Yokogawa's Measuring Technologies for Energy Conservation and Environmental Preservation

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Greenhouse gases are causing global warming and dramatic climate changes. To tackle serious environmental issues, energy-saving technologies are actively being developed, and the measuring technologies to support them are increasing in importance as well. Yokogawa has a long history of high-precision electric measuring technologies, which help preserve the global environment. This paper introduces these measuring technologies and their specific applications.

INTRODUCTION

There is much concern that economic activities will increase greenhouse gas emissions and cause global warming, adversely affecting the world's climate and ecosystem. As Japan's Prime Minister Yukio Hatoyama appealed to the world, the activities to reduce greenhouse gases has become an important issue in international politics.

To tackle this problem, energy-saving efforts are being accelerated with new technologies. These include reducing the power consumption of home electronics, introducing hybrid or electric vehicles, expanding the use of alternative energies such as solar power, and implementing a smart grid network using communication network technologies to efficiently control and operate electric and alternative power sources in an integrated manner. Measuring technologies are becoming increasingly important to assist this trend.

Yokogawa has a long history of electrical and physical measurement, and its technologies and instruments have greatly helped the growth of energy-saving technologies. This paper outlines our commitment and specific applications.

ENERGY CONSERVATION AND MEASURING TECHNOLOGIES

Even in a familiar area of home electronics, technologies to reduce power consumption are seen in devices, circuit designs, structure designs and software control technologies. These technologies include improving the efficiency of power supplies and motor drives by mounting inverters, using light emitting diodes (LED) for lighting apparatus, and applying intelligent technologies to control the operation of equipment with reduced energy consumption. In the technology development process, their characteristics must be quantified, and it is important to measure the power consumption of products by power meters with guaranteed traceability.

Some examples of measurement applications contributing to developing technologies for energy conservation and manufacturing products embodying them are shown below.

EXAMPLE OF MEASUREMENT APPLICATIONS FOR ENERGY CONSERVATION TECHNOLOGIES

Assessing compliance with Lot 6 of Energy-using Products (EuP) Directive

The European Union (EU) has introduced the EuP Directive relating to environment conscious design of products. EuP Lot 6 enforced in January, 2010 requires to reduce power consumption in standby and reduce/avoid off-mode losses. The power measuring method is based on IEC62301, and the uncertainty must be less than 2%. In addition, the assessment report must include the prescribed data such as measured voltage, frequency, power value, and crest factors (peak value divided by effective value).

All our WT series digital power meters ensure high accuracy with uncertainty less than 2%, and are suitable for assessing compliance with Eup Lot 6. Especially, the WT3000 precision power analyzer with world class accuracy, basic power accuracy of ±0.06%, can accurately measure power consumption during normal operation as well as during standby defined by the EuP Directive.

Figure 1 shows the WT3000 and dedicated PC software to assess compliance with Eup Lot 6. Complex assessment procedures can be performed easily by automatically measuring items required by the EuP Directive and outputting reports of the results.

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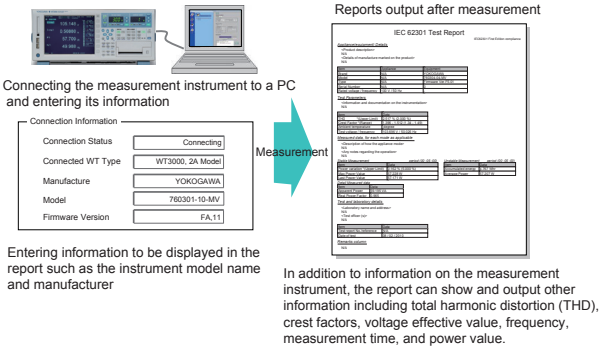

Figure 1 Example of Assessing Compliance with EuP Lot 6 by Dedicated Software

Assessing the luminous efficacy of LED lighting apparatus

LED lamps offer excellent potential to save power, consuming just 1/8 of the power of existing incandescent bulbs and yet lasting about 40 times as long. They are now attracting attention as the backlights of large LCD screens. To optimize the efficiency, it is important to identify the operation point at which the luminous efficacy is maximized in terms of luminance divided by power consumption.

Figure 2 shows an example of measurement application configured with the GS820 source measuring unit, the 765670 curve tracer software, and the 52005 color illuminometer. This system can identify the operation point of maximum efficiency by simultaneously measuring and plotting the voltage-current curve and luminance of the diode. Moreover, light control by pulse width modulation can be simultaneously assessed because the GS820 can turn on and off the output current following the programmed patterns.

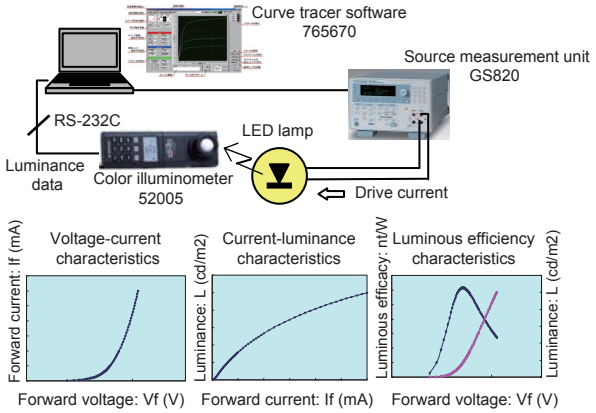

Figure 2 Assessing the Luminous Efficacy of LED Lamps

Evaluating inverter circuits

Motor drives are now used throughout society, from home electronics such as air conditioners and refrigerators, transportation means such as electric cars and rail vehicles, to elevators and machine tools. Inverter control technology is widely used in motors to save power.

Generally, power semiconductor devices such as insulated gate bipolar transistors (IGBT) are used to switch a large electric power in the motor control inverter circuit. A special measurement technology considering insulation and others is required to observe the waveform of the circuit. Specifically, while securing the insulation among channels, an oscilloscope with characteristics such as high withstand voltage, bandwidth, and common-mode rejection ratio (CMRR) in the bandwidth is needed.

Figure 3 shows an example of measuring an inverter circuit with our DL750 ScopeCorder. The DL750 with its high CMRR can accurately measure the output voltage and control signals of the inverter by using insulated probes.

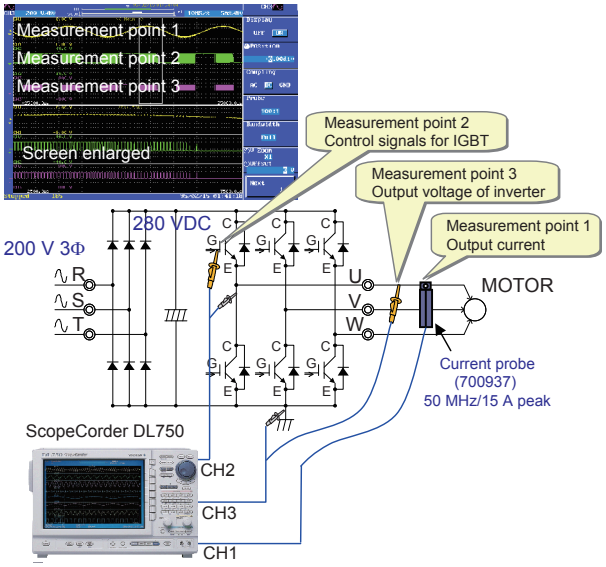

Figure 3 Example of Inverter Circuit Evaluation Test

CONCLUSION

Technology development addressing global environmental problems ranges widely in various fields and requires measuring technologies to support them in almost all the fields. Yokogawa has long-cultivated high-precision, high-speed measuring technologies. We will continue to provide them as the fundamentals supporting technology development for preserving the environment.

* ScopeCorder is a registered trademark of Yokogawa Electric Corporation.