



Working for Sustainability

The world has woken up to the need for building a sustainable society. Countries and companies from across the globe are working to solve global issues through shared goals such as the Sustainable Development Goals (SDGs) and the Paris Agreement.

At Yokogawa, we pursue global business based on our corporate philosophy. *As a company, our goal is to contribute to society through broad-ranging activities in the areas of measurement, control, and information. Individually, we aim to combine good citizenship with the courage to innovate.* We work together with customers in the energy, industrial materials, pharmaceuticals, foods, social infrastructure, and other industries. As we solve customer issues, we make a major contribution to a sustainable society.

In 2017, Yokogawa released a statement on its aspiration for sustainability for the year 2050. This publication provides our vision for society in 2050, as well as the path by which we resolve issues and create value on our journey forward.

Growing Trends towards Sustainability

With the advent of the Industrial Revolution, human activity has become more complex. Populations have grown, economies have developed, much of the world has globalized. This progress has brought with it a number of serious issues. Seeing these issues, the United Nations proposed the idea of sustainable development. What is sustainable development? It is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development should be achieved in its three dimensions — economic, social and environment — in a balanced and integrated manner.

Sustainable Development Goals

The Sustainable Development Goals (SDGs) consist of 17 goals and 169 targets addressing universal issues such as ending poverty and hunger, ensuring sustainable consumption and production, combating climate change, and more. These SDGs were adopted formally by the United Nations in September 2015.

Under the pledge that no one will be left behind, the SDGs are the universal goals for both advanced and emerging economies, with a heavy focus on the role played by corporations.



Paris Agreement

Adopted in December 2015, the Paris Agreement was the first-ever framework under which all signatory nations have targets for reduced greenhouse gas emissions.

The agreement aims to balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century. Specific targets include holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C.



Environmental Issues

Scientists regard the increase of greenhouse gas emissions due to fossil fuel use as one factor behind climate change. Climate change may have a grave impact on future generations ways that include increasingly severe flooding, typhoons, infectious diseases, and more.

Yokogawa Initiatives: Solutions for renewable energy; support to supply of LNG and other low-carbon energy sources



Social Issues

The more society develops, the more we become aware of issues such as food, health, gender, education, safety, and employment. Demand rises for human health and abundant living.

Yokogawa Initiatives: Solutions for life innovations in pharmaceuticals, foods, etc.; creation of safe and comfortable workplaces



Economic Issues

In 1900, the global population was 1.6 billion. By the year 2050, world population will likely top 10 billion.

Our traditional economies based on mass production, mass consumption, and mass waste threaten the water, energy, mineral, and other needs of future generations.

Yokogawa Initiatives: Solutions for stable operations, greater efficiencies, and resource recycling throughout relevant system lifecycles

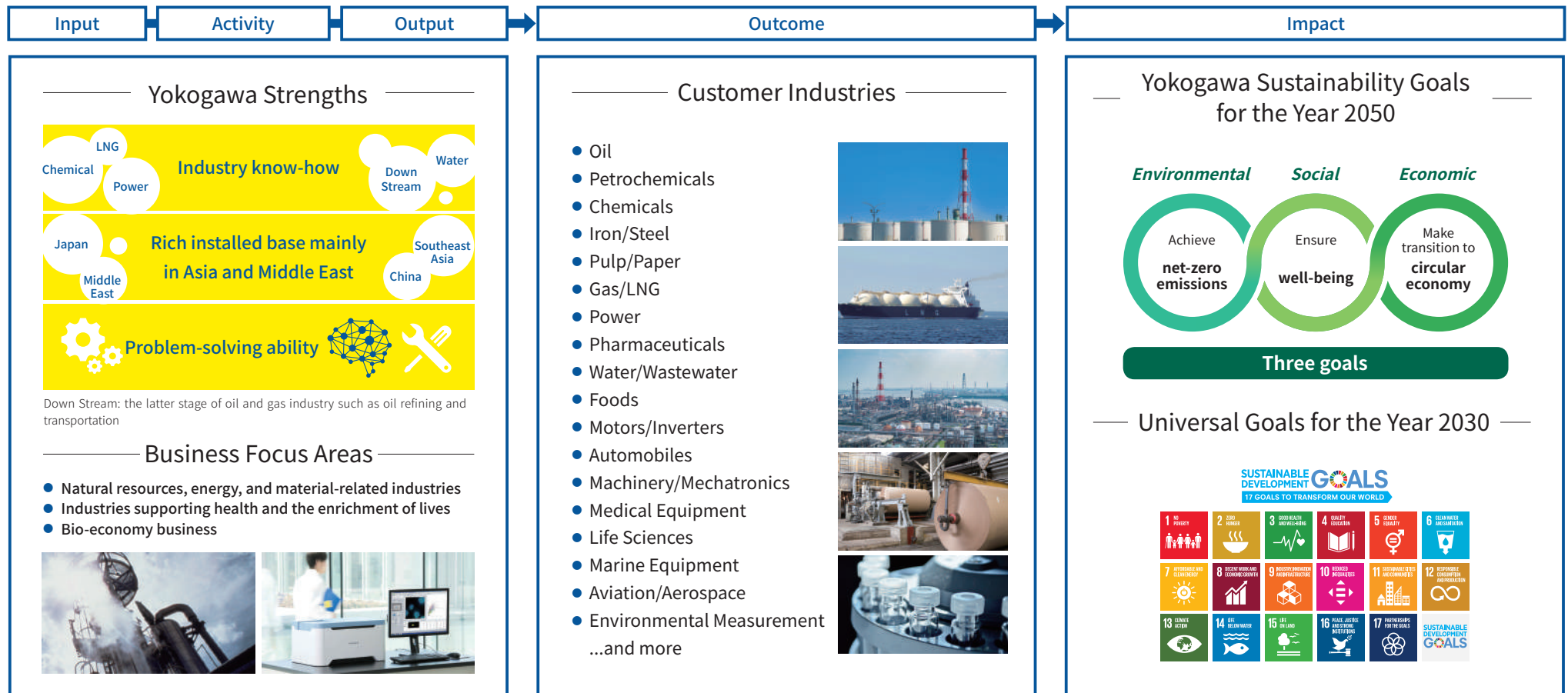
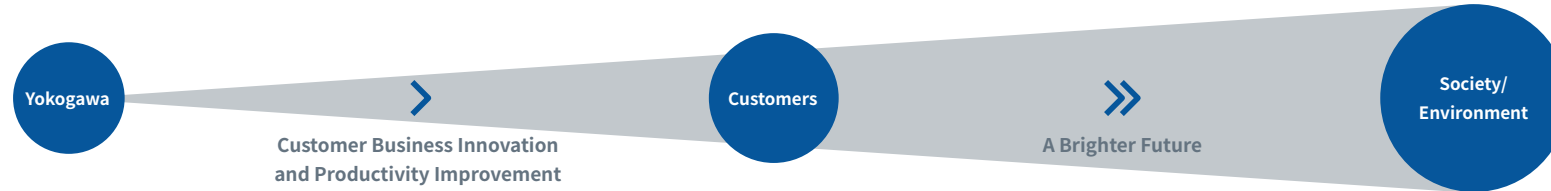


Building the Future with Our Customers

Yokogawa has contributed to solving problems for customers across a wide range of industries.

Our initiatives have done more than simply increase economic value of our customers. We have contributed to solving social and environmental issues, including energy conservation, resource conservation, greenhouse gas reduction, improved safety, and other accomplishments that fall in line with the SDGs.

We work with our customers to identify and solve problems over the entire range of their business activities as we journey to a sustainable future.



Three Goals for 2050

Yokogawa released the statement on its aspiration for sustainability and established Three goals for the year 2050, contributing to making the world a better place for future generations. These goals will help us turn our vision for society in the year 2050 into a reality.

Our Three goals cover three aspects of sustainability related to the environment, society, and the economy, namely, *net-zero emissions*, *well-being*, and *circular economy*.

Statement on Yokogawa's Aspiration for Sustainability

Yokogawa will work to achieve net-zero emissions, make a transition to a circular economy, and ensure the well-being of all by 2050, thus making the world a better place for future generations.

We will undergo the necessary transformation to achieve these goals by 1. becoming more adaptable and resilient, 2. evolving our businesses to engage in regenerative value creation, and 3. promoting co-innovation with our stakeholders.

Top Commitment

Companies have a growing responsibility to respond to issues such as population growth and the rising use of fossil fuels that are addressed in the Paris Agreement and the SDGs. Yokogawa provides solution that improve the stability, efficiency, and safety of operations at industrial plants and other infrastructure facilities by, for example, speeding up processes, reducing workloads, and saving energy.

For the achievement of the sustainability goals, Yokogawa will work harder to broaden its solutions so that it can address other issues that impact our society and continue to create new value through co-innovation with our customers and partners.

Takashi Nishijima
President and Chief Executive Officer



* Yokogawa operates under the corporate brand slogan *Co-innovating tomorrow*. *Co-innovating* conveys our determination to continually engage in the co-creation of value with our clients by working with them in long-term partnership to develop solutions.

Yokogawa Sustainability Goals Three goals



Net-zero emissions Stopping climate change

Climate change is an urgent issue that requires a united global response. Our goal is to reach net-zero emissions through the use of renewable energy and greater energy efficiency. By net-zero emissions, we mean a balance between greenhouse gas emissions and absorption, preventing an increase in the concentration of greenhouse gases in the atmosphere.

Well-being Quality life for all

Well-being means a state of physical, mental, and social contentment. Yokogawa supports people's health and prosperity through the achievement of safe and comfortable workplaces and our pursuits in such areas as the pharmaceutical and food industries. We promote diversity and inclusion, providing education, training, and employment in local communities.

Circular economy Circulation of resources and efficiency

We are seeing a movement that rejects the one-way take, make, and dispose economy. This new economy circulates resources and emphasizes services over physical products. Yokogawa aims for making a transition to a circular economy that uses resources without waste and makes effective use of assets.

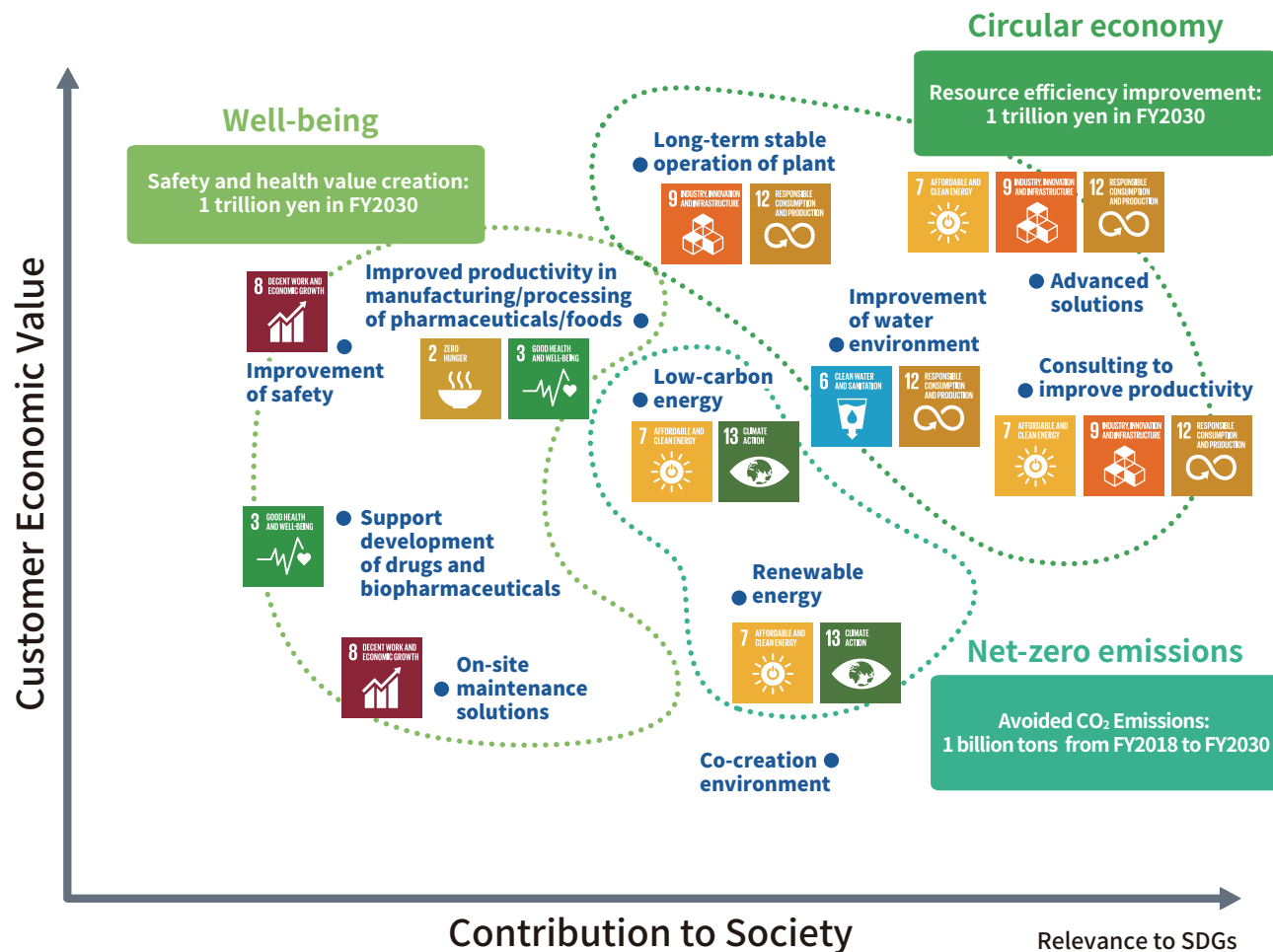
Creating Value for the Three Goals

At Yokogawa, we use narratives to help us achieve our Three goals for sustainability. Each narrative is a Value Creation Story that describes a specific process creating social and environmental value through our customers.

Each Value Creation Story has been collected and categorized into value creation themes according to value creation type from the standpoint of the Three goals and the SDGs. We have evaluated these themes on a scale of customer economic value and contribution to society (social/environmental value).

Based on our evaluations, we set three business focus areas related to Yokogawa Group initiatives and aspirational targets for the year 2030.

Business Focus Areas and Value Creation Themes

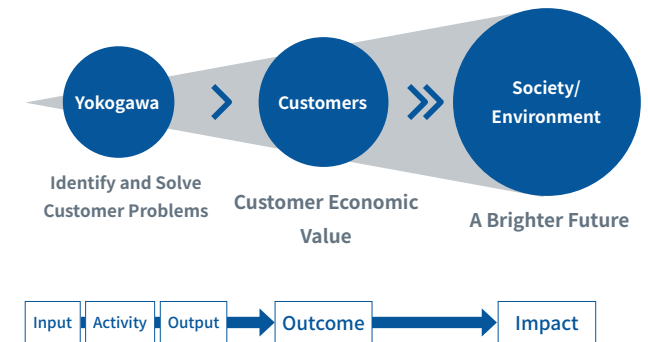


Yokogawa Value Creation Story

Yokogawa works with our customers to identify and solve problems over the entire range of their business activities, thus aiding them in their efforts to innovate and improve productivity. This activity leads ultimately to the creation of an abundant society.

This process (Input → Activity → Output → Outcome → Impact) is what we call our Value Creation Story.

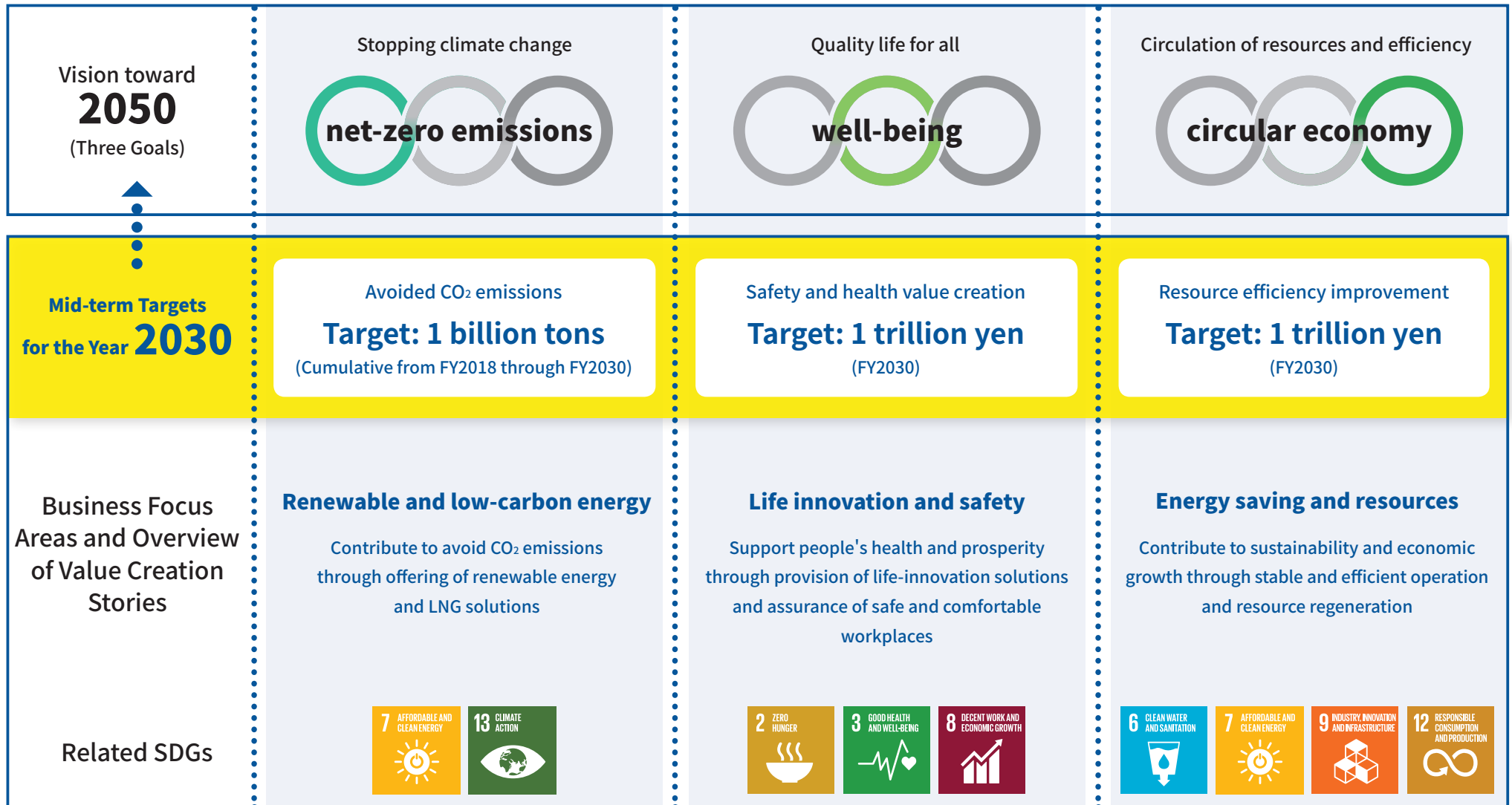
We will achieve the Three goals by expanding and building on our Value Creation Stories.



Sustainability Targets for 2030

To achieve our Three goals for the year 2050 and to play our part in realizing the SDGs, Yokogawa has defined three business focus areas and specific mid-term targets for the year 2030. These focus areas and targets address net-zero emissions, well-being, and circular economy.

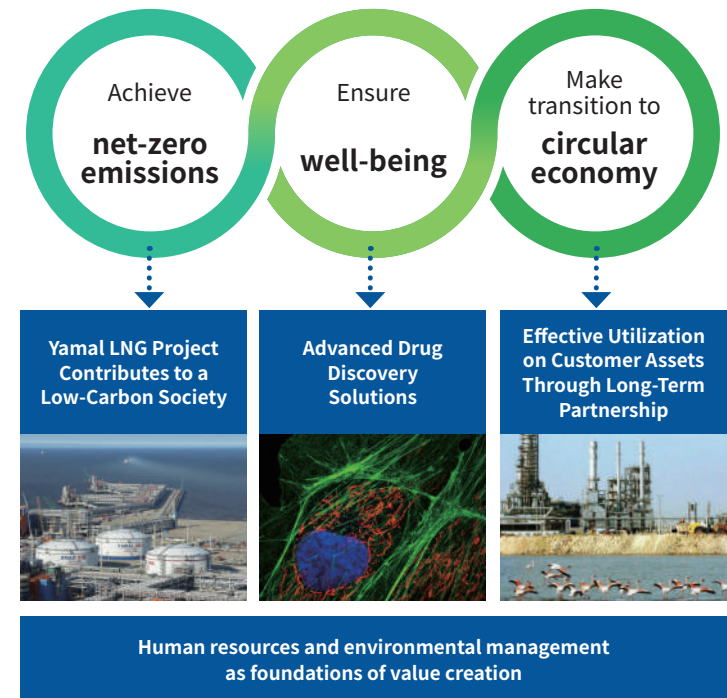
We have incorporated these targets into our business plans, to be pursued group-wide.





The Value Creation Themes and Underlying Foundations

Yokogawa is making steady progress toward a sustainable society for future generations through our work on behalf of our customers. The following section introduces value creation themes in three business focus areas with case studies, as well as efforts of human resources and environmental management initiatives in support of value creation.





Stopping Climate Change

Yokogawa pursues renewable and low-carbon energy as business focus areas through which we will achieve net-zero emissions. We have built long-term relationships of trust with customers in the energy industry based on our numerous successes in this field. We leverage these relationships to offer solutions for renewable energy and safe and highly reliable control systems for greater LNG supply chain efficiency, contributing to reduced greenhouse gas emissions.

Sustainability Target for 2030

Avoided CO₂ Emissions: 1 billion tons (FY2018-2030 cumulative)

Contribution to avoidance compared to average fossil fuel usage

Value Creation Themes

1 Renewable energy

Contribute to the growth of renewable energy through solutions for the monitoring, control, data collection, and facilities maintenance for the stable and efficient operation of wind, biomass, and other sources of renewable energy.

2 Low-carbon energy

Create a safe and efficient LNG supply chain in concert with customers and partners to respond to increasing demand for LNG, a source of low-carbon energy. Here, we will bring our wealth of experience and history of success in the natural gas and LNG instrument industry to bear.

Feature

The Yokogawa global mother factory is located at our Kofu Factory. In this factory, we utilize our own products and solutions to create visibility for facility and energy usage. Many customers visit this factory every year, seeing it as a model of plant energy efficiency.



Value Creation Theme Low-Carbon Energy

Case Study: Yamal LNG Project Contributes to a Low-Carbon Society

- Yokogawa** Set up a global project structure, provide instrument systems supporting large-scale production plants
- Customer** Conduct safe and efficient LNG plant operations in harsh conditions as low as -50° C
- Society/Environment** Transition to low-carbon by shifting away from oil and coal to natural gas which emits much lower levels of CO₂

The Yamal LNG Project is one of the largest resource development projects in Russia, located on the eastern shore of the Yamal peninsula in the arctic region of Northwest Russia. Ultimately consisting of three trains, the project will have the capacity to produce an annual total of 16.5 million tons of LNG. Recently completed, Trains 1 and 2 began shipping to worldwide destinations from December 2017 and August 2018. Our involvement in the project consists of product and system engineering, installation, testing, and operations training. Our instrument system serving as the brains and nerves of large-scale production plant includes the CENTUM® VP (integrated control system), ProSafe®-RS (safety instrumented system), Exaquantum™ (plant information management system), PRM® (integrated equipment management software package), analyzer shelter (installation and storage for analysis and sampling equipment), training simulators, and more.

We have built a structure to oversee this large-scale project, headed by our regional management company of Europe in the Netherlands and overseeing group companies located in Singapore, India, the Philippines,

Russia, and other countries. We worked toward the plant launch through the efforts of employees from many different countries. We assign resident engineering staff to perform 24/7 support for mission critical plants in operation in the Arctic. We also provide remote support from Moscow to monitor system health on an ongoing basis, contributing to the safe and efficient operation of the LNG plant. Natural gas emits much lower levels of CO₂ compared to coal, oil, or other fossil fuels. Natural gas is not only in demand for electricity production, but also enjoys increasing demand in industry and transport where electricity is difficult to use as a source of energy. By helping Asia and other regions shift to natural gas and away from oil and coal, we work together with our customers to encourage the development of a low-carbon society.



Message



It is both a privilege and a challenge to lead a major programme like YAMAL LNG. The size of the project; the extreme geographical location; and the organisational and technical complexity are challenges that we have to overcome. On the other hand, the opportunity to work and collaborate with many of our Yokogawa offices in Europe, Asia and Russia is a noteworthy experience. With the production capacity of YAMAL LNG contracted mostly to consumers in the Far East, I like to think that in some form we are able to contribute in the decades to come towards the low carbon energy transformation of Asia, and in simple terms to improve the quality of life of people in cities like Beijing, Seoul, Tokyo and hopefully Manila (where I'm originally from) – to breath cleaner air.

Marvin Nepomuceno Project Director Yokogawa Europe Solutions B.V.



Quality Life for All

We address well-being mainly through our solutions for life innovation and safety.

We have deep experience in process control, as well as a record of successful co-innovation with customers doing business in the medical facilities, food, resources, and other fields. We leverage these experiences and expertise solutions ranging from research and development to production and distribution services, facilitating safe and healthy lifestyles for all.

Sustainability Target for 2030

Safety and Health Value Creation: 1 trillion yen (FY2030)

Contribution to customer/social safety and health in the fields of life innovation and safety

Value Creation Themes

1 Improved productivity in manufacturing/processing of pharmaceuticals/foods

We leverage our technologies in measurement, control, and information, combined with our experience across a range of industries, to introduce leaps forward in production throughout the entire value chain, from basic research to logistics and services.

2 Support development of drugs and biopharmaceuticals

We support efficient development and production of highly safe pharmaceuticals through drug discovery support technologies including confocal microscopes, cell image analysis, and bioreactors.

3 Improvement of safety

We contribute to improved safety at customer plants through integrated process control and safety instrumented systems, operating training simulators, cyber security solutions, and other safety solutions.

4 On-site maintenance solutions

We provide facilities management and consulting that result in low-workload, safe and efficient plant management.

Value Creation Theme

Support Development of Drugs and Biopharmaceuticals

Case Study: Advanced Drug Discovery Solutions

Yokogawa

Support bio antibody and other leading-edge drug development and production through solutions and services

Customer

Reduce cost of drug discovery significantly and develop highly effective leading-edge pharmaceutical rapidly

Society/Environment

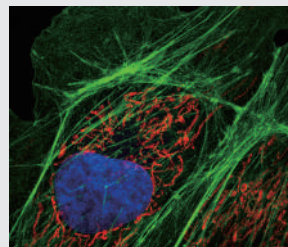
Leading-edge pharmaceuticals and treatments available more quickly to more people

The Sustainable Development Goal 3 is to “Ensure healthy lives and promote well-being for all at all ages.” This goal emphasizes the importance of research and development leading to creation of innovative drugs. Yokogawa was one of the first companies to be active in this field. The confocal microscope is one example of our contributions. This equipment has made a major contribution to explain the mechanisms behind the mysteries and illnesses of life that have been veiled for so long in basic medical and biological research and development. Today, our confocal microscopes are being used in prominent research projects in the fields of molecular biology and genetic engineering. These research projects are said to be candidates for future Nobel Prize consideration. We have created a drug discovery support system based on confocal microscope imaging technology, image processing technology, and AI technology. This system facilitates the rapid screening of the efficacy and toxicity of an enormous number of sample compounds, dramatically reducing the time and cost involved in drug discovery. Yokogawa is involved in research and development for single-cell solutions

in medical treatments. Single-cell solutions are techniques that use confocal imaging to accurately recover and analyze the constituents of a single target cell. This technology is vital for explaining the diversity and interaction mechanisms of individual cells, and is hoped to be used in simple specific diagnosis of cancer and in individual medical treatments using applications of genetic engineering. We also plan to enter the fields of biopharmaceuticals (medicines produced by cells) and regenerative medicine (using cells) in the future. We believe applications of Yokogawa measurement, control, and information technologies for cell research and development will improve the productivity of innovative biopharmaceuticals. And, by managing information across the entire value chain, we will be able to generate improvements in quality and efficiency. Many regions across the world, particularly in the emerging countries of Asia, are waiting eagerly for advanced drugs and medical treatments. Yokogawa solutions and services will play an important role in providing advanced drug and medical treatments to more people more rapidly.

Confocal Microscope Imaging

Technology for observing living cells and tissues in 3D



Message



Single-cell gene analysis is one single-cell solution that makes composite analysis of individual cell morphological information and gene expression possible for the first time.

My role is to secure technologies that provide for the stable recovery of genes from extracted cells. I am involved in equipment development and improving sample extraction equipment. At the same time, I conduct experiments in ways to recover trace amounts of genes from a single cell. We believe this technology is effective in uncovering the role of organoids^{*1} produced in cancer tissue and iPS cells, as well as other individual cells from within heterogeneous^{*2} aggregations. I hope that Yokogawa systems can be useful in people’s lives, contributing to the development of cancer treatment and regenerative medicine.

Tomoko Hirai

Bio Solution Center R&D, Life Innovation Business Headquarters, Yokogawa Electric Corporation

^{*1} Organs created in 3D in test tubes, etc. ^{*2} Mixture of different types of cells



Circulation of Resources and Efficiency

Solution and services to reduce consumption of energy and resources are a core part of our business to the ultimate goal of a circular economy. We offer digital technology consulting and advanced solutions and supply a range of long-life, environmentally-friendly products designed to ensure operational stability and efficiency throughout the system life cycle. We also aim for transformation into resource recycling business model.

Sustainability Target for 2030

Resource Efficiency Improvement: 1 trillion yen (FY2030)

Resource efficiency improvements delivered to customers through consulting and solution services

Value Creation Themes

1 Improvement of water environment

We offer water environment technologies and solutions such as leak monitoring and operational systems for water and sewerage networks that ensure the security and efficiency of water supplies while at the same time promoting effective water usage.

2 Advanced solutions

We optimize temperature, flow rate and pressure parameters in complex production processes to maximize product yields while minimizing energy and resource consumption.

3 Consulting to improve productivity

Our consulting and solution services optimize production processes to improve overall plant efficiency and operational stability.

4 Long-term stable operation of plant

We provide products and services to maintain ongoing operational stability throughout the plant life cycle, encouraging the efficient use of resources.

Value Creation Theme Long-Term Stable Operation of Plant

Case Study: Effective Utilization on Customer Assets Through Long-Term Partnership

- Yokogawa** Contribute to efficient and stable operation of plant by providing maintenance services of control system for more than 20 years
- Customer** Reduce total cost of ownership (TCO) through life cycle with effective use of large-scale plant facilities
- Society/Environment** Preventing pollution by plant operation considering the environment and providing high quality products to society

The Bahrain Petroleum Company (M/s BAPCO) is the first refinery established in the Arabian Gulf. Since its inception, BAPCO has held a sustainable goal towards health, safety and environmental commitment. BAPCO had the 1st Distributed Control System of Yokogawa supplied in 1994 and over the last 24 years, all the Process Control Systems operating in BAPCO are maintained by Yokogawa. Yokogawa is recognized as a value-added partner in BAPCO's quest for excellence towards environmental responsibilities. Yokogawa maintained BAPCO's Process Control System from 1997 to 2011 under the Annual Maintenance Contract and from 2012 onwards it has done so under Yokogawa's flagship concept of maintenance known as the Life Cycle Agreement (LCA), which will support BAPCO until 2022. As partners, BAPCO and Yokogawa have been successful in managing the large Process Control System installation with due diligence and the Life Cycle Agreement, which ensures that their equipment & instrument assets are always available, reliable, healthy and up-to-date and helps to reduce

TCO (Total Cost of Ownership). With the continuous engagement between Yokogawa and BAPCO through the Life Cycle Agreement, maintaining the Process Control System and resolving any issues related to the system have been immensely helpful in enhancing the skillset of incumbents. The proactive approach towards the joint goal of environmental responsibility has ensured that Yokogawa is accepted more as a service solution partner rather than a mere service provider. We believe that not only the recycling of resources but also diverse efforts to improve efficiency of the entire lifecycle contribute to a circular economy. Yokogawa with its systematic life cycle plan, obsolescence management and continuous engagement with BAPCO has safeguarded the Process Control System over the years and provided the path forward for upgrade and migration of the systems. BAPCO and Yokogawa aim for a sustainable future as common responsibilities to the industry and society.



Photo: Bapco Archive

Message



Yokogawa introduced the concept of a lifecycle agreement to BAPCO, listening to the pain points of the BAPCO maintenance team. Yokogawa Middle East & Africa identified concerns related to training, variable replacement costs, and performance evaluations/analyses of field instruments, providing a comprehensive proposal to BAPCO, which BAPCO management signed for multiple years. Yokogawa performed numerous modification projects and upgrades, resulting in up-to-date automation assets, improved systems efficiency, and increased stability of operations. During the delivery of lifecycle services, BAPCO contracted an additional eight Yokogawa process control systems and one safety system. BAPCO also asked Yokogawa to include these systems in the renewed contracts, as well as add mandatory lifecycle parts replacements in the lifecycle agreement renewal.

Shamik Dev Assistant Manager, Regional Service Division, Yokogawa Middle East & Africa B.S.C. (c)

Foundations of Value Creation

Yokogawa has established sustainability indicators for the following two fields as the foundations for achieving sustainability. One is human resources management to make our transformation and create new value. The other is environmental management to conserve the global environment, which is essential for the existence of our business.



Human Resources Management



At Yokogawa, we believe that human resources management is key to our growth. We have established diversity and inclusion, and talent attraction and engagement as themes. We create value through a diverse workforce equipped to adapt to ongoing change. At the same time, we drive transformation aimed at both the individual and organization. Occupational health and safety represent the bedrock of corporate management. We continue to pursue the ultimate goal of zero workplace accidents and incidents.

Sustainability Indicators

- Female ratio out of total number of managers
- Engagement survey score
- Disability employment rate (Japan)
- Frequency of occupational accidents

Value Creation Themes

1 Diversity and inclusion

Yokogawa seeks to attract, cultivate, and engage with people who bring different life experiences, skills and competencies, sensibilities, perspectives, cultures, and value systems to our organization. This is how we adapt and respond effectively to an ever-evolving industry environment, as well as to the varying demands of the marketplace.

2 Talent attraction and engagement

Our global talent management program inspires employees to create new forms of value through co-innovation. We strive to provide a safe and welcoming workplace environment that encourages every employee to be their best.

3 Elimination of occupational accidents

Occupational health and safety are important underlying elements of corporate management. We are committed to ensuring the health, well-being, and safety of all employees in the Yokogawa Group.

Environmental Management



The Yokogawa environmental management program involves ongoing evaluation of factories and offices throughout the Yokogawa Group according to three key sustainability indicators: (1) water usage efficiency; (2) energy consumption; and (3) greenhouse gas emissions. We have set a long-term greenhouse gas emissions reduction target for the year 2030 based on the 2° C target defined in the Paris Agreement.

Sustainability Indicators

- Water usage
Target: 18% reduction by FY2030 (compared to FY2013)
- Energy consumption
Target: 34% reduction by FY2030 (compared to FY2013)
- Greenhouse gas emissions
Target: 34% reduction by FY2030 (compared to FY2013)

Value Creation Themes

1 Promotion of efficient use of water resources

We promote efficient use of water resources by monitoring water usage at production facilities and encouraging recycling of water used in production.

2 Reduction of energy consumption

We are committed to reducing energy consumption via digitization of administrative procedures and processes and strategies to optimize group-wide production through greater labor productivity.

3 Reduction of greenhouse gas emissions

The Yokogawa Group is committed to reducing greenhouse gas emissions in line with the 2° C target set out in the Paris Agreement. We will accomplish this goal through strategies designed to reduce energy consumption and our active use of renewable energy sources.

Partnering in Growth with Local Communities

Yokogawa has conducted business throughout the world for many decades. We partner with local communities to support sustainable growth tailored to local conditions. Below are some examples of our education and job creation initiatives.

Kingdom of Saudi Arabia

Supporting skills development, job creation and social empowerment of women



King Fahd University of Petroleum Minerals



Engineering department of local subsidiary

We provide training and skills development programs in engineering and related fields under formal agreements with several universities in Saudi Arabia, including the King Fahd University of Petroleum Minerals. Yokogawa recruits local engineers, both male and female.

Republic of Tatarstan

Training for engineers in measurement and control systems



Kazan National Research Technological University

The Technical Center is a joint venture between Yokogawa and the Kazan National Research Technological University. This partnership provides practical training in measurement and control systems in the Republic of Tatarstan.

The program includes a simulated production plant where university students and working engineers train on the latest measurement and control systems.

Japan

Practical and theoretical training in stable operating methods for factories



Mitsui Chemicals Plant Operation Technology Training Center



Working with Mitsui Chemicals, we have developed a unique practical curriculum for training in stable plant operations. We contribute to manufacturing technology engineer development through training that includes control improvements and troubleshooting using a methanol distillation training plant and simulators.

Kingdom of Thailand

Simulated production plant for engineering student training



King Mongkut's University of Technology North Bangkok



We supply model plants and other industrial equipment on a regular basis to engineering colleges and institutes of technology in Thailand. Our donations help undergraduate engineering students receive hands-on experience in industrial automation and smart factories. Young engineers use Yokogawa products and systems for field training.



Visit the [Yokogawa website](http://www.yokogawa.com/about/sustainability/) for more details about our approach to sustainability.

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