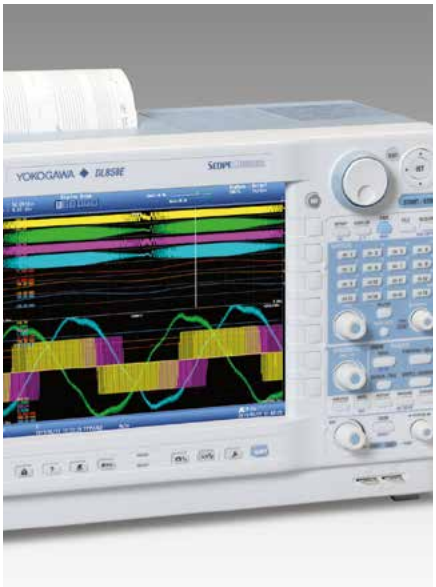

Real-time power measurement accelerates development and fault finding

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With today's increased incorporation of power electronics and switching devices in industrial and transport systems, measuring the power consumption and performance of the individual components alone is often not sufficient to understand the overall performance and behaviour of a system.

Typically engineers involved with these development or service tasks will have to use measuring instruments such as fast sampling data-acquisition recorders that can cope with a wide range of input signals, including measurements of voltage and current coming from power conditioning devices and other signals coming from sensors, controllers, rotary encoders or other inputs. Using a data-acquisition recorder provides the engineer with the ability to acquire all signals available from the device under test, and helps in analysing the system dynamics and identifying the cause of any problems.

A full analysis, however, requires the calculation of electrical power-related parameters such as active power, power factor, integrated power (consumed energy) and harmonics - which are typically calculated and analysed with software applications after the measurement is finished. This requires the data-acquisition recorder to store the measurement data on a PC or at a remote location. Based on the analysis of the data, a possible next step could be to modify the application and repeat the measurement.

Why real time?

With the increased demand for the efficient use of energy, it is becoming increasingly important to be able to control and measure the power dynamic behaviour of rotary devices, motor drives and other electromechanical processes where the electric power is not stable. For example, during the startup of an electric motor, the waveform cycle time and active power will vary for each cycle.

Potentially significant time savings in this measurement process can be achieved if the calculations of power-related parameters can be carried out in such a way that the measurement results and analysis are made available in real time: i.e. while the event is actually happening.

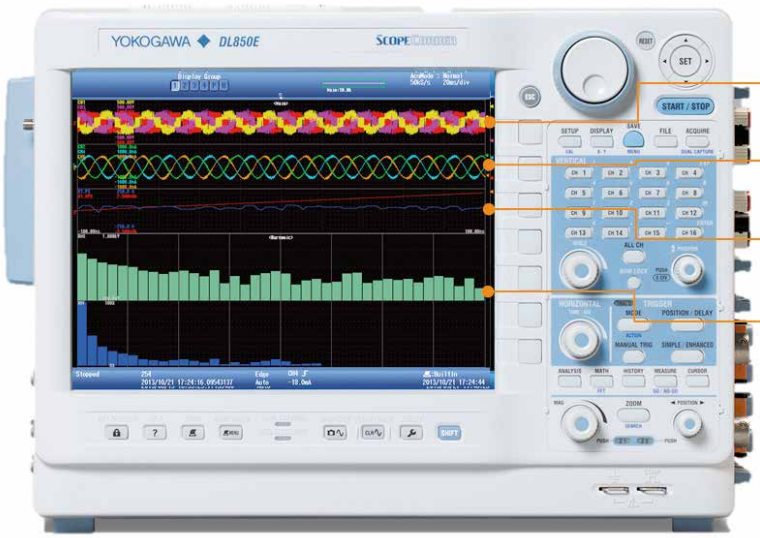
DSP provides the solution

Yokogawa Test & Measurement has developed a solution to satisfy this new measurement requirement in the form of the DL850E ScopeCorder, which can capture and analyse both transient events and trends over periods of up to 200 days. Using flexible modular inputs, it combines measurements of electrical signals and inputs from physical sensors

and CAN/LIN serial buses, and is equipped with a powerful digital signal processor (DSP) which makes the instrument able to calculate and trigger on electrical power-related calculations in real time.

The majority of industrial applications incorporate a variable-speed drive in combination with a 3-phase induction motor which generally means that more than 8 signals will have to be measured. Whereas an oscilloscope often has a limited channel count and non-isolated input channels, the DL850E can be equipped with 16 or more channels and has a diverse range of input modules, with each channel being individually isolated. The instrument offers direct input of voltages up to 1000 V, with no need for active probing, and samples data at rates up to 100 MS/s with 12- or 16-bit vertical resolution. These features are ideal for capturing variable-speed drive inverter switching signals with high precision.

A wide variety of unique acquisition features is included to handle small or large amounts of data. As a result, the DL850E can perform multi-channel measurements for longer measurement periods (up to 200 days) while still being able to precisely capture transient events with the highest detail. Being able to connect the outputs from additional torque sensors, rotary encoders or thermocouples also makes the DL850E ScopeCorder an ideal measuring instrument to enable engineers to improve the design and efficiency of motor and electric drives as well as reducing size and costs.
An additional model, the ScopeCorder DE850EV Vehicle Edition, is designed for engineers working in the automotive, railway and industrial automation industries for applications with incorporated CAN or LIN busses. It adds the ability to decode and display CAN- or LIN-bus data transmitted by the powertrain management system making it ideally suited for monitoring and analysis of actual physical data transmitted over the vehicle serial bus. This way a ScopeCorder provides a thorough insight into the dynamic behaviour of any electromechanical system and saves a considerable amount of time compared to other approaches such as analysis on a PC or the use of other software.



Example | 3Phase Measurement

Voltage Signals
3 Phase Inverter Output

Current Signals
3 Phase Inverter Output

Power Calculations
Real power & kWh Trend

Harmonic Analysis
Bargraph, Vector or List

Trigger
Trigger on Voltage, Current, Power Calculation or Harmonic content

Real-Time Measurement of Electrical Power - /G5 option

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