HVAC Harmony: **Best practices for HVAC Equipment Selection, Maintenance and Operation For Your Facility**

Come discover how **Equipment Selection, Application, Installation and Proper Maintenance** of your facilities HVAC equipment can directly affect your cost of ownership. Find out tips to understanding equipment functionality to be able to specify your equipment to optimize the operation of equipment and meet your client’s needs. Once equipment is installed and running, proper maintenance helps keep things functioning properly. **Learn about proper equipment maintenance and service** and how it can benefit you and your customers.

**Monday, February 4th**
- 11:30 Check In / Networking
- 11:45 Announcements
- 11:55 - 1pm Presentation
What Type of Sound Waves Do You Make?

4 Questions about sound:
- Do sound waves last forever?
- How long do they last?
- Who can hear it?
- Is it pleasing to the ear?

There are theories that sound waves have been found “bouncing” around our solar system from events in the past. Does that mean the things we say here on earth last forever, spiraling around the cosmos? Radio frequencies have the ability to travel forever.
The first person to discover that sound needs a medium was a brilliant English scientist known as Robert Boyle (1627–1691). He set an alarm clock ringing, placed it inside a large glass jar, and while the clock was still ringing, sucked all the air out with a vacuum pump. As the air gradually disappeared, the sound died out because there was nothing left in the jar for it to travel through.

How do the waves travel???

The first person to discover that sound needs a medium was a brilliant English scientist known as Robert Boyle (1627–1691).

He set an alarm clock ringing, placed it inside a large glass jar, and while the clock was still ringing, sucked all the air out with a vacuum pump.

As the air gradually disappeared, the sound died out because there was nothing left in the jar for it to travel through.

Why would I bring this up??? Alarm clocks are annoying?
HVAC Harmonics...
How can we “hear” HVAC equipment?

Every piece of equipment will not only take up a physical footprint on the site, but a footprint in the facilities utility consumption. If we select the right equipment to match the customer’s application and the owner follows up with proper preventative maintenance, we can create “harmony” for the customer’s cost of ownership and their budget.

Every piece of equipment will not only take up a physical footprint on the site, but a footprint in the facilities utility consumption.

If we select the right equipment to match the customer’s application and the owner follows up with proper preventative maintenance,

we can create “harmony” for the customer’s cost of ownership and their budget.
How can we make “Good Vibrations”?

It all starts at equipment selection!

Many options now available with new HVAC technology!

What equipment has this new technology?

What equipment has this new technology?
RTUs,
DOAS what is it? Common application with VRF
ERVs for heat reclamation from exhaust
VRF technology,
DFS/Mini Splits,
Chillers,
Boilers,
and the list goes on...

4 Questions Again:
Can poor equipment choices haunt us forever?
   Mis-sizing, wrong application,
How long will the issues last?
   Till the day they are replaced or retrofit repairs completed.
Who can hear it? Wait...should my equipment be that loud?
   Is there dissonance on your job?
Is it pleasing to my utility costs? Why are my costs going up?
We can monitor electrical and gas consumption on a site by using analog or digital means. These meters can be integrated into our DDC controls on a site to build a history and trends of a facilities consumption.

MUST HAVE A DDC SYSTEM OR APPLICABLE SOFTWARE TO MONITOR AND TREND.
To Make Harmony, You Must Have A Balanced Musical Chord:

What are some of the HVAC equipment best practices we can implement today?

Musical chords are all composed of individual notes. The space between the notes is called an interval.
If we don’t have all the notes in the right intervals/places, then it will not create a pleasing sound.
Just like our equipment on a facility, if we select all the right options for that environment, we can build a chord that rings beautifully!
The chord rings right, we will always have happy owners and occupants!
Now, what are some of the best options available today?
Supply and Exhaust Blowers

Direct Drive Blowers
• Eliminates belt loss for higher efficiency.
• Less maintenance and materials.

VFDs
• Find the right frequency!
• Eliminates on/off duty cycle.
• Duct and building static control.

Shaft Grounding Rings
• Protects your motor’s bearings.

Shaft grounding rings - Eliminates premature bearing failure due to static electricity. Explain how it helps control duct static and building static definition and operation.
Refrigerant Compressors

Constant speed

Digital Compressors

VFD Driven Compressors

Inverter Compressors

What determines the life of compressors? Is it just Maintenance? Correct Charge? Starts and stops!

**Constant compressors** are efficient when used in the proper application (where load is constant).
If not in right application we see wear and tare, inrush causing higher electrical consumption.

**Digital Compressors**- utilized for precise supply air temperature control. How is it better? Electrical, mechanical, longevity. Use in conjunction with constant compressors to give systems adaptive modulation and staging.

**VFD Compressor** – Compressor that is fed by VFD – Conjunction with EEV to regulate proper refrigerant flow.

**Inverter Compressors**- Scroll and Dual vane rotary for mini splits and VRF equipment! Able to ramp from 15 to 165 Hz, stage up and down to match load.

**How does this help?** If we are able to modulate, then we are able to match the supply air requirements for the space, giving us adequate runtime to properly control space temperature and humidity during the cooling cycle.
Head Pressure Control

On – Off control

- Condenser fan is at constant speed when compressor is operational.
- Some utilize a fan cycle switch to try maintaining head pressure.
- Can cause wear and tear on motors and fan props.
- Inrush during cycling causes higher electrical consumption.
- Large pressure swings.

Modulating Control

- EC and VFD Driven Motors
  - Both use discharge pressure transducer for control point.
  - Soft start and variable speed eliminate inrush.
  - Easier on motors, fan props, mounts, etc.
  - Precise head pressure control for all ambient conditions.

Why is head pressure important? Maintain head pressure to maintain proper evaporator temperature during varying ambient temperatures.

What are some of the methods of head pressure control

- Condenser fan is at constant speed when compressor is operational.
- Some utilize a fan cycle switch to try maintaining head pressure.
- Can cause wear and tear on motors and fan props.
- Inrush during cycling causes higher electrical consumption.
- Large pressure swings.

- EC Motor – electronically communicated motor – constant single phase power and vary speed with VDC signal
- VFD – 3 phase power through a variable frequency drive to change electrical frequency to motor to speed up and slow down the motor and its attached load.
Humidity? Will it throw you out of tune?

A huge factor to overcome in Kansas is the humidity and how to eliminate it!

Modulating Hot Gas Reheat –

Utilizes the hot, discharge gas from the compressor to heat the supply air after the cooling process takes place. The modulating valve works to maintain supply air & space temperature.

While normal cooling operation is taking place, we can direct the compressor discharge gas from the to the reheat coil (downstream of cooling coil) to reheat the air. This allows the air to cool & condense moisture on the evaporator then reheat to a neutral air temperature to supply into the space.
Heat Recovery Equipment

Exhaust air can save $$$! Reclaim what you already paid for!

- Heat Recovery Wheel
- Energy Recovery Ventilator

Reclaim the heat energy from the buildings exhaust – generally MAU or DOAS – and temper incoming air!
Heat pumps – RTUs, VRF and split systems use HP technology to allow the use of hot gas to heat the air flow. What limits do heat pumps have? Ambient temp

Why do we need electric heat backup. If your in defrost, you aren’t heating the space.

SCR Heat – Pulse high voltage to maintain supply air temp setpoint.
Economizers

• Comparative enthalpy economizer.

• When the BTU content of the outside air is lower than the BTU content of the inside air the equipment stays in the economizer mode longer.

• By monitoring CO2 levels in the space, we can minimize the amount of outside air that is introduced to the building.

Comparative enthalpy economizer control uses outside air conditions vs. indoor air conditions to cool the space.
CO2 – This lowers the amount of load on the equipment
Even if you have the right instrument, you must keep it in tune.

Who is the conductor of your facility’s equipment?

Do all pieces of equipment on your site “tune” with each other?
What can I do to make a difference?

Where do you stand?

- Determine consumption & maintenance cost per square ft.
- Initial system analysis.
- Make sure you have the goods.
- Make the Commitment.
- Set the goals, budget….and go.

• Determine consumption & maintenance cost per square ft. Many sources, books and consultants that can show you where to start!
• Initial system analysis.
  - Go Out And Look (GOAL)
  - Know the age and condition of your equipment.
• Make sure you have the goods.
  - Building plans and specifications.
  - Balance reports.
  - Find a trusted partner.
  - Equipment specifications.
  - Get the specific tools for your equipment.
  - Invest in maintenance management software.
• Make the Commitment
  - Start a Preventative Maintenance Program.
  - Material Lists.
  - Training for all staff.
  - Fix the immediate issue but truly solve the issue.
• Set the goals, budget….and go.

Once you start...don’t hesitate! Stick with it! When the director cues the orchestra – everyone must be on the same page. You could see this as your fiscal year. Start at the top and move clockwise. Remember that time can go backwards. Learn from our past but always keep moving forward!
EUI – What is it and how can it help us?

Energy Utilization Index

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>kWh</th>
<th>kW</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Jan</td>
<td>25,920</td>
<td>69</td>
<td>$2,876</td>
</tr>
<tr>
<td>2018</td>
<td>Feb</td>
<td>24,640</td>
<td>78</td>
<td>$2,903</td>
</tr>
<tr>
<td>2018</td>
<td>Mar</td>
<td>21,280</td>
<td>64</td>
<td>$2,539</td>
</tr>
<tr>
<td>2018</td>
<td>Apr</td>
<td>26,528</td>
<td>93</td>
<td>$3,120</td>
</tr>
<tr>
<td>2018</td>
<td>May</td>
<td>41,342</td>
<td>143</td>
<td>$5,295</td>
</tr>
<tr>
<td>2018</td>
<td>Jun</td>
<td>47,020</td>
<td>120</td>
<td>$5,768</td>
</tr>
<tr>
<td>2018</td>
<td>Jul</td>
<td>48,254</td>
<td>136</td>
<td>$6,079</td>
</tr>
<tr>
<td>2018</td>
<td>Aug</td>
<td>41,412</td>
<td>123</td>
<td>$5,253</td>
</tr>
<tr>
<td>2018</td>
<td>Sep</td>
<td>30,588</td>
<td>120</td>
<td>$4,019</td>
</tr>
<tr>
<td>2018</td>
<td>Oct</td>
<td>19,505</td>
<td>105</td>
<td>$2,937</td>
</tr>
<tr>
<td>2018</td>
<td>Nov</td>
<td>21,551</td>
<td>66</td>
<td>$2,522</td>
</tr>
<tr>
<td>2018</td>
<td>Dec</td>
<td>22,870</td>
<td>71</td>
<td>$2,605</td>
</tr>
</tbody>
</table>

Total energy used for cooling or heating a building or facility over a specific period. Chart out your facilities consumption and remember to always compare it to the weather.

Therm is a unit of heat equivalent to 100,000 BTUs.

A kilowatt is a metric that equals 1,000 watts of power. Wattage, in turn, indicates how much power a device can provide over a relative amount of time. Thus, a 1,000 watt (1 kW) microwave will warm up a meal much faster than a 600-watt microwave. Because of this relationship between capacity and time, we use the terms watt-hours (Wh) or kilowatt-hours (kWh) to describe energy use.
Go Out And Look!
What will you find??
“GOAL”

Go Out And Look
“Oh, Wow! I just didn’t know!”

How was the equipment installed. Was it per manufacturers specifications? Clearances? Do you know how often they recommend filter changes, greasing bearings, what type of grease to use? Can you use chemicals to clean coils?
When we take a different perspective on our energy loss/gain, the biggest issues could be right beneath our very feet!

After an energy analysis was completed, we discovered an existing steam leak on a site. After the repair, the owner had savings of over $400K per year!

When we take a different perspective on our energy loss/gain, the biggest issues could be right beneath our very feet!

After an energy analysis was completed, we discovered an existing steam leak on a site. After the repair, the owner had savings of over $400K per year!
Building Owners and Managers Association has generated a list of how long do general piece of equipment should last on a site...
Preventative maintenance is the key to making equipment last and even go beyond those estimated years. BOMA offers a wealth of information about preventative maintenance and best practices for a facility.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Age</th>
<th>Useful life (BOMA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>Chiller</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Chiller</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>Pump’s</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Package unit’s</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Pneumatic controls</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>Unit vents</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Unit vents</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>Valve actuators</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>Power burner</td>
<td>32</td>
<td>18</td>
</tr>
</tbody>
</table>
Preventative Maintenance

- Know what equipment you have and the manufacturer’s recommendations for service.
- Know where all your equipment components are located and have the tools/materials to do the work.
- Know your product usage so you can plan correct maintenance intervals.
- Always follow through on your maintenance to limit equipment failures & repairs.

Bullet 1- Get your IOMs for your equipment – maintenance guide for that specific equipment.
Bullet 2- GOAL
Bullet 3 ex- Motor greasing – calculated by run time of the motor itself and environmental factors.
Bullet 4 – missing a maintenance cannot only cause temporary loss of conditioning, it can cause more service cost in the future.
PM Checklist

One for each season. Cooling startup, heating startup, mid season heat/cool. Keep them for your records. Manufacturers can ask for maintenance data before approving warranty on components.
“Do I have to do that whole list??”

Visually check the equipment for refrigerant leaks
- Low charge can cause the evaporator coil to freeze up.
- Low velocity suction for proper oil return.
- Potential to slug compressor with liquid refrigerant.
- Lack of charge = Lack of capacity = incorrect operation.
  - Supply air temperature will not maintain properly.
  - Lack of dehumidification on evaporator coil

Check crankcase heater
- Ensures no liquid refrigerant resides in compressor oil sump.
- Keeps oil warm and correct viscosity.

Belt Condition and tension
- Cracks and glazed belts.
  - Causes failures and interruption of service.
  - Can cause noise during operation and pulley failures.
- If the belt is too tight or loose,
  - Increased amp draw on motor.
  - Damage to motor, bearings, shaft and blower wheel.
  - Incorrect CFM into space which directly affects capacity of the equipment.
  - Can cause incorrect system pressures and affect ability to heat or cool.

Check & tighten electrical connections
- Overheating, loss of phase, voltage drop, component failures.

Change air filters
- Diminishes airflow across the evaporator coil.
- Causes capacity issues, frozen evaporator coils and compressor damage.

Check and clean condensate drain pan
- Clogged condensate drains/pan can cause property damage.
- Moisture to evaporate back into the supply air and cause high humidity in the space.

Do I really have to?? How can those check list items affect the system?

Visually check the equipment for refrigerant leaks
- Low charge can cause the evaporator coil to freeze up.
- Low velocity suction for proper oil return.
- Potential to slug compressor with liquid refrigerant.
- Lack of charge = Lack of capacity = incorrect operation.
  - Supply air temperature will not maintain properly.

Check crankcase heater
- Ensures no liquid refrigerant resides in compressor oil sump.
- Keeps oil warm and correct viscosity.

Belt Condition and tension
- Cracks and glazed belts.
  - Causes failures and interruption of service.
  - Can cause noise during operation and pulley failures.
- If the belt is too tight or loose,
  - Increased amp draw on motor.
  - Damage to motor, bearings, shaft and blower wheel.
  - Incorrect CFM into space which directly affects capacity of the equipment.
  - Can cause incorrect system pressures and affect ability to heat or cool.

Check & tighten electrical connections
- Overheating, loss of phase, voltage drop, component failures.

Change air filters
- Diminishes airflow across the evaporator coil.
- Causes capacity issues, frozen evaporator coils and compressor damage.

Check and clean condensate drain pan
- Clogged condensate drains/pan can cause property damage.
- Moisture to evaporate back into the supply air and cause high humidity in the space.
### Performance Indicator Levels

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Service and Response Time</strong></td>
<td>Able to respond to virtually any service, immediate response.</td>
<td>Response to most service needs, typically within a week.</td>
<td>Maintenance, response time is 10% of CRV or less.</td>
<td>Maintenance, response time is 25% of CRV or less.</td>
</tr>
<tr>
<td><strong>Customer Satisfaction</strong></td>
<td>Able to respond to virtually any service, immediately.</td>
<td>Response to most service needs, usually completed by facilities staff.</td>
<td>Reaction maintenance is performed within the same day.</td>
<td>Reaction maintenance is performed within the same week.</td>
</tr>
<tr>
<td><strong>Facilities Mix</strong></td>
<td>100%</td>
<td>75-100%</td>
<td>50-75%</td>
<td>25-50%</td>
</tr>
<tr>
<td><strong>Service Efficiency</strong></td>
<td>Maintenance activities appear highly organized and focused. Service and maintenance cells are responsive and timely.</td>
<td>Maintenance activities appear organized and focused. Service and maintenance cells are responsive to needs.</td>
<td>Maintenance activities appear organized and focused. Service and maintenance cells are responsive to needs.</td>
<td>Maintenance activities are somewhat chaotic. Service and maintenance cells are responsive to needs.</td>
</tr>
<tr>
<td><strong>Building Systems’ Reliability</strong></td>
<td>Breakdown maintenance is rare and limited to vandalism and abuse repairs.</td>
<td>Breakdown maintenance is limited to system components that are critical to UHS. (Mean Time Before Failure).</td>
<td>Building and systems components periodically in need of repair.</td>
<td>Systems unreliable. Constant need for repair. Backlog repair exceeds resources.</td>
</tr>
</tbody>
</table>

This chart will help to determine which facilities have good or poor cost efficiencies. Determines which maintenance costs are causing the inefficiencies. Uses time trend analysis to compare seasonal peaks, anomalies, or trends.

**CRV (current replacement value index)** is the Total Maintenance Cost / Total Current Replacement Value

**Total Maintenance Cost:** Sum of all Service Types = Maintenance. This includes all maintenance-related Cost values such as Utilities, Custodial, and Grounds.

**Total Current Replacement Value:** Building Condition Assessment holds the Current Replacement Value for each building (CRV = Gross Area * Cost per Area)

**Facilities Condition Index (FCI):** Facilities condition is a measure of renewal need as compared to current replacement value (CRV)
# Performance Indicator Levels

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTION</td>
<td>SHOWPIECE FACILITY</td>
<td>COMPREHENSIVE STEWARDSHIP</td>
<td>MANAGED CARE</td>
<td>REACTIVE MANAGEMENT</td>
</tr>
<tr>
<td><strong>Customer Service and Response Time</strong></td>
<td>Able to respond to virtually any service, immediate response.</td>
<td>Response to most service needs, typically in a week.</td>
<td>Services available only by reducing maintenance, response times of one month or less.</td>
<td>Services available only by reducing maintenance, response times of one year or less.</td>
</tr>
<tr>
<td><strong>Customer Satisfaction</strong></td>
<td>Proud of facilities, have a high level of trust for the facilities organization.</td>
<td>Satisfied with facilities related services, usually complimentary of facilities staff.</td>
<td>Basic level of facilities care. Able to perform mission duties. Lack of pride in physical environment.</td>
<td>Generally critical of cost, responsiveness, and quality of facilities services.</td>
</tr>
<tr>
<td><strong>PM vs. CM</strong> (Preventative Maintenance vs. Corrective Maintenance)</td>
<td>100%</td>
<td>75-100%</td>
<td>50-75%</td>
<td>25-50%</td>
</tr>
<tr>
<td><strong>Maintenance Mix</strong></td>
<td>All PM is scheduled and performed on time. Emergencies (e.g. power outages) are infrequent and handled efficiently.</td>
<td>A well-developed PM program: PM done less than defined schedule. Occasional emergency caused by pump failures, etc.</td>
<td>Reactive maintenance high due to systems failing. High number of emergencies causes reports to upper management.</td>
<td>Worn-out systems require staff to be scheduled to react to failure. PM work consists of simple tasks done inconsistently.</td>
</tr>
<tr>
<td><strong>Aesthetics, Exterior</strong></td>
<td>Windows, doors, trim, exterior walls are like new.</td>
<td>Watertight, good appearances of exterior cleaners.</td>
<td>Minor leaks and blemishes, average exterior appearance.</td>
<td>Somewhat drafty and leaky, rough-looking exterior.</td>
</tr>
<tr>
<td><strong>Aesthetics, Lighting</strong></td>
<td>Bright and clean, attractive lighting.</td>
<td>Bright and clean, attractive lighting.</td>
<td>Small percentages of lights out, generally well lit and clean.</td>
<td>Numerous lights out, missing diffusers, secondary areas dark.</td>
</tr>
<tr>
<td><strong>Service Efficiency</strong></td>
<td>Maintenance activities appear highly organized and focused. Service and maintenance calls are responded to immediately.</td>
<td>Maintenance activities appear organized with direction. Service and maintenance calls are responded to in a timely manner.</td>
<td>Maintenance activities appear to be somewhat organized, but remain people-dependant. Service/Maintenance calls are sporadic, without apparent cause.</td>
<td>Maintenance activities are somewhat chaotic and people-dependant. Service/maintenance call are typically not responded to in a timely manner.</td>
</tr>
<tr>
<td><strong>Building Systems’ Reliability</strong></td>
<td>Breakdown maintenance is rare and limited to vandalism and abuse repairs.</td>
<td>Breakdown maintenance is limited to system components short of MTBF (Mend Time Before Failure).</td>
<td>Building and systems components periodically or often fail.</td>
<td>Systems unreliable. Constant need for repair. Backlog repair exceeds resources.</td>
</tr>
<tr>
<td><strong>Operating Budget as % of CRV</strong> (Current Replacement Value)</td>
<td>&gt;4.0</td>
<td>3.5-4.0</td>
<td>3.0-3.5</td>
<td>2.5-3.0</td>
</tr>
<tr>
<td><strong>Campus Average FCI</strong> (Facility Condition Index)</td>
<td>&lt;0.05</td>
<td>0.05-0.15</td>
<td>0.15-0.29</td>
<td>0.30-0.49</td>
</tr>
</tbody>
</table>
**Example Site: Central Plant**

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>Projected</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilled water temp</td>
<td>38 deg</td>
<td>41 deg</td>
<td>45 deg</td>
</tr>
<tr>
<td>Chiller operation</td>
<td>3 at 100%</td>
<td>3 at 75%</td>
<td>2 at 50% - 75%</td>
</tr>
<tr>
<td>Water flow / pump ops</td>
<td>100%</td>
<td>75%</td>
<td>68%</td>
</tr>
<tr>
<td>Fan Speeds</td>
<td>60 Hz</td>
<td>50 Hz</td>
<td>30Hz - 55Hz</td>
</tr>
<tr>
<td>GPM (Flow)</td>
<td>1800 gpm</td>
<td>1200 gpm</td>
<td>600 gpm</td>
</tr>
<tr>
<td>OR CFM (Air Changes)</td>
<td>100%</td>
<td>80%</td>
<td>~60%</td>
</tr>
</tbody>
</table>

*Prevented need of additional chiller: $700K to $1M Cost Avoided.*

**What instruments helped them tune up their facility?**
- VDFs with duct static pressure sensors on AHUs.
- VFDs on chilled water pumps.
- Reset chilled water temp to maintain space temperatures and humidity levels.
- Reset condenser water temp to maintain it a couple degrees above the dew point.
- Less outdoor air due to space CO2 monitoring, when applicable.
- Use of matched/calibrated sensors can help accuracy of analysis.
The Conductor Must Keep Time

- Scheduling is very important on job sites.
  - The tighter the schedule, the more savings we can achieve.
- Peak demand limiting should be planned.
  - An energy management application that limits consumption of electricity with the intent to prevent higher demand rate charges.
    - Demand rates differ from site to site.
    - Demand window is typically a 15 minute segment of an hour.
    - Demand is the amount of electricity used at any given time.
  - Demand charges can be more than 50% of your utility bill!
    - PDL will prevent higher demand charges by shutting off or reducing the capacity of non-essential electrical loads.
    - The loads will be reactivated once the overall demand decreases and the loads can be restored without adversely affecting the overall demand.

Whole idea – the power company will monitor your peak usage, so they can ensure that the equipment that feeds a particular facility will be able to meet demand. This is called the Peak demand. A facility will want to limit this as much as possible to save money! Demand charges can be more than 50% of a facilities utility bill –

PDL example – instead of bringing on all 4 cooling stages in a 170 ton RTU, bring on 2 instead. Stage units on over an hour or two instead of all at once.

- Demand rates differ from site to site.
- Demand window is typically a 15 minute segment of an hour.
- Demand is the amount of electricity used at any given time.
- Demand charges can be more than 50% of your utility bill!
- PDL will prevent higher demand charges by shutting off or reducing the capacity of non-essential electrical loads.
- The loads will be reactivated once the overall demand decreases and the loads can be restored without adversely affecting the overall demand.
adversely affecting the overall demand.
The Cadence

• At the end of a musical piece, there will be a cadence. The cadence for a facility is the end of the fiscal year.
  • Take time to look back on your facilities performance.
    • How can we improve?
    • Where do we need to focus?

Then you can set goals for the year to come.

Performance is how the equipment has maintained, cost of preventative maintenance, utility costs, replacement costs, corrective repair costs, etc. We can always improve – there is always more work to be done or knowledge to be gained. Where do we focus – is your equipment experiencing failures due to age? Lack of maintenance?
Thank You For Your Time!

About the Presenter:

Joshua Lindholm is the Technical Service Adviser and Trainer for Building Controls and Services. Josh has been with BCS since 2012 and in the HVAC industry for over fifteen years. Josh has earned his bachelor’s degree from Wichita State, completed the apprentice program with the local 441 Plumbers and Pipefitters Union and holds many certificates for the HVAC Industry. Josh has experience with equipment ranging from split systems, VRF technology to industrial chillers and boilers. Since Josh has joined BCS, he has become the LG Multi V MVP, LG DFS TSA, Aaon Service Specialist, LG and Aaon certified commissioning agent, representative and trainer. Since he was certified as a trainer, he has been working with contractors and customers to provide essential information for all the stages of construction projects and ownership. After the project is done, Josh continues to work with customers and contractors in their facilities to advise them how the system can best fit their needs while maintaining the highest efficiency possible. From the installation of the equipment to completion, Josh is working to educate others how to select, operate, maintain and service a new age of HVAC equipment.