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Making the Best of a Bad (Energy) Situation

By: Walter Bright, PE, PEM

Professional Energy Managers and IEP partners,

We at IEP hope this newsletter finds you well. Since we have a large national and international reach, circumstances from PEM to PEM may be quite different. Whatever your situation is, we hope that you and your family are healthy and safe.

A quick note about what we have been doing at IEP to adjust. Outside of moving all our instruction and courses to online delivery for the foreseeable future, we have also relaxed renewal policies to help with PEMs that cannot renew due to financial or work circumstances. If your renewal window comes up and your circumstances cause difficulty in renewing, please let us know.

In the last few months, I have seen several projects "go against" the energy efficiency trend in the name of patient or occupant safety. While my inner energy geek cringes a little, energy savings should not be pursued at the expense of people's safety; not before and certainly not now. Examples of these projects include converting air handling units (AHU) to 100% outside air/100% exhaust (or relief), running fans on units 24/7 with higher levels of filtration (meaning more pressure drop) even when the building is unoccupied, increasing flow to areas in an effort to provide additional air changes (and hence more filtration), and others.

On the surface, these things might feel like an inevitability, or an "it is what it is" situation. However, there is no reason why we cannot try and do some of these things as efficiently as possible. For example, I have seen buildings put into 24/7 occupied operation through the building automation system (BAS) to keep the AHU fans running and the fresh air being continuously introduced. While the intent is good, this also potentially means the building is being heated/cooled to occupied setpoints when no one is there. Perhaps there is a better way, and that way is likely different building to building. Some have a standby ability, so that while the fans are running, the setpoints are relaxed to help save energy. Some might need more manual intervention by overriding setpoints and fan/damper commands. If we are increasing airflow to spaces (increasing airflow setpoints to classrooms, for example), could we potentially live with a slightly higher discharge air temperature (assuming we do not have temperature reset already in place). All these things need to be done with some care (for example higher discharge air temperature means higher humidity in hot and humid summer climates right now), but they are possibilities to explore.

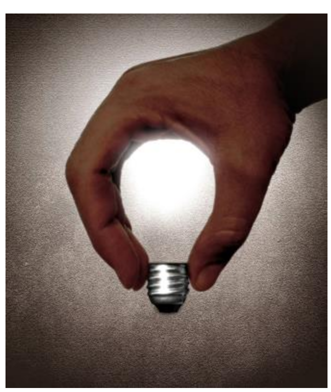
Making the Best of a Bad (Energy) Situation *(continued)*

Another avenue is to think about how to improve buildings now so in the future some of the projects above are easier. For example, let us say that you have an old building in your portfolio that has pneumatic controls that has not been changed to direct digital control (DDC). For years you have tried to get it through on your facilities, maintenance, or energy budget, only to have it pushed further and further out. If it was my building, I might be telling my management, “hey, if I had a new control system in that building, I could really provide a lot of additional ventilation and outside air, but the old pneumatics cannot be adjusted to do that and a lot are locked at a fixed position.” We talk about this in the in-person PEM course some, but often the decision-makers are more interested in your secondary and tertiary benefits of your ECMs (energy conservation measures) than your primary driver of BTU’s and kWh’s as an energy manager. In my example above I have not said anything about saving energy. There is no doubt the pandemic has shown us how important buildings can be in preventing (or amplifying) the spread of the virus. This insight is likely new to many people who are not aware of indoor air quality, percent outside air and other building health factors. As such, these people might be more likely to listen to things you have already said due to their new and heightened awareness.

It is also a good time to remember that snake oil is still snake oil. For those of you that have not heard of snake oil, it is an old saying or euphemism that essentially means if the product is too good to be true, it probably is. There are a ton of different products out on the market that claim to “clean” air. Some of them are legitimate, some may be but are not professionally researched or documented as to their effectiveness, and some are a flat-out scam. In situations like this, I recommend using a non-biased third-party resource to evaluate the product, such as ASHRAE. The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) has released a lot of technical resources on filtration, disinfection, reopening of buildings, and other tools/articles. They have been made publicly available and can be found at https://www.ashrae.org/technical-resources/resources.

One thing of particular interest within those resources is the use of UV lights in the airstream to kill viruses (not just COVID-19) as it passes past the lights. The type of light, location, temperature, and velocity of the airstream are all important to determine the effectiveness or “kill rate.” UV lights are already a great tool to us energy managers, as they help keep coils clean and operating at peak performance, but now can be used to help improve indoor air quality (IAQ) as well. Again, another potential project to sell as an energy manager but not using energy to justify the project.

This is certainly a time when the old adage of making the best out of a bad situation comes to mind. Hopefully at some point we can come out of this with healthier buildings to live, work, and play in that are also energy efficient.



What Exactly Are Best Energy Practices?

By: Thomas D. "Dan" Mull, PE, PEM, CEM

They go by many names *Best Energy Practices, Energy Efficiency Best Practices, Best Practices, Best Operating Practices, Best Energy Efficient Practices, etc.* Regardless of the name their focus is the optimization of system performance. That is, the delivery of a commodity or service in the most efficient and cost-effective manner possible given current technology.

While efforts to improve system performance are not new, it has only been since the 1990's there has been a concerted effort by major organizations to identify these practices. This, in part, was due to companies coming to the realization that energy is a controllable expense. By identifying these practices, they could be replicated in similar operations thereby multiplying their benefits.

<u>*Benefits Associated with Best Energy Practices*</u> – The implementation and adherence to *Best Energy Practices (BEPs)* yields benefits on multiple levels. They can:

- reduce system energy consumption and operating expenses
- extend equipment life
- reduce system maintenance expenses
- provide emissions reductions

The U.S. Department of Energy summarized the potential monetary benefits noting "*It has been estimated that O&M programs targeting energy efficiency can save 5% to 20% on energy bills without a significant capital investment (PECI 1999). From small to large sites, these savings can represent thousands to hundreds-of-thousands of dollars each year, and many can be achieved with minimal cash outlays.*"

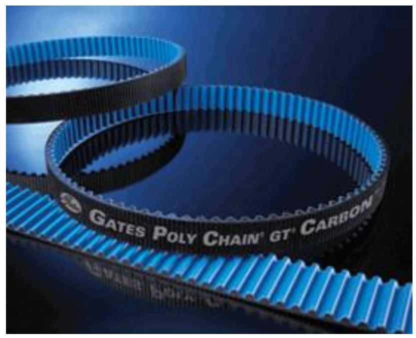
<u>*The Specifics*</u> – Identifying *BEPs* for a facility requires a thorough understanding of the equipment, system operating characteristics, and production/operational requirements. It is not a "one size fits all" approach. The specifics, i.e. the individual *BEP,* can vary based upon the system under consideration, its design, and operating requirements. Even within a system category, such a compressed air, recommendations can vary based upon unique parameters or requirements. Even so, within each major system category, there are generally two to four practices that can be viewed as universal. For example, if the discharge pressure of an air compressor is reduced 2 psi (0.138 bar), the energy required would drop by 1%.

Air Compressors

What Exactly Are Best Energy Practices? *(continued)*

This relationship is essentially linear over normal operating ranges. Therefore, operating a compressor at the lowest acceptable pressure to accomplish the necessary services would be considered a *Best Energy Practice*.

Another example of a *BEP* would be the use of synchronous belts in the majority belt-drive systems. When properly applied and aligned they can save approximately 4% in energy over standard belt drive systems.



Synchronous Belts
(Picture courtesy of Gates)

The U.S. Department of Energy and Environmental Protection Agency have published articles specifically addressing these practices including:

- Operating and Maintenance Best Practices (U.S. Department of Energy)
- Energy Efficiency Program Best Practices (U.S. EPA)
- Best Practices Guide for Energy-Efficient Data Center Design (U.S. DOE)
- Best Practices for Program Design and Implementation (U.S. DOE – Energy Star)

The private sector has also endeavored to provide guidance in identifying *Best Energy Practices* and their benefits, such as:

- *Best Practices Benchmark Program* (Itron, Inc.)
- *The Top Ten Energy Efficiency Best Practices and Best Available Technologies Task Group* (International Partnership for Energy Efficiency Cooperation)
- *Best Practices in Energy Efficiency* (Practice Greenhealth)

Changing Technology – As with any end-use application, changing technology can impact recommended *Best Energy Practices*. Improvements in equipment efficiency and control strategies can require a modification or complete replacement of a *BEP* with another. Therefore, it is prudent to stay abreast of developing technologies impacting operations and revisit each periodically to assess what, if any, impact these changing technologies may have.

Summary – As a good steward to our energy resources, everyone should strive to implement *Best Energy Practices*. They are an essential part of an effective and sustainable energy management strategy. Identifying, implementing, and replicating *BEPs* will ensure efficient operation and the long-term minimization of expenses and resources, while having a positive impact on the environment.

Belimo Energy Valve Report

Tennessee State Office Building Reduces District Energy Chilled Water Usage by 49%

Submitted by: Jones Lang LaSalle (JLL) Personnel

JLL (Jones, Lang LaSalle, Incorporated) has management responsibility for the primary government facilities for the State of Tennessee. In 2017 IEP conducted the three-week PEM Training Program for the State of Tennessee in Nashville. Local JLL personnel participated in the program. The following case study and resulting article were a joint effort between Belimo, Inc and JLL. The full article by Belimo, which includes additional information and case studies for additional buildings, along with supporting videos, are included as links at the end of the article. – Staff Writer

Founded in 1939, Jones Lang LaSalle (JLL) is one of the world's premier commercial real estate firms. The company is an industry leader in property and integrated facility management services, with a portfolio of 4.6 billion square feet [427.4 million square meters] worldwide. Since its inception, JLL has been committed to delivering value to its occupants and stakeholders by putting sustainability at the heart of its services and operations. In Nashville, Tennessee, an example of this commitment produced positive results as the company endeavored to improve energy efficiency and reduce chilled water usage at multiple buildings by leveraging the advanced capabilities of the Belimo Energy Valve.

Facilities and Project Overview

Citizens Plaza stands in the heart of Downtown Nashville. The Class A, 275,000 square feet [25,550 square meters], 15-story office building was constructed in 1984 and houses multiple Tennessee governmental agencies. During a typical workday, it has anywhere from 800 to 1,200 occupants.

Citizens Plaza receives its chilled water and steam from Metro Nashville District Energy System, which is located nearby on the Cumberland River. Chilled water from the plant enters the building at a temperature of 40°F [4.4°C]. As part of the contract, return water is to be no less than 54.5°F [12.5°C], or a Delta T of 14.5°F [8.1°C]. Any water that leaves Citizens Plaza below the contracted Delta T results in a thermal inefficiency charge. When JLL took over the management of building operations, the return water temperature was as low as 44°F [6.7°C], and this lingering problem needed a solution.

"At Citizens Plaza, we were experiencing high utility thermal inefficiency charges from Metro Nashville District Energy System due to low Delta T and over pumping," said Chad Lovell, Operations and Safety Specialist at JLL. "We were pushing water too fast through the building and not getting sufficient thermal transfer. Initially, we saw poor Delta T performance between 4°F to 8°F [2.3°C to 4.5°C]. Before JLL took over the contract, there were monthly thermal inefficiency charges upwards of $12,000 to $13,000 for the building. It was obvious that we needed a strategy to increase Delta T to reduce our chilled water usage."

The Solution

To solve Citizens Plaza's low Delta T syndrome and reduce thermal efficiency charges, JLL turned to Belimo.

"On our first visit to Citizens Plaza, we just verified what we already knew, which was that the structure was a Class A office building with air handlers on each floor," said Kevin Leathers, District Sales Manager at Belimo. "As is often the case in older buildings, the air handlers, globe valves, and coils were oversized. We had all the original drawings and realized pretty quickly that the Energy Valve was a perfect candidate for lowering chilled water usage and optimizing flow through the coils and air handlers."

After close communication between JLL and Belimo regional field consultants, Citizens Plaza underwent a pilot project installation with three 2-inch [DN 50] Energy Valves; one each on the 2nd floor, 5th floor, and 14th floor. The scope of work comprised a mechanical valve change-out without any control system modifications. The contractor removed the old globe valves and wired in the new Energy Valves with factory default settings.

Belimo Energy Valve Report *(continued)*

"Even without the Energy Valve's patented Delta T Manager logic enabled, we were able to reduce flow through the coils while maintaining the same building temperature," said Steve Rybka, Mechanical Contractor Consultant at Belimo. "The benefits kicked in when we initiated the Delta T Manager logic with refined setpoints for maximum flow and Delta T. The maximum design flow of the coils was 81.7 GPM [5.2 l/s]. With the Energy Valve, on the hottest day in August, flow peaked at 54 GPM [3.4 l/s] briefly. On average, coil flow was 30 to 35 GPM [1.9 to 2.2 l/s] for August and September." Overall, through the installation of just three 2-inch [DN 50] valves, the entire building Delta T increased by 2°F [1.2°C] during the summer.

The Belimo Energy Valve is an IoT cloud-connected pressure independent valve that monitors coil performance and energy consumption while maintaining Delta T.

With positive results from the pilot project, JLL decided to install eleven additional Energy Valves on the remaining floors (ten 2-inch [DN 50] valves and one 2½-inch [DN 65] valve on the make-up air unit). Installation of the valves took place approximately eight months after the start of the pilot project.

Savings and Benefits

After all, 15 Energy Valves became operational in Citizens Plaza, the average flow through the building during full occupancy reduced by over 200 GPM [12.6 l/s] versus the previous year when the original globe valves were still in place. "As a result of the retrofit project, we were able to reduce chilled water pumping by 49%, which equated to about $23,000 in annual savings", said Chad Lovell. "The total cost of the project, including installation, was $53,474. A simple financial calculation produced a payback in about 2.4 years."

The district energy provider even noticed a substantial reduction in chilled water usage at Citizens Plaza. "Shortly after all the Energy Valves became operational, we got a call from Metro Nashville District Energy System saying that our chilled water usage had dropped significantly, and they were going to send out a technician to check on the problem," added Lovell. "I informed them that there was no problem and that we had solved our low Delta T issue. It felt really good to get the confirmation from our chilled water provider that the building was performing better than they'd ever seen."

Full article:
https://www.belimo.com/mam/americas/marketing_communication/case_studies/energy_valves/success_story_tennessee_state_building.PDF

Full video: https://vimeo.com/359577368/4068b6a836