



Maintaining an Environment for Efficiency

There can be very few buildings that don't have some form of environmental control. Whether it's a simple heating system or a complex **HVAC** installation, those responsible for operating and maintaining it face two challenges: they must preserve a comfortable environment within the building, and they must minimise energy consumption. Measuring and monitoring are the keys to meeting these seemingly conflicting challenges, says **Julian Grant** of **Chauvin Arnoux**.

As most of those responsible for managing buildings and workplaces will surely know, measuring and monitoring the performance of systems that have an effect on the environment in these locations is no longer optional. To meet the requirements of Part L of the Building Regulations, for example, HVAC systems and the like must be commissioned in line with the design intent, which necessarily means evaluating their performance. And the Energy Performance of Buildings Regulations require all but the smallest air conditioning systems to be inspected regularly at intervals that must not exceed five years.

There are also more general regulations, such as the Workplace (Health, Safety and Welfare) Regulations 1992. These don't explicitly require measurement and monitoring beyond specifying that thermometers must be provided, but they do say that "during working hours, the temperature in all workplaces inside building shall be reasonable", and "effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air."

It is also worth noting that lighting is an important element of the work environment and that there are many regulations and guidelines relating to the provision of

adequate lighting. A useful guide in this instance is HSG38 "Lighting at Work" which can be downloaded free of charge from The Health and Safety Executive website.

With so much regulatory weight behind the measurement and monitoring of environmental control systems, it would be easy to see these tasks as thankless burdens that absorb time and money while delivering little in the way of tangible business benefits. That would be a mistake. As a quick web search will readily confirm, there's an enormous amount of evidence to show that a good working environment boosts worker productivity and efficiency, and those are benefits that no company can afford to ignore. In short, effective environmental control not only keeps the regulators happy, it also helps businesses to operate more profitably.

So, measuring and monitoring the working environment is a key ingredient of business success, but which aspects of the environment need to be measured and monitored, and how exactly do you go about it? In most cases, the first question is easy to answer. The essential aspects to measure and monitor are light levels, temperature, air movement and humidity. But that's not quite all. As well as confirming how well the environmental systems are performing, it is absolutely crucial to monitor how much energy they are using.

Shortly we'll move on to look individually at each of the key aspects of environmental measurement and monitoring, but first let's answer a simple but important question: what is the difference between measuring and monitoring? The answer, for our purposes at least, is that a measurement is a one-off event – "the temperature in the office right now is 21 °C", for example, whereas monitoring involves recording the temperature (or another parameter) over a period of time, which might be just a few hours, but it could also be months or even years.

The benefit of monitoring, which is usually performed by instruments that have a logging function, is that it provides much more useful information than individual measurements. It might reveal, for example, that the office temperature is still above 20 °C in the middle of a winter night, when it could well be allowed to drop to, say 10 °C, which would save a lot of energy. Monitoring over extended periods will also allow circadian and seasonal effects to be detected and evaluated.



For measuring and monitoring light levels a logging luxmeter, such as the Chauvin Arnoux **C.A.1110**, is required. These instruments are typically small enough to be handheld and the best will give accurate results with virtually any type of light source: daylight, LED, incandescent, fluorescent, etc. A good luxmeter will also provide a mapping function that allows the light levels over an area or room to be mapped to determine whether or not they are uniform. Some models have a sensor with a magnetic base which is an added convenience as it allows the user to position the sensor and move away to avoid casting their shadow across it. The magnetic base is also an advantage when the sensor is installed semi-permanently for monitoring purposes.

Temperature can, of course, easily be measured with a simple and inexpensive thermometer. Indeed, as has already been mentioned, employees are required by law to provide thermometers. Nevertheless, there are distinct advantages to using more sophisticated instruments not least because they are likely to be more accurate and, of course, if they are logging types like the Chauvin Arnoux **C.A.1227**, which also incorporates an anemometer, or the **C.A.1246**, which incorporates a hygrometer, they will allow monitoring to be carried out over extended periods.

The logging of temperature over extended time periods is particularly useful as it can reveal when heating and cooling systems are being operated unnecessarily, when rooms are prone to overheating in sunny weather and when they cool too quickly in cold weather. These findings point the way to simple and often inexpensive remedial measures, such as fitting reflective foil on windows or installing additional thermal insulation, which can lead to big energy savings.

Instruments for measuring light levels and temperatures need little justification, but what about anemometers and hygrometers? In reality, these are also easy to justify. As we saw, the Health and Safety at Work regulations require the provision of ventilation, but prudent users of energy will want to be sure that this provision is met without wasting heat through draughts. An anemometer enables air movement to be identified and measured, which makes it easier to provide draught-free ventilation.



A hygrometer measures humidity, which is important because excessive humidity can lead to sweating and discomfort, while insufficient humidity can lead to dry, sore eyes. For these reasons, the Chartered Institution of Building Services Engineers recommends that humidity in the workplace should be maintained between **40% and 70%**. As always, the first step to achieving this is accurate measurement.

While measuring and monitoring the effectiveness of environment control systems is vital, so is measuring and monitoring the amount of energy they consume. For systems that are electrically powered, this is most easily achieved with a portable energy logger (**PEL**). These are typically installed at the distribution switchboard feeding the environmental control systems and the best types have been designed so that installation can be completed quickly and easily with a minimum of disruption to the plant fed by the switchboard.



Once in place, the **PEL** will record all major aspects of the energy supply, including not only the energy used and peak loading, but also other important parameters such as power factor, phase imbalance, harmonics, peak loading and much more. This information, when analysed, will help to show whether energy usage by the environmental control plant is in line with design expectations and it will also help to identify areas in which energy efficiency improvements could be made.

Maintaining a comfortable workplace environment is good for staff morale and productivity while maintaining efficient operation of environmental control plant is good for the bottom line.

Fortunately, it is now easier than ever to achieve these desirable objectives thanks to the availability of affordable and easy-to-use instruments for measuring and monitoring all key environmental parameters. For advice on choosing the instruments best suited to your needs, don't sweat or shiver, simply talk to the expert in the field, **Chauvin Arnoux!**



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