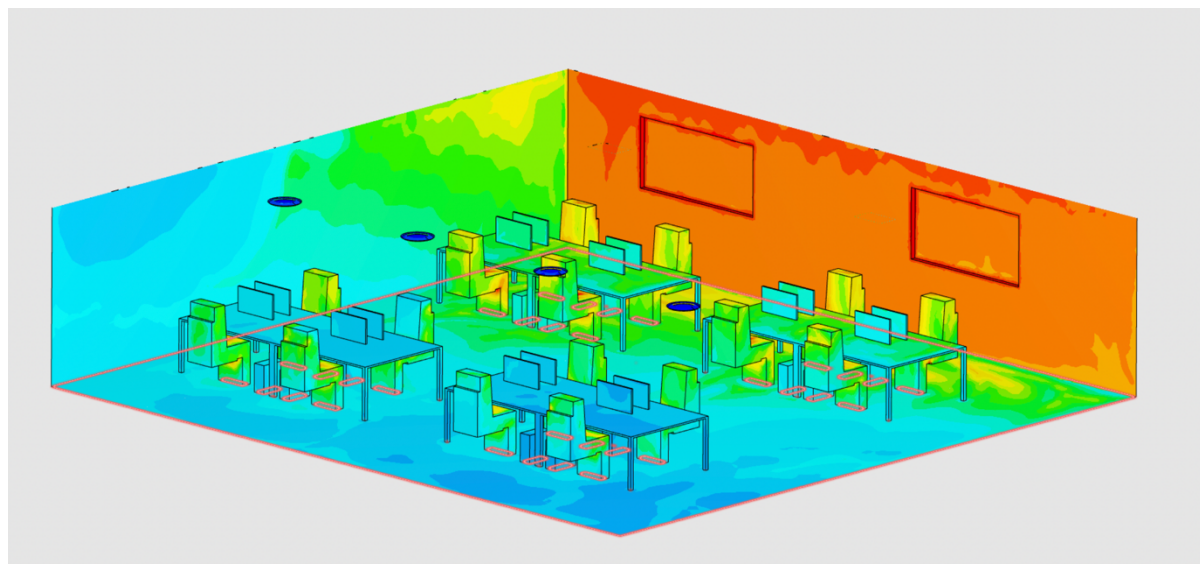


PURRMETRIX TECHNICAL NOTES

FINDING WASTED HVAC ENERGY

USING PURRMETRIX TO RETRO-COMMISSION HVAC AND HEATING



HVAC is often 30-40% of the energy footprint of a commercial building and offers substantial opportunities for energy reduction.

Occupiers often seek to reduce HVAC energy by expenditure on capital items like new plant but the danger is that they miss out on the single most cost effective way to lower HVAC energy – retro-commissioning.

This article will give you a better understanding of retro-commissioning and how to use a Purrmatrix system to achieve it.

WHAT IS RETRO-COMMISSIONING?

Retro-commissioning involves a systemic evaluation of opportunities to improve energy-using systems and is one of the most cost effective investments that can be made in improving HVAC systems, with studies showing payback of 0.2 – 2.1 years, depending on type of building and system. Overall energy savings can reach up to 15%. A full retro-commissioning exercise will identify:

- operations and control problems
- maintenance problems
- opportunities to retrofit better equipment

Changing operations and control problems provides the most rapid payback, generally in under a year. It can identify and fix:

- Equipment that is on when it may not need to be
- Operation times that might need trimming to reflect real patterns of occupation
- Thermostats and sensors that are out of calibration

Many of these small operations and control improvements cost little or nothing to implement, but can have big effects. For example, sensor calibration not only improves current operations but also increases the effectiveness of diagnostic monitoring and testing.



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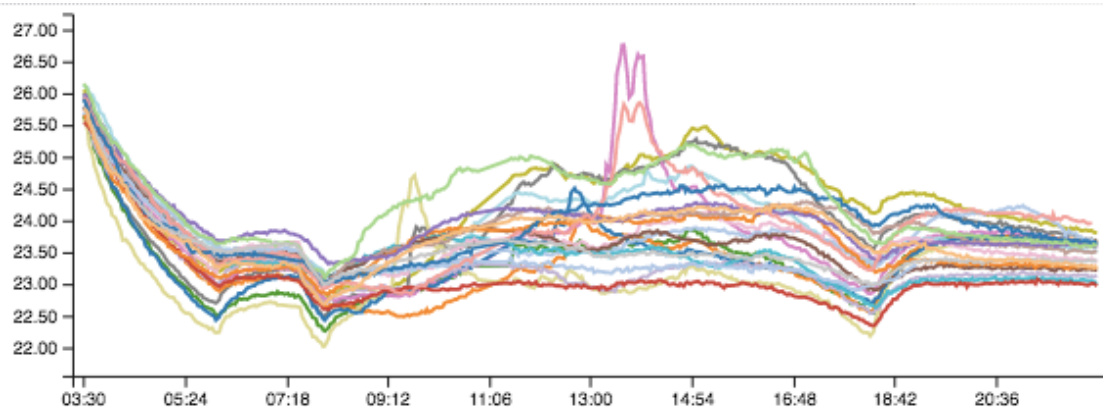
AVOIDING RUN TIME OUT OF HOURS

Running HVAC out of hours is a silent but huge problem, with a US study pegging it at the second most common reason for HVAC wastage, accounting for \$1.9 Bn of wastage every years (1). Unlike lighting, it's not obvious when systems are running. Staff – or a BMS – can change hours of operation for many reasons, and may not communicate that this has been done and why. Different zones or subsystems may be controlled using central or local settings, which further confuses the picture.

Beyond the energy wasted, running out of hours has other 'hidden' costs, including shorter equipment life and higher maintenance costs. But although an audit is time well spent, building managers trying to conduct one face some challenges:

- Run times may not be consistent across the building, with some zones kept on to cool data rooms, for example
- Run time schedules may vary over seasons, clock changes and holiday schedules
- Run time can often be altered by other members of staff, contractors, meaning the system can drift over time.

In these situations, Purr helps building managers by providing a continuous record of on/off times across the whole building, and the facility to set reports to identify where the system is operating outside hours.



Purrrmetrix system graph showing on and off events for HVAC

TRIMMING OPERATION TIMES TO SUIT SPECIFIC BUILDINGS AND ZONES.

HVAC may be running exactly to the hours you want, but still wasting cooling/heating, if the building is under occupied. For example, a cooling system that comes on at 6.30 to pre cool a building before workers arrive could be overcooling the space if it is only 50% occupied. This not only creates a uncomfortable space but wastes energy since a much shorter period of cooling would have been appropriate.

The problem for building managers is to identify where this is a recurring pattern and adjust operation accordingly, and in this situation Purr's visualisation tools make it possible to spot opportunities for adjustment.

CHECKING THERMOSTATS AND OTHER SENSORS

Modern buildings run on sensors, but generally very little attention is paid to them. This is a mistake because sensor error can compromise comfort as well energy efficiency. Errors don't just include a lack of calibration, but can also come from dead sensors, mistakes in control sensor (for example attributing the wrong sensor's input) or simply having the sensors in the wrong location.



PURRMETRIX TECHNICAL NOTES

When surveying sensors, remember all sensors are not equal – some affect the performance of the whole building envelope while others have a more localised impact. An incorrect return air sensor at the air handler will affect many parts of a building, but a poorly calibrated thermostat in a meeting room will have a much smaller impact. The biggest wins in energy terms are likely to come from central plant sensors, but to balance efficiency with comfort it is critical that more localised sensors are surveyed as well.

There are likely to be many critical control sensors in your building. [Contact us](#) for a free checklist to kick start your audit.

For any building or energy manager trying to monitor the performance of all these sensors is a time consuming process. Ideally a building services manager would have a log of system sensors and their needs for maintenance. But realistically, commissioning is often the first time there is an opportunity to build such a log. Other challenges:

- loss of performance that occurs between calibration can account for substantial losses
- the need to periodically access and inspect these sensors is time consuming

Purrrmetrix saves time for building managers and allows for rapid identification of faulty or drifting sensors. The sooner you can get control sensors back on track, the more energy can be saved.

So why wait? Contact us on info@purrrmetrix.com for a demo. Or call 01223 967301

Read more:

(1) Roth et al. 2005. "Energy Impact of Commercial Building Controls and Performance Diagnostics: Market Characterization, Energy Impact of Building Faults and Energy Savings Potential: Final Report." U.S. Department of Energy.

Mills, E, 2009: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions, Lawrence Berkeley National Laboratory.

Mills, Friedman, Powell et al, 2004: The Cost-Effectiveness of Commercial Buildings Commissioning, Lawrence Berkeley National Laboratory.

