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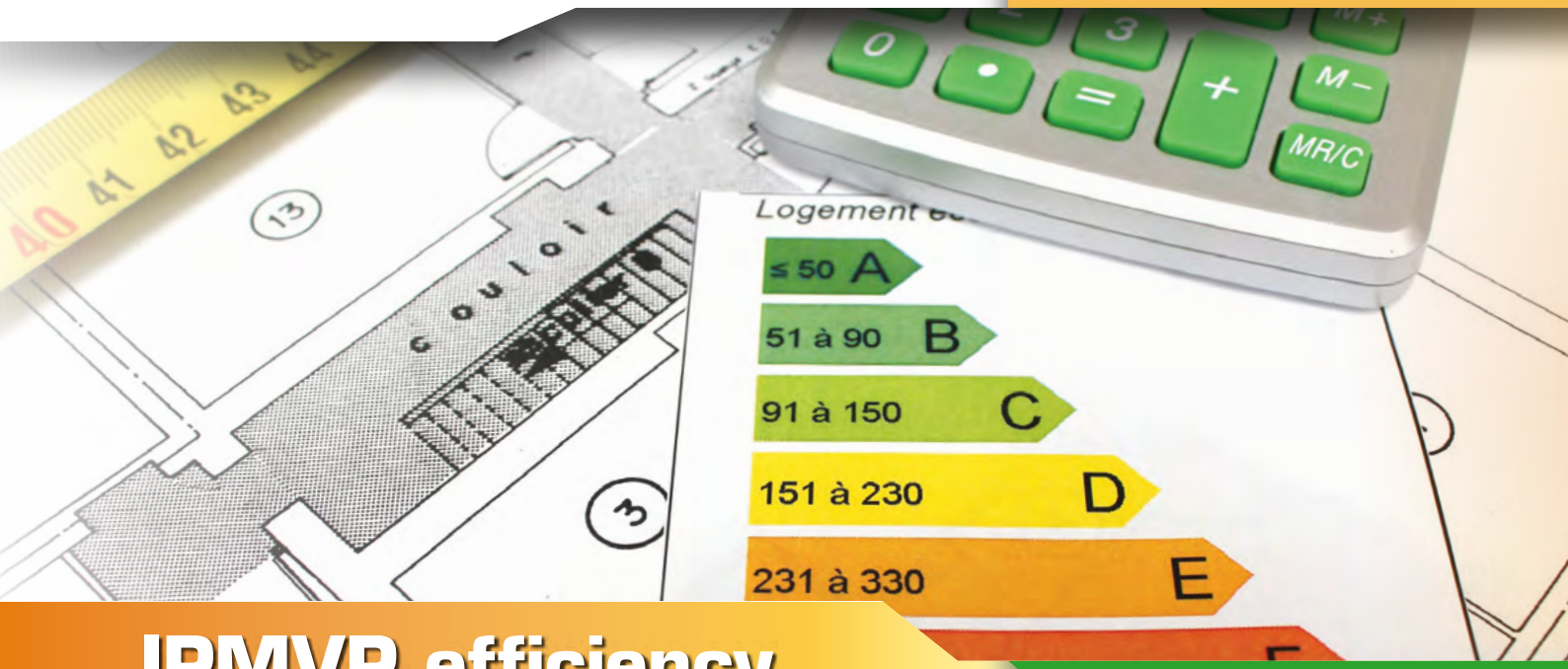
ENERGY ANALYSIS AND MANAGEMENT



IPMVP efficiency verification

This article summarizes the current context regarding energy saving, presents the International Performance Measurement and Verification Protocol (IPMVP) and discusses the new Chauvin Arnoux measurement solutions for checking energy performance.

Energy: a major concern in an increasingly restrictive context.

Reducing or optimizing energy consumption is part of the sustainable development approach which many industrial countries, particularly in Europe, signed up to in the context of the Kyoto Protocol. This agreement has led to gradual but constant strengthening of the regulations with the aim of reducing CO_2 emissions.

The continuous rise in electricity prices in the last few 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. It is time to look at methods for dealing with this situation.

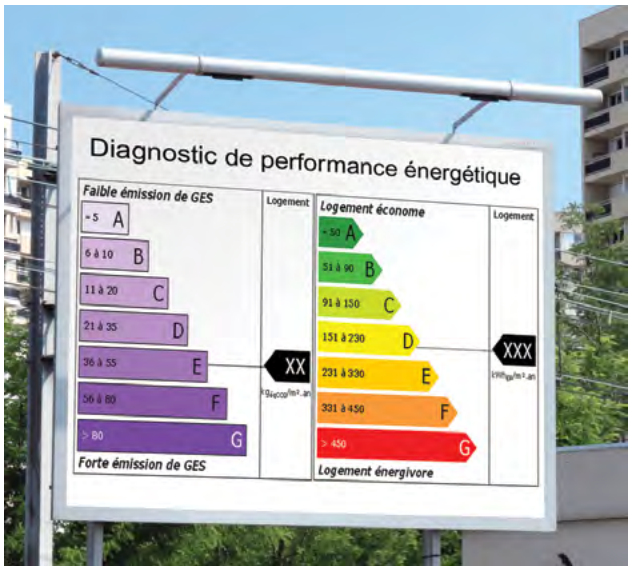
A recent survey of European companies' energy bills has shown that, although they benefited from relatively stable energy prices throughout the 1990s, the last decade has seen a change in this situation. Worldwide demand for oil, the main fossil energy source consumed, has risen steadily in the last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

With higher costs now affecting profits, industrial companies 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.

Recording

Energy efficiency

Savings



Although one of companies' first reflexes was 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, remain overhauling their installations and adapting certain types of consumption by following simple principles which are now 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, rising energy prices, the necessity of growing profits and the current economic constraints all mean that reducing and/or optimizing energy spending is now a major concern for everyone. In industry, for example, it is widely accepted that significant savings are possible and may represent up to 30 % of current energy consumption (source: ADEME).

Measurement is the essential function for all energy efficiency projects. We are seeking to control, optimize 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 orientations for improvement.

As defined in the **ISO 50001 international standard**, the key is to "monitor and measure the processes and essential characteristics of the operations which determine energy performance in the context of the energy policy and objectives, and to report the results". In the current economic crisis, with energy costs expected to continue rising, taking steps to reduce energy bills is not an easy task. But the actors already in place will soon be boosting their aid for industrial companies. Since September 2012, Europe has included the principle of significant energy consumption reductions in its official policy on energy saving. 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, optimizing 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 standardized procedure for auditing, measurement and verification of energy performance. It is now the most widely-used framework internationally.

A written **"Measurement and Verification Plan"** will ensure repeatability of the measurement campaigns so that the results of the analysis are reliable. 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. The data from the reference measurement campaigns (first or previous campaign) 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. They 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 analyses, etc.) must be recorded in order to confirm the relevance of the project. There are 4 phases in the IPMVP methodology.

Phase 1: definition of the requirements

You must 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 concern the total consumption of the industrial site. Alongside this, you need to detail the consumption and allocate it across the various electricity users connected to the installation (factory, workshop, production line, building, agency, 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
- Generation and printing of balance sheets, reports, graphs and summaries

Energy analysis and management

Phase 2

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 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.

Phase 3

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 will be compared directly with the initial objectives.

Phase 4

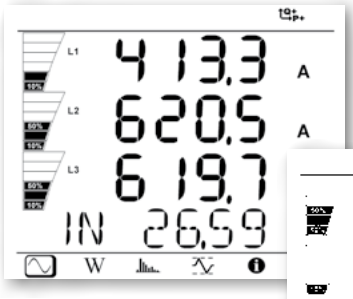
Once this has been established, a procedure must be set up for periodic testing (every 6 or 12 months). The tests must be exhaustive and must measure all the components of the electrical distribution network:

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

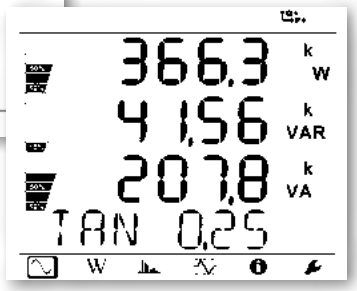
Chauvin Arnoux energy loggers

Measurement is the foundation for optimizing 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.
Drawing on more than ten years' experience in energy analysis and management, Chauvin Arnoux has strengthened its position on the energy efficiency market with the recent launch of its PEL 100 Power and Energy Loggers. They represent a response to the growing need for electricity metering, providing an easy-to-install, portable solution for professional customers. These instruments are simple to use and allow you to measure, record and analyse all the important energy data. They are compatible with most types of networks currently in use.
The PEL100 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 φ, 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.

The PEL 100 power and energy loggers are designed for monitoring buildings and electrical loads in order to improve electricity consumption.



Measurements of current consumption



Measurement of all the power and energy values with associated phase indications

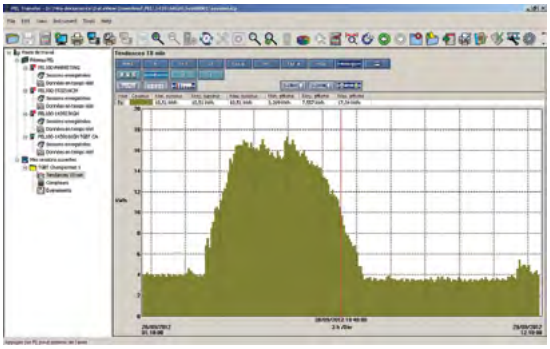
Example of implementation:

The owner of a restaurant franchise saw a reduction in his business's energy consumption from the first year after making the necessary modifications.

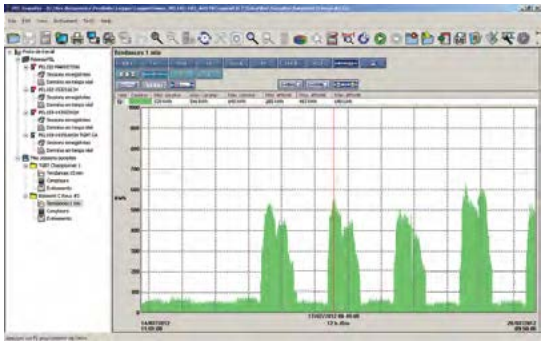
The main areas for improvement involved upgrading the lighting, refrigeration, heating, ventilation and air-conditioning. The company is still in the process of upgrading its equipment, but its electricity consumption is already 18 % lower than in the 2 previous years. And when the full plan has been implemented, the restaurant owner hopes to achieve an overall annual energy saving of 23 %, cutting € 25,000 euros off his annual electricity bill.

Energy analysis and management

All the data are stored on a removable SD memory card, but users can also recover the data via a USB, Bluetooth or Ethernet connection. The choice of networked communication makes it possible to contact several loggers simultaneously, even though they are remote from one another. The associated PEL Transfer software can then retrieve the data and display the required trend curves.



Recording of consumption in kWh over one day



Recording of consumption in kWh over one week

Chauvin Arnoux power analysers

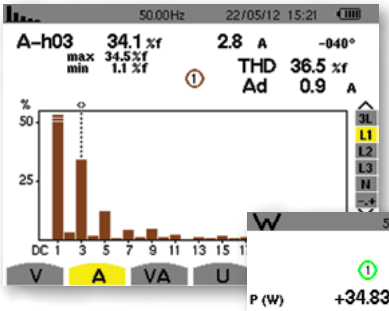
With its new functions, the QUALISTAR+ makes the job much easier for maintenance supervisors.

The QUALISTAR+ range of three-phase + neutral network analysers has recently seen the launch of a new model, the C.A 8336. This version includes calculation of DC power, distorting power and non-active power values. These last two functions involve concepts which were known in theory but are unprecedented on measuring instruments.

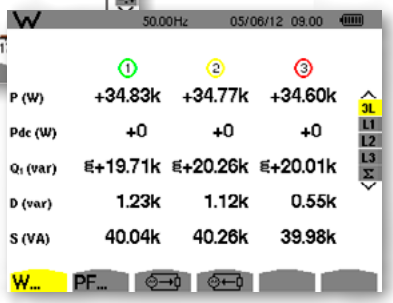
The Qualistar+ C.A 8336 power and electrical network quality analyser can be used to check your electrical network and analyse the results effectively. Ideal for testing and maintenance teams, the Qualistar models are designed for quick verifications and simple processing of the results. The instrument is equipped with a wide colour screen for clear display of the multiple electrical signals in all circumstances.

The fact that these instruments are simple to operate helps to reassure users. In addition to their power measurement and electricity metering functions, these instruments can also record a large number of other parameters such as the unbalance, flicker, harmonics data and phase difference.

With this specific mode, they can indicate whenever the alarm thresholds are overshot and can capture transients lasting only tens of microseconds. They can also provide all the recording needed for maintenance linked to the startup of loads over a period of several minutes thanks to their Inrush mode.



The distorting current (Ad) can be read directly. It is useful for sizing anti-harmonic filters.



The Q1 power measurement corresponds to the reactive power, i.e. the loss of power linked to the phase displacement. The D measurement corresponds to the distorting power, i.e. the reactive power linked to the harmonics.

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