

# Contribution of Measuring Instruments to Sustainable Society

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*Yokogawa Electric Corporation was founded in 1915 to manufacture analog meters domestically. Since then, Yokogawa has been contributing to technologies and industries by providing not only analog meters but also various high-quality measuring instruments. In the 21st century, the creation of a sustainable society has become one of the most important global issues. This paper introduces our contribution to this issue through our measuring instruments.*

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## INTRODUCTION

Yokogawa was established to manufacture electric meters in 1915 when the infrastructure for electricity supply in Japan was quite primitive and electric meters were imported. Since then, Yokogawa has been providing electric meters and other various products. They include standard instruments for electrical measurement, measuring instruments with high accuracy and reliability, insulation-resistance testers, and various field measuring instruments that are used for inspecting electric power distribution infrastructure. Yokogawa also entered the control business and has been growing, based on technologies and quality that were cultivated during the long-time development and manufacturing of electric measuring instruments. We have a common goal in both the electrical measurement business and control business: contributing to society and customers through high quality. This is our mindset that has been inherited by the Yokogawa Group since its establishment. Yokogawa's electric measuring instruments have supported the industry. This paper introduces how much our products contribute to the achievement of a sustainable society, which is a global concern, and how they are expected to evolve.

## CHANGING SOCIAL DEMAND FOR MEASURING INSTRUMENTS

The electric meter [Figure 1 (a) ] business, which was Yokogawa's core business when it was established, aimed to help the development of the electricity supply infrastructure through the implementation of power distribution panels, etc., and to obtain and accumulate electric measurement technologies. This business is still active. Electric meters are widely used in applications that require high visibility and

reliability, such as the control panels of vessels and welding machines. Since their indicating components are driven by the power of the measuring target, electric meters do not need dedicated power supplies. So they can be an ultimate eco-friendly measuring instrument.

Then, Yokogawa developed various standard instruments as the basis of electrical measurement, DC measuring instruments, portable instruments, and recorders, etc., and supported the development of the industry during different periods. As electronics and communications technologies rapidly advanced in the 1980s, R&D became active in these fields. Yokogawa entered the high-frequency measuring instrument market in 1988 to satisfy the needs of these industries and society. In those days, inverter technologies started to become widely used in trains and home appliances to control electric power. In line with the electronization of automobiles, Yokogawa's various measuring instruments including the power measuring instrument shown in Figure 1 (b) have been contributing to the development of and production in both the electronics and mechatronics industries.



(a) Meter



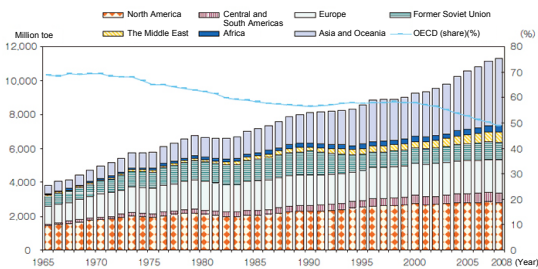
(b) Precision power analyzer

**Figure 1** Evolution of electric measuring instruments

In this century, the rapid growth of emerging countries is causing an energy crunch worldwide. As shown in Figure 2, energy consumption keeps increasing and thus awareness of global environment conservation has been rising. In these circumstances, demand from society for development and dissemination of energy-saving and energy-creating technologies is increasing more than ever.

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**Figure 2** Trend of global energy consumption  
 Note: Compiled from reference material (1).

Yokogawa’s control business is helping to protect the global environment and improve customers’ value through improving operation efficiency of plants including power generation and petrochemicals. Meanwhile, our electrical measurement business does the same by offering highly accurate and reliable measuring instruments for new energy fields such as solar power and wind power generation, for hybrid/electric vehicles with advanced inverter technologies, and for developing energy saving technologies and producing energy-saving home appliances.

**TOUGHER REQUIREMENTS FOR MEASURING INSTRUMENTS AND YOKOGAWA’S EFFORTS**

Measuring instruments are devices that indicate physical values of a measuring target as accurately as possible. As industries and technologies develop, measuring instruments are required to have more sophisticated performance, precision, and functionality. These, however, can be said to be essential elements that have not changed at all although measuring instruments are transforming into solution-oriented devices that analyze and diagnose measurements obtained.

**Leading-edge electric energy control technologies and measuring instruments**

Take the electric energy industry as an example. Solar and wind power are attracting attention and being implemented and used globally, in addition to conventional thermal and nuclear power. Power generation using renewable energies release less CO<sub>2</sub> and cause less environmental damage, so they are expected to be introduced more as technologies to help achieve a sustainable society. However, their power output is unstable. Therefore, when connecting to the existing power grid, it needs to be precisely controlled by an intelligent power conditioner that uses inverter/converter technologies so as not to influence the grid. Meanwhile, on the energy consumption side, inverter/converter technologies with the latest switching devices are used not only for drive control but also for regenerative control during slow-down in hybrid and electric vehicles.

Some energy conversion control technologies achieve a conversion efficiency of over 99% thanks to the advance of devices and control technologies. For measurement and evaluation purposes, higher accuracy, faster response and harmonic analysis capability, etc., are required from DC

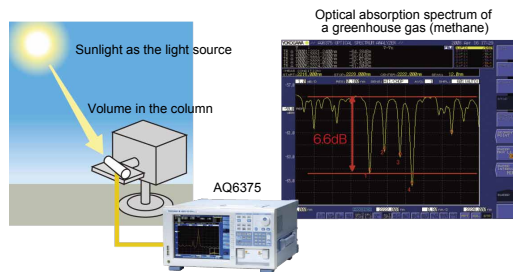
through to high frequency. Yokogawa offers power measuring instruments and waveform measuring instruments that secure safety and satisfy these severe requirements through its technologies for high insulation input circuits and digital signal processing. Thereby, Yokogawa helps the development of those latest energy conversion technologies.

In the electric energy field, SiC and other devices are beginning to be launched and switching is becoming faster and more efficient with more power capacity. Each product is required to pass conformance testing and certification of various standards such as standby power standards and quality standards for wind power generation (e.g.: IEC61400). Yokogawa will satisfy these new social demands and help society and industries.

**New usages of measuring instruments and their expansion**

Yokogawa offers optical spectrum analyzers for evaluating optical communication equipment and optical devices, as well as optical measurement instruments such as OTDR that are used in the installation and maintenance of fiber-optic communication networks.

Recently, an optical spectrum analyzer found new usage other than in optical communication: to measure greenhouse gases in the atmosphere instead of gas analyzers as shown in Figure 3. This measurement uses the steep absorption spectra of greenhouse gases such as CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, and methane. This example shows the great potential of these measuring instruments.



**Figure 3** Measuring greenhouse gases by an optical spectrum analyzer

**CONCLUSION**

This paper described only part of Yokogawa’s efforts in the electrical measurement business. Measuring instruments will surely play an important role in society. By maximizing the efficiency of electricity use, they can help achieve a sustainable society and by applying optical measurement technologies to new uses, they can help conserve the environment. Yokogawa will support the development of advanced technologies by using its core technologies and high reliability that have been consistently nurtured since its establishment.

**REFERENCE**

(1) Agency for Natural Resources and Energy, 2010 Annual Report on Energy (Japan’s “Energy White Paper 2010”), Ministry of Economy, Trade and Industry Government of Japan, pp. 197 in Japanese