned about today and want to act on soon.

Finding opportunities in manufacturing

The challenge – manufacturing is largely heterogenous

Get everyone involved – multiple disciplines

Empower site staff to identify EE opportunities

Stress that finding opportunities is helpful not punishable

Speak to all site staff for brewing ideas with no home

Three types of practices

Reduce waste

Improve efficiency

Equipment upgrades equipment

*Watch for these icons in our examples to identify types of opportunities!

Low-cost and no-cost opportunities - “Just do it”

- Interval data analysis (load duration and load profile)
- Compressed air (poor application)
- Idling equipment (full shut down and set back)
- Industrial lighting (efficiency upgrades)
- Pump systems

Data analysis: load duration curve

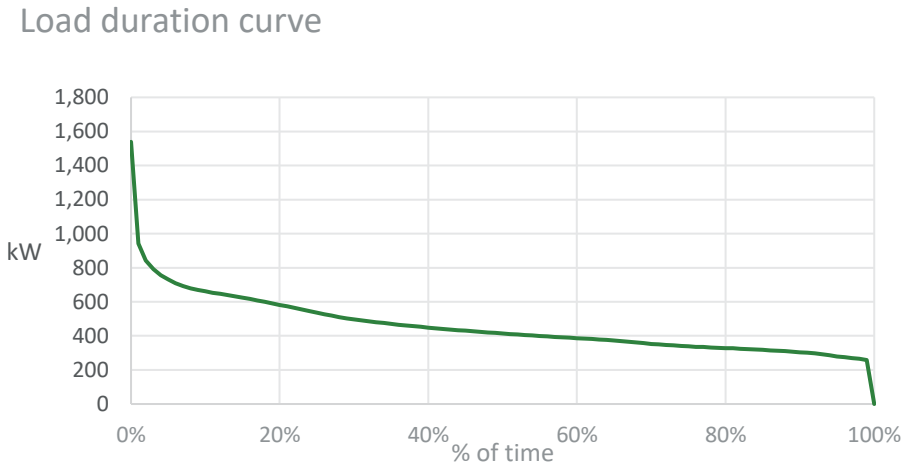
Only need hourly interval data from the utility or access utility's interval data portal

Needs to match billing dates

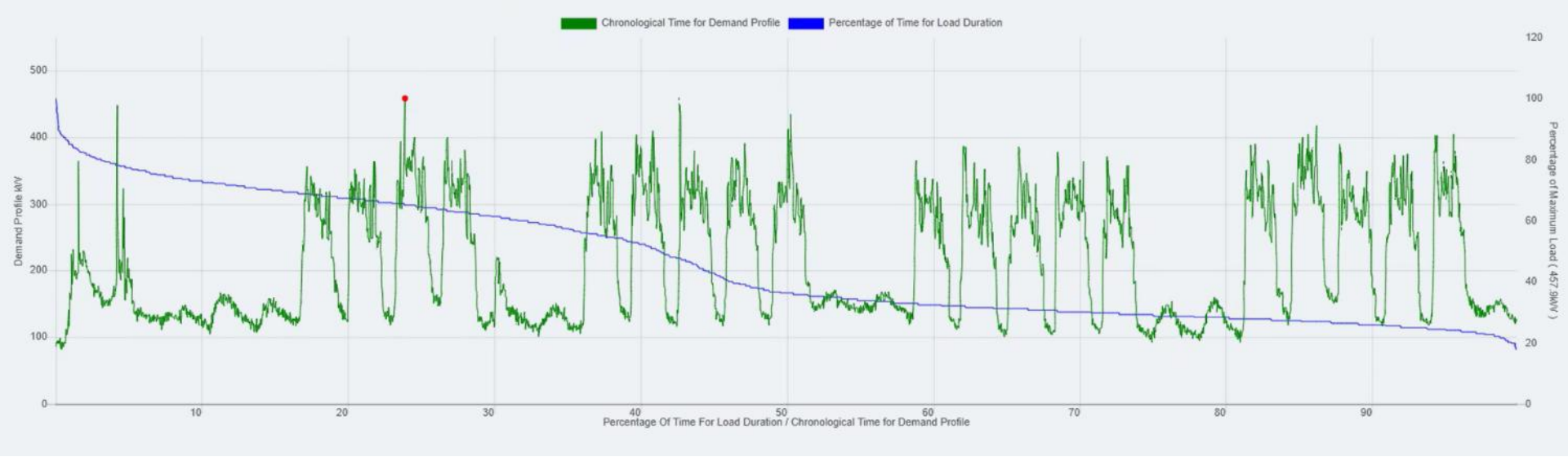
Classic example of "Friday afternoon fire pump test"

Example of new chiller plant tested in parallel with existing chiller plant

$40,000 penalty for month



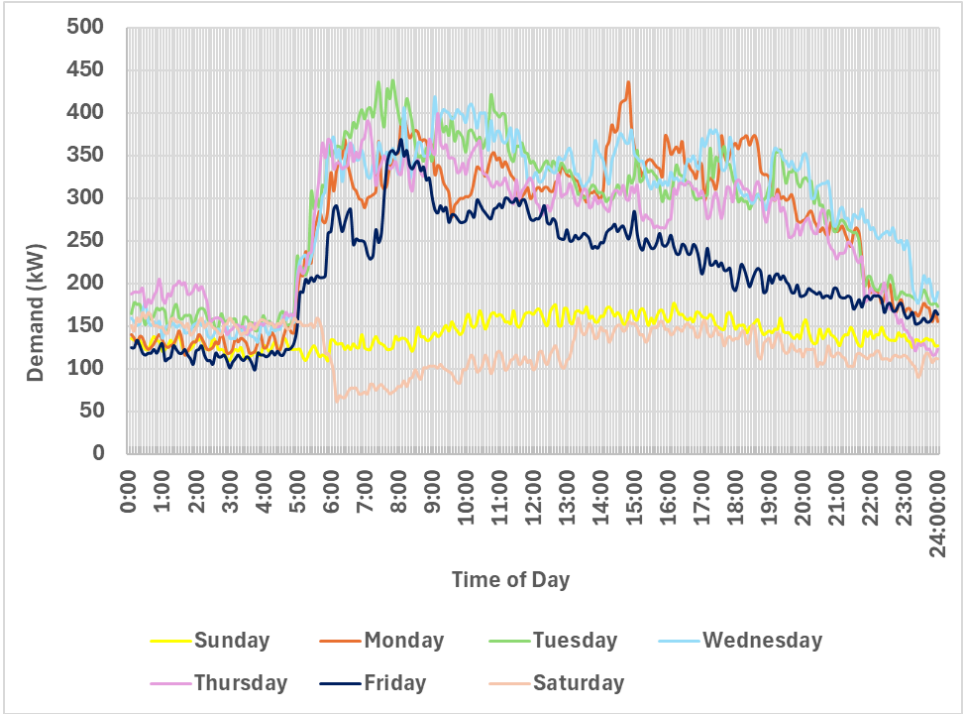
Data analysis: poor demand control



- Approx 12 instances
- 50 kW x $12/kW x 12
- = $ 7,200 / year

Data analysis: all days not equal

- May want to separate out weekend or non-production hours
- What is up with Friday ”decline”?
- What happened Monday at 3 pm?
- Why is Sunday baseload higher than Saturday 6 am?
- What else can be shut down during non-production time?



Common opportunities: expensive air

Approximately 6-9% of electricity used in industry is used to compress air

For every 1 kW of work you pay for about 5.2 kW of electricity. It's like paying 81% tax!

Compressed Air is not an expensive source of energy, it is **the most expensive** form of energy.

About 80-90% of electrical power input into the compressor, is wasted as heat

Site investigation: you want to use air for that?!

- Ask why compressed air needed for application
- Develop cost of use estimate
- Estimate cost of replacement technology
- Decide if compressed air is best energy source

Poor Application	Better Approach
Open blowing, drying	Low pressure blowers, fans, engineered nozzles
Sparging, aerating	Low pressure blowers, mixers
Cooling control equipment, cabinets	Refrigerated cabinet coolers
Air motors	Electric motors (in non-explosive environments)
Venturi vacuum	Vacuum pump
Personal cleaning, cooling	Absolutely not

Example: you want to use air for that?!

Opportunity

- Venturi air blowers for comfort cooling
- COPr (Coefficient of Performance): approx. 0.1 (Venturi or open pipe)

Solution

- Portable refrigeration system: COPr between 2.6 and 3.0
- Venturi ≈ 1600 kW vs vapour compression ≈ 52 kW

Results

- Savings ≈ 1550 kW
- Annual savings calculation: 1550 kW * 8760 hours * $0.05/kWh ≈ $700,000/year

Employee strategies: turn that thing off!

- Some things cannot be turned off but could be turned down
- Not only equipment, but services (lighting, compressed air, cooling water, etc.)
- Often shut off can be effective even for 15-minute breaks – nearly 200 hours / year

Example: Automotive components

Opportunity 1

- 30 x Machines for fusing
- Electric heat bases
- Most of the time machines turned on without considering schedule of use or heat up time
- Units idled for hours

Opportunity 2

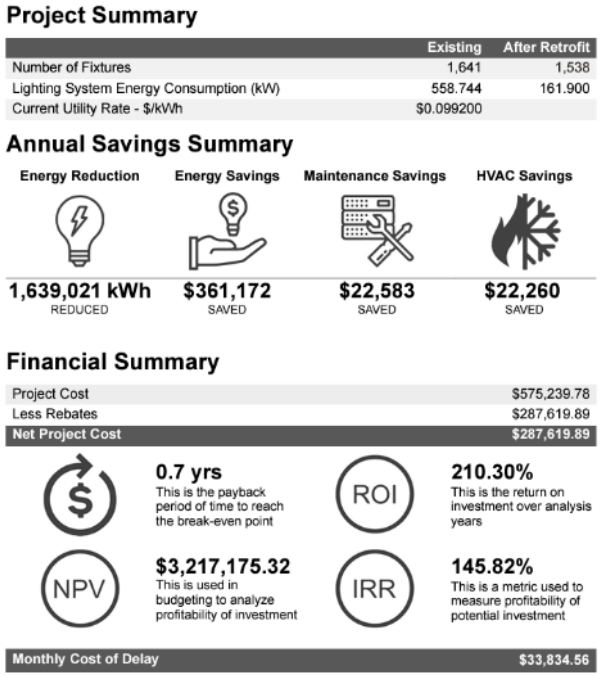
- Extrusion cooled by spray water
- Compressed air to blow of water
- Compressed air on continually

Solutions

- Step 1: Interlocks to shut off air when line is idle
- Step 2: Replace compressed air with interlocked low-pressure blowers

Site investigation: I can see clearly now…

- Lighting is "visible"
- Industrial fixtures can be a harder business case, however, be sure to include:
  - Reduced re-lamping costs
  - Reduced cooling costs
  - Utility incentives
- Consider monthly cost of delay



Project Summary

	Existing	After Retrofit
Number of Fixtures	1,641	1,538
Lighting System Energy Consumption (kW)	558.744	161.900
Current Utility Rate - $/kWh	$0.099200	

Annual Savings Summary

Energy Reduction	Energy Savings	Maintenance Savings	HVAC Savings
1,639,021 kWh REDUCED	$361,172 SAVED	$22,583 SAVED	$22,260 SAVED

Financial Summary

Project Cost	$575,239.78
Less Rebates	$287,619.89
Net Project Cost	**$287,619.89**

$	**0.7 yrs** This is the payback period of time to reach the break-even point	ROI	**210.30%** This is the return on investment over analysis years
NPV	**$3,217,175.32** This is used in budgeting to analyze profitability of investment	IRR	**145.82%** This is a metric used to measure profitability of potential investment

Monthly Cost of Delay	**$33,834.56**

Site investigation: don’t go with the flow

- Pump best efficiency point is specialized
- Pressure drop can often be reduced
  - Pumping through unused equipment
  - Too many bends and fittings
  - Pipes fouled over time
  - Increasing elevation unnecessarily
- Throttling valves (manual or automatic)
  - VFD opportunities
- Mine with six-inch pipe diameter reduced to ½ inch
- Bypass valve on pump left open

Example: don’t go with the flow

Opportunity

Process cooling water system (not chilled)

- closed loop pumps
- open-loop pumps
- cooling tower fans
  - All fixed speed

- Facility hours 8,760
- Non-production hours: 3000
  - At least one pump from each loop required to keep equipment cool

Solution - Upgrade to variable flow

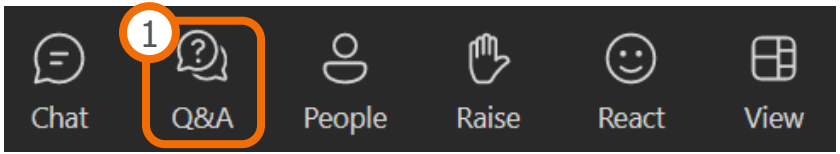
- Replaced two closed-loop pumps w/ more efficient ones
- Installed VFDs and flow control on all 3 closed-loop pumps
- Installed VFDs and temperature controls on all open-loop pumps

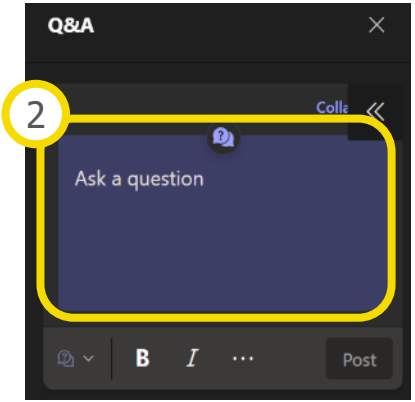
Results

- Energy Savings ≈ 1,200 MWh
- Cost Savings ≈ $170,000

Q&A with Daniel and Jon

Use the Q&A function to type out your questions.





Feel free to turn on your camera to ask questions as well!

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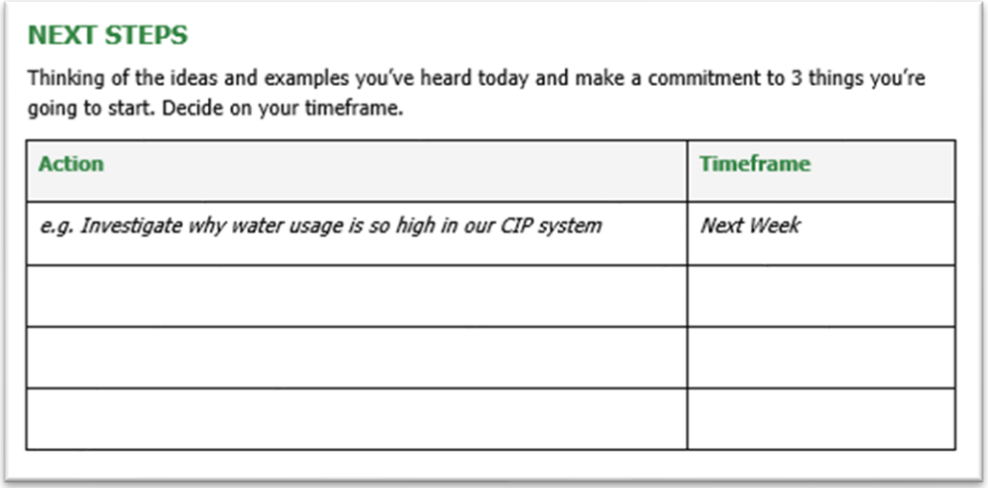
Next steps…

Pg. 6

Commit to 3 things you're going to start and decide on a timeframe

Share one thing you'd like to commit to in the next week



NEXT STEPS

Thinking of the ideas and examples you've heard today and make a commitment to 3 things you're going to start. Decide on your timeframe.

Action	Timeframe
e.g. Investigate why water usage is so high in our CIP system	*Next Week*