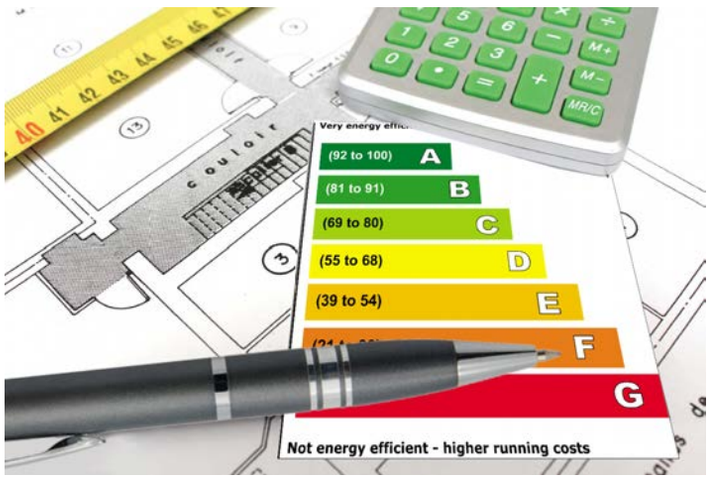
IPMVP Efficiency Verification

Reducing or optimising energy consumption is part of the sustainable development approach which many industrial countries, particularly in Europe, signed up to in the Kyoto Protocol. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. This agreement has led to gradual but constant strengthening of regulations with the aim of reducing CO2 emissions.

Julian Grant, General Manager for Chauvin Arnoux UK, looks at the current trends regarding energy saving, presents the International Performance Measurement and Verification Protocol (IPMVP), and discusses measurement solutions for checking energy performance.

The continuous rise in electricity prices in recent years illustrates a significant, widespread trend: higher energy prices in Europe are placing a growing burden on the budgets of European industrial companies. Several studies have clearly shown the recent and foreseeable upward trend of companies' electricity bills, and so there has never been a better time to look at methods for dealing with this situation.



A recent survey of European companies' energy costs has shown that, although they benefited from relatively stable energy prices throughout the 1990s, recent years, and particularly the last decade or so, have seen a change in this situation. Worldwide demand for oil, the main fossil energy source consumed, has risen steadily, and at the same time political instability in several oil-producing countries has caused the base price of fossil fuels to rise. This price rise has increased energy bills for industry, and therefore business in general, as well as consumers. Rising energy costs are now directly affecting the prices of manufactured goods, as industrial companies are rarely able to absorb them, and even then, only partially.

With higher costs now affecting profits, businesses are taking a new look at energy efficiency and many are trying to reduce the cost of utility services by upgrading their equipment or changing their operating procedures. Experts warn that, even though their intentions are good, the benefits may only be temporary unless appropriate maintenance is performed.

Although several companies' first reactions were to see whether they could buy their energy more cheaply or even produce it themselves, the best solutions to this problem, despite the cost involved, remains in overhauling their installations and adapting certain types of consumption by following simple principles which are now well known and widely implemented.

Energy Efficiency

Whatever the sector of activity, whether industrial, tertiary, infrastructure or local government, energy efficiency is becoming a major issue. The need to remain competitive, the necessity for ever increasing profits,

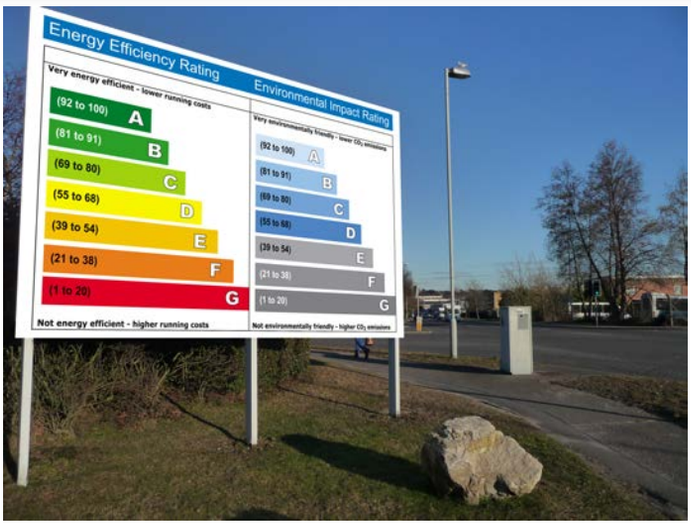
continuously rising energy prices, and the current economic constraints, all mean that reducing and/or optimising energy spending is now a major concern for everyone. In industry, for example, it has been shown that significant savings are possible with the eradication of inefficient equipment and unnecessary “out of hours” usage, and this may represent between 20 and 46% of current energy consumption, depending on the issues.

Measurement is the essential function for all energy efficiency projects in order to seek to control and optimise or reduce energy costs. Consuming less, and more efficiently, necessarily means surveying existing installations. This involves comprehensive measurement of all the parameters needed to detect potential savings and propose initial areas for improvement.

As defined in the ISO 50001 international standard, the key is to "establish, implement, maintain and improve an energy management system, whose purpose is to enable an organisation to follow a systematic approach in achieving continual improvement of energy performance, including energy efficiency, energy security, energy use and consumption. The standard aims to help organisations continually reduce their energy use, and therefore their energy costs and their greenhouse gas emissions". In the current economic climate, with energy costs expected to continue rising, taking steps to reduce energy bills is not an easy task. However, since September 2012, Europe has included the principle of significant energy consumption reductions in its official policy on energy saving. Within this it will force energy companies to invest 1.5 % of their annual energy sales revenues every year in services enabling their customers to reduce their consumption.

International Performance Measurement and Verification Protocol (IPMVP)

The IPMVP is part of an approach for controlling, optimising, or reducing energy costs by measuring technical and economic performance. The IPMVP is not a standard but a "framework document describing shared best practices for measuring, calculating, and monitoring the savings achieved in the context of energy efficiency projects". It defines the methodology for defining a standardised procedure for auditing, measurement and verification of energy performance. Internationally, it is now the most widely-used framework.



A written "Measurement and Verification Plan" will ensure repeatability of the measurement campaigns so that the results of the analysis are reliable, comparable and repeatable. This is an essential tool for any energy efficiency project and involves drafting a complete procedure, establishing the points to be checked in order to ensure that the solutions implemented are effective.

In the context of energy efficiency projects, an exhaustive approach is crucial. All the parameters which may have a significant influence on energy savings have to be measured. The measurement of a site must therefore be considered as a whole. In this way, the energy budgets can be managed precisely and the actions specified in the Measurement and Verification Plan will gain credibility. The definition of the content of the reports, and the precision of the performance measurement methodology, are crucial features for establishing the credibility of the Measurement and Verification Plan and for ensuring that it is accepted by all the people involved. The precision of the measurements, the equipment used for monitoring, and the test procedures, all contribute to assessing the gains in order to calculate the return on investment. The Measurement and Verification Plan thus encourages investors to finance the project and the data from the reference measurement campaigns must be kept for this reason.

The data used to draft the Measurement and Verification Plan must be clearly identified in a document, along with their locations and dates. This can then be used to justify the action undertaken in relation to the initial goals of the project. All these elements (parameters to be measured, reference units, data formats, type and content of the analysis, etc.) must be recorded in order to confirm the relevance of the project. There are 4 phases in the IPMVP methodology.

Phase 1: Define requirements and make measurements

It is crucial to start by producing a historical, comparative analysis of consumption. The first step in this approach involves analysing the different bills from the electricity suppliers. But these bills will only concern the total consumption of the industrial site. Alongside this, there is a need to detail the consumption and allocate it across the various electricity users connected to the installation (factory, workshop, production line, building, offices, etc.). The data must be recorded over a period which is genuinely representative of consumption on the site.

- Real-time monitoring of consumption
- Predictive maintenance, overshooting of subscribed power threshold
- Creation and printing of balance sheets, reports, graphs and summaries

Phase 2: Plan and implement solutions

On the basis of the measurements performed, an investment plan must be developed which includes suitable solutions to be implemented and, once again, measured. The proposals for improvements to the installation will then be put into practice. The most frequent measures taken involve modifying the type of lighting, changing the command systems of electric motors, replacing some electric motors with more efficient models, and switching systems off when they are not in use. These are just a few examples concerning electrical equipment, but for energy saving, all consumption (heating/cooling, compressed air, gas, etc.) is monitored and may be need to be modified.

It is important to remember that fighting waste is not the only way to achieve energy savings but should be accompanied by the implementation of the least energy-hungry solutions for any given situation.

Phase 3: Measure and verify improvements

A measurement campaign is then performed to ensure that the expected savings are genuinely achieved. This measurement of the technical and economic performance of the action undertaken should be compared directly with the initial objectives.

Phase 4: Ongoing periodic testing

Once this has been established, a procedure must be set up for periodic testing (every 6 or 12 months). The tests must be exhaustive and must measure all the components of the electrical distribution network:

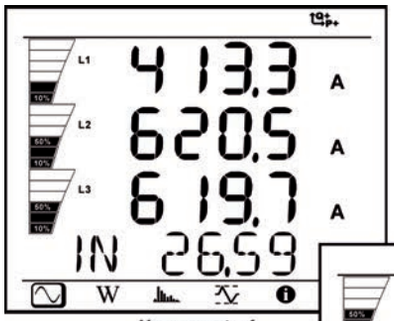
- Lighting network
- General single-phase distribution network
- Three-phase distribution network
- Distribution via uninterruptible power supplies
- Standby generator set
- Any internal electricity production

Energy Loggers

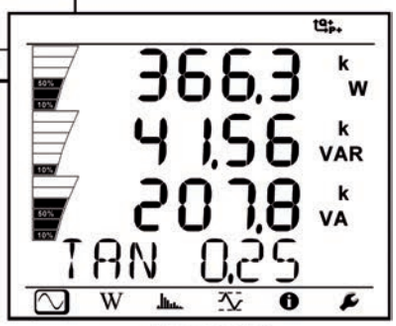
Clearly then measurement is the foundation for optimising an installations energy efficiency, supervising electrical networks, and allocating the costs fairly. Measurement is therefore a crucial component of the diagnostics, the testing, and the progress plan. It guarantees effective, long-term energy efficiency.

Driven by this need to measure and record electrical usage there are now a variety of Power and Energy Loggers available. They not only represent a response to the growing need for electricity metering, providing an easy-to-install, portable solution for professional customers, but by necessity these instruments are simple to use and allow measurement, recording and analyse all the important energy data. They are compatible with most types of networks currently in use.

Modern loggers measure on three voltage inputs and three current inputs and record the power values (in W, VAr & VA) and energy data (kWh, kVAh and kVArh). At the same time, they calculate and record the power factor, the cos , the crest factor and the frequency. They also provide information on the harmonics (THD) present on the network, depending on the selection made by the user.



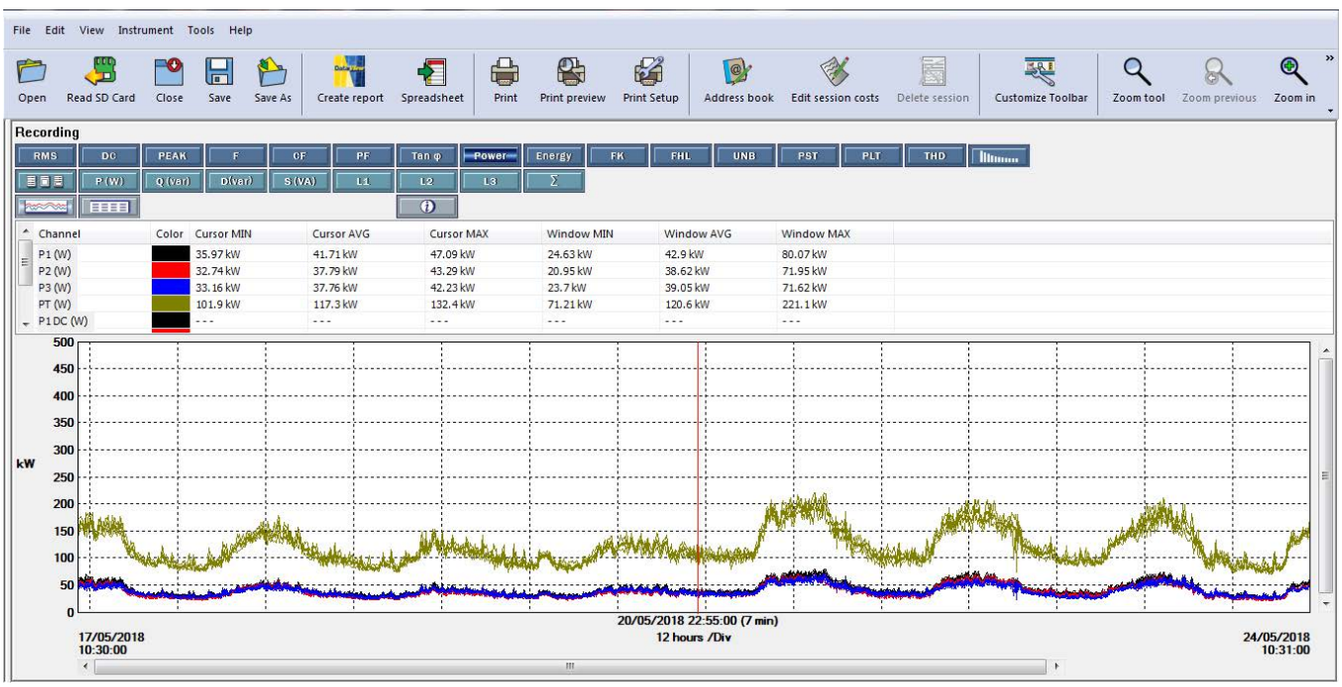
Measurements of current consumption



Measurements of power and energy

All the data is stored within the Energy Logger, preferably on a removable media like SD memory cards, but users can also recover the data via USB, Bluetooth or Ethernet connections. The choice of networked communication makes it possible to remotely contact several loggers simultaneously, that have been temporarily installed throughout the facility.

The associated software can then retrieve the data and display the required trend curves.



In conclusion, reducing or optimising energy efficiency is not only necessary for a variety of reasons, some legal and some moral, but it is also increasingly financially prudent to do so. Energy costs will continue to rise for the foreseeable future, but the knowledge, guidance and tools to achieve the necessary savings to mitigate this are all readily available.

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