

Achieving sustainability goals through test and measurement

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Sustainability is becoming an increasingly growing concern for the C-suite (CEOs, COOs, CFOs, etc.). A 2024 survey by consultancy firm PwC shows 58% of CEOs are already implementing strategies to develop climate-friendly products and technologies, as well as adopting policies to improve their own companies' carbon footprint.

Sustainability pressures are mounting: In the EU, for example, companies are expected to publish regular reports on the impact they make on the environment and societies. The EU's Corporate Sustainability Reporting Directive (CSRD) that came into force in 2023 is now law across the EU member states, expecting businesses to adopt more sustainable practices. Sustainability efforts are now transforming company policies and even entire industries.

Supporting sustainability

"Sustainability" is just a single word, yet it is an entire universe of regulations, demands and practices, enveloped in complexities that add to companies' tasks of juggling regulatory checklists with improved efficiencies and better profit margins – all

at lower costs. One route to reaching sustainability goals is through accurate measurement tools.

In engineering and product development, better data leads to better decisions. More accurate measurements lead to improved product performance, which in turn reduces waste, increases energy efficiencies and extends product lifespans. From optimising telecom networks and refining renewable energy systems to advancing electric transportation, precise measurement is a catalyst for lowering emissions and achieving more sustainable outcomes, not just for manufacturers, but across entire value chains.

New products and electronic systems are introduced on the market all the time, each with ever greater complexity – with a growing number of sensors, more processing power and AI-enabled functionalities. This makes analyzing their power requirements and improving their power efficiencies increasingly difficult. These needs are particularly acute during the evaluation and testing stages of product development, when systems are analyzed from the ground up – from the selection of the components to the sub-system level and then the entire system as a whole, each step

focused on delivering high-performing yet streamlined and power-efficient design.

Sustainability begins at the very start of the electronic system design process. Power analyzers and oscilloscopes play a crucial role here, used in measuring parameters such as voltage, current, power, phase, power factor, frequency, harmonics, and more. With these high-accuracy measurements, engineers can then improve system efficiencies. Transient events and distorted waveforms are easily identified with power analyzers, with oscilloscopes adding an even greater degree of insight, with visual information of the signals running through the device under test.

Improving power efficiencies

To examine and refine their designs for power efficiency, R&D engineers frequently switch between separate instruments like power analyzers and oscilloscopes – and this takes time, eating into the already short product introduction lead times. Yokogawa has an extensive lineup of test and measurement equipment for R&D across all sectors. Its instruments have been specifically designed to be linked and synchronized together, either through an optical synchronization interface or via

the IEEE 1588 protocol, and supported by a single software package. This ability creates a comprehensive measurement setup that provides a thorough, precise and fast analysis of signals and system behaviour, reducing development times. These accurate measurements then lead to improved product performance, lower energy consumption and even less waste.

Another good example where power efficiencies are important are electric vehicles (EVs); see Figure 2. Testing an EV's efficiency calls for precision measurements of the input from the battery into the motor, as well as the EV's drivetrain torque and rotation speed. Engineers examine the power characteristics in fine detail, in all operating conditions. For example, precision power analysis of high-speed EV drivetrains entails measurement of high-frequency harmonics, which are a source of losses in an inverter. Harmonic analysis leads to improved efficiencies and, ultimately, a better product.

The Yokogawa WT5000 unit performs high-frequency harmonic analysis up to the 500th order. This instrument can measure harmonics and power simultaneously, and display a comparison of the harmonics from different sources. For high-precision synchronous measurement, the Yokogawa WT5000 power analyzer can be time synchronised with the DLM Series oscilloscope via the IEEE 1588 protocol. Some Yokogawa power analyzers feature a motor evaluation function to enable measurements of motor efficiency, but also rotational speed and direction, synchronous speed, torque, slip mechanical power, electrical angle, and more.

The WT5000 power analyzer has a modular architecture, and features high isolation and high noise immunity. It is an extensible measurement platform that performs precision power analysis to aid the development of energy-efficient systems.

Correct measurements for sustainability

It's one thing to build energy efficient products, but it is another to know that measurements taken during their development are accurate and correct. That means that the T&M equipment should also be checked for any

potential deviations in measurements. Measurements can drift over time with the effects of ageing, oxidation, temperature, humidity, and other effects. To verify an instrument operates within its specified tolerance limit, it should be calibrated at regular intervals. Accredited calibration is a method for gaining quantifiable confidence in a measurement system by comparing the instrument's performance to a standard of known accuracy.

Power calibration services maintain the accuracy and repeatability of testing equipment, but also any other part of the measurement setup on the test bench, such as cables, probes, current sensors, and more. Using precise and accurate energy and power calibration services ensures that designs and instruments meet engineering and quality control requirements, but also allows them to meet regulatory needs for their application and contribute to saving energy.

Yokogawa provides an ISO/IEC 17025 accredited power calibration service, calibrating electrical power at DC and AC from 10Hz to 100kHz, thus enabling customers to prove on their ISO certificates that their measurements are correct – even when measuring distorted waveforms. The accreditation ensures that Yokogawa's calibration services are traceable to national standards, and technical competence is audited by an independent party, like the national accreditation body.

Yokogawa also offers calibration of AC energy measuring devices to 40MWh at maximum time of 1000 hours, and its calibration lab is one of the few places where instruments can be calibrated in the range of 40Hz-1kHz. This service is applicable to renewable energy projects

(photovoltaic, wind installations, etc.), end tests and type rating, but also to accurate billing of electrical energy between supplier and user, for example in the charging of electric vehicles.

Rising to environmental scrutiny

Companies today face growing environmental scrutiny that is going to get even tougher. However, many are now turning sustainability into a competitive advantage, proving that profitability is not sacrificed when focusing on sustainability. At the heart of these efforts are accurate, precise and fast instruments and tools, and at Yokogawa we continually innovate such equipment, making it even easier to meet sustainability goals. **EW**



Figure 1: Power analyzers help cut motor drive losses