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NEDO Project Success Stories

2023

New Energy and Industrial Technology Development Organization

Challenge for Innovation

Introduction

My name is SAITO Tamotsu, and I was appointed to the post of Chairman of the New Energy and Industrial Technology Development Organization (NEDO) in April 2023.

Following the two oil crises of the 1970s, NEDO was established in 1980 to promote the development and introduction of new energy technologies. Since then, NEDO has become one of the largest public research and development management organizations in Japan, and it works with the government to implement economic and industrial policies. In this capacity, NEDO undertakes research, development and demonstration activities to carry out the two basic missions of addressing energy and global environmental problems and enhancing industrial technology by integrating the combined efforts of industry, academia, and government.

NEDO's Fifth Five-Year Plan began in April 2023. NEDO is carrying out the plan with a focus on the three pillars of creating innovation through research and development management, fostering technology-based startups, and strengthening and accumulating technology intelligence that contributes to policy making and research and development management.

First, as a specific effort to create innovation through research and development management, NEDO is striving to enhance management functions through the project manager system and further strengthen its management capabilities. These efforts are expected to maximize research and development outcomes and allow NEDO to respond quickly to changes that occur due to innovations around the world, thus promoting practical applications by businesses. Second, in order to foster technology-based startups, NEDO has developed a system to provide consistent support from the seed phase to practical application. NEDO's activities include giving assistance to discover startups capable of bringing about innovation, thereby creating new industries. NEDO is also contributing to the establishment of a startup ecosystem through cooperation with other public organizations. Third, NEDO is strengthening and zaccumulating technology intelligence that contributes to policy making and research and development management, which will lead to the cultivation and practical use of innovation in the future. In addition to providing the evidence necessary for policy making, technology strategies utilizing Japan's competitive advantages are being formulated by anticipating innovation trends faster and more accurately than in other countries. NEDO is then planning and carrying out industry-academia-government collaborative projects.

NEDO is also implementing eight funding projects, including the Green Innovation Fund, to achieve policy goals such as revitalizing industrial technology, promoting innovation, achieving carbon neutrality, and ensuring economic security. In this manner, NEDO strives to meet greater expectations and shoulder its responsibilities to usher in a sustainable society. NEDO also remains committed to supporting the energy and environmental policies of Japan and playing a leading role in Japan's nnovation policy.

NEDO intends to enhance its role as an innovation accelerator that promotes the practical application of project results and to contribute even further to the resolution of social issues.

New Energy and Industrial Technology Development Organization
Chairman SAITO Tamotsu

NEDO's role as an innovation accelerator

New paths to commercialization.
To make technologies available in society as products and services, researchers need to overcome various challenges through repeated trial and error.

To assist in surmounting such challenges, NEDO combines the efforts of industry, academia, and government to drive progress to create innovation.

In its pursuit of achieving a sustainable society, NEDO promotes the practical application of the results of its research and development in society, thereby helping to solve social issues.

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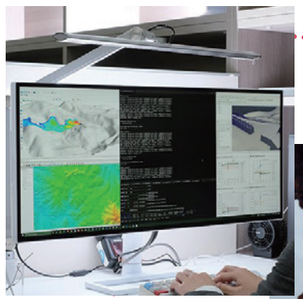
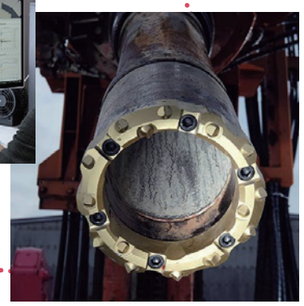
About NEDO Project Success Stories

Behind every accomplishment in NEDO's research and development projects is a story of how companies overcame daunting technical challenges to achieve commercialization.

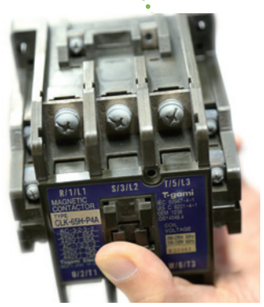
NEDO carries out a post-project evaluation after a project is completed by conducting follow-up monitoring to determine how project results have spread throughout society. Based on the products and services identified in the monitoring, interviews are conducted with related companies, and then the products and services are introduced in NEDO Project Success Stories, which are posted on NEDO's website. NEDO Project Success Stories have introduced more than 120 technology development themes since publication of such stories was started 15 years ago.

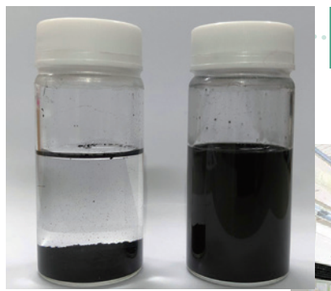


New Energy



Resolution of Global Environmental Problems





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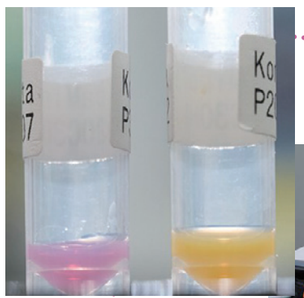
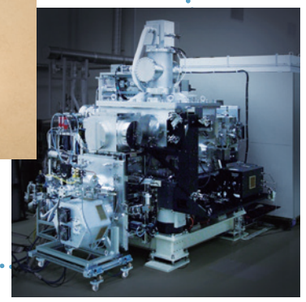


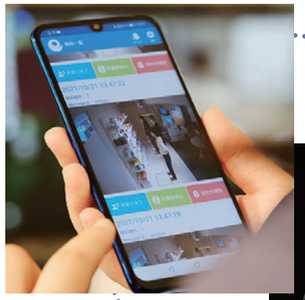
Medical Biotechnology

The results of NEDO projects contribute to a better future.

Energy Conservation

Electronic / Information





Robots / AI / Welfare Equipment

◆This brochure outlines four new success stories of technology development leading to commercialization.

Resolution of Global Environmental Problems

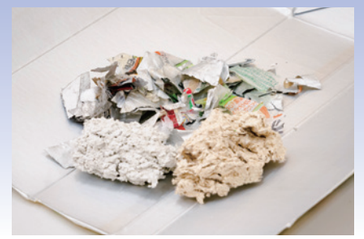
Alhytec Inc.

▶Strategic Innovation Program for Energy Conservation Technologies and others

Development of a Hydrogen Power Generation System That Enables Local Production and Local Consumption of Clean Energy

Hydrogen production system that produces hydrogen from extracted aluminum (Data provided by Alhytec Inc.)

Pulper separator that separates and recovers paper pulp and aluminum mixed with plastic from aluminum waste



Paper pulp and aluminum mixed with plastic separated and recovered by the pulper separator

Pyrolysis furnace that separates aluminum mixed with plastic into plastic and aluminum (dry-distillation-type aluminum recovery system)

Aims

Making effective use of aluminum waste that has been incinerated or buried for disposal

Challenges

Developing a system that can recover high-purity aluminum, produce hydrogen from the recovered aluminum, and use the produced hydrogen to generate power

Achievements

Alhytec Inc. has successfully developed a system that can produce approximately 5 kg of hydrogen per hour. Companies in many industries are considering the introduction of this system

Developer Profiles ▶ P.14

Comments by NEDO Personnel in Charge ▶ P.16

Using aluminum waste for power generation

The aluminum used mainly for cartons and medicinal tablet sheets is thin and cannot be recovered easily. Therefore, it has been incinerated or buried for disposal, and there has been no effective means of recycling it. To solve this challenge, Alhytec Inc. participated in NEDO's Strategic Innovation Program for Energy Conservation Technologies from FY2014 to FY2016. In this program, Alhytec worked to develop and verify an integrated system that can recover high-purity aluminum from aluminum waste, use the recovered aluminum to produce hydrogen, and use the produced hydrogen to generate electricity. Hydrogen power generation does not emit CO_2 when electricity is generated and expectations for it are rising as a next-generation energy source that can be produced from various resources. In NEDO's program, Alhytec worked to develop a dry-distillation-type aluminum recovery system (pyrolysis furnace) for separating and recovering aluminum as well as a hydrogen production system.

Commercialization through a series of improvements

There are roughly four steps in hydrogen power generation using aluminum waste: (1) separating aluminum waste into pulp and aluminum mixed with plastic by using a pulper separator, (2) dry-distilling aluminum mixed with plastic with the pyrolysis furnace to decompose the plastic and to recover aluminum; (3) reacting the aluminum with a reusable special alkaline solution in the hydrogen production system to produce high-purity hydrogen, and (4) sending the produced hydrogen to fuel cells to generate electricity. Alhytec has verified this series of processes and improved them for commercialization.

In the pyrolysis furnace, aluminum is recovered with a purity of 95% or more by reducing the deposition of carbides generated due to incomplete combustion. The amount of aluminum mixed with plastic loaded per hour was originally 10 kg but was increased to 95 kg after participation in NEDO's program. In the hydrogen production system, aluminum is mixed with a reaction solution to produce hydrogen at ordinary temperature and pressure and to recover aluminum hydroxide, which can be used as a resource. Alhytec developed an innovative reaction solution that can be reused over 100 times at ordinary temperatures. Currently, approximately 5 kg of hydrogen can be produced per hour, which can generate 71.8 kWh of electricity if this amount of hydrogen is charged into Toyota's hydrogen-powered vehicle MIRAI. This amount of electricity enables MIRAI to travel as far as approximately 900 km.

Local production and local consumption of electricity using regional garbage

Today, companies in many industries are considering the introduction of aluminum hydrogen production systems. Alhytec is recognized as an option for achieving carbon neutrality and a decarbonized society.

In FY2022, to introduce this system at a warm bath facility in Toyama Prefecture, Alhytec developed a hydrogen production plant as part of NEDO's Technology-Based Startup Support Program. Aluminum cans and swarf collected from local communities and companies in Toyama Prefecture are being used to produce hydrogen, aiming to achieve local production and local consumption of energy. Alhytec will continue to work hard to contribute to realizing a sustainable hydrogen society that conserves energy.

(Interview: August 2022)

Steps in hydrogen power generation using aluminum waste

(1) With a pulper separator, aluminum waste is separated into pulp and aluminum mixed with plastic.

(2) Aluminum is extracted with a pyrolysis furnace.

(3) Hydrogen is produced from the aluminum.

(4) Power generation

Electronic/ Information

Sharp Display Technology Corporation
National Institute of Advanced Industrial Science and Technology

▶ Clean Device Society Promotion Program

Commercialization of a Transparent Display That Adds a New Function to Window Glass

A transparent display exhibited at the Sharp Museum (Tenri City, Nara Prefecture). Left: Transparent mode. Right: Color mode.

A transparent display installed on the fall prevention barrier at Tokyo Metro Toyosu Station. Left: Transparent mode. Right: Color mode. (Data provided by Sharp Display Technology Corporation)

A transparent display installed on the window glass of the driver's cab door on a Saitama New Urban Transit train. Left: Transparent mode. Right: Color mode. (Data provided by Sharp Display Technology Corporation)

Aims
Developing use cases for the newly developed transparent display

Challenges
Collecting data and standardizing the characteristic evaluation method through social demonstration experiments

Achievements
The measurement method of the newly developed transparent display has been registered as an ISO technical report and the display has been commercialized and used in the amusement industry

Developer Profiles ▶ P.14

Comments by NEDO Personnel in Charge ▶ P.16

Birth of the transparent display

In the process of studying the mechanisms for high-speed liquid crystal operation, Sharp Display Technology Corporation (formerly part of Sharp Corporation) came up with the idea of developing a transparent display, through which the background can be seen.

A challenge to be solved in developing a transparent liquid crystal display is the presence of the color filter, which takes specific colors from a white light source, and the backlight, which is installed as a light source at the back of the display. These needed to be eliminated, so a field sequential system was developed, which quickly changes and displays the light source color (RGB) without using a color filter. In addition, the backlight was installed on the lateral side of the display to pass light to the front. This resulted in a transparent display that has a light transmission rate about four times higher than the conventional color filter system and provides better color representation.

Exploration of use cases in a NEDO project

Sharp Display Technology successfully developed a transparent display, but a major hurdle to commercialization remained. At exhibitions and presentations made while visiting companies, the newly developed transparent display was well-received for its novelty as a device, but Sharp Display Technology could not clearly explain how it should be used for specific applications, inhibiting commercialization. Therefore, Sharp Display Technology joined NEDO's Clean Device Society Promotion Program, which was carried out from FY2015 to FY2016, and conducted social demonstration experiments as well as standardizing the characteristic evaluation method to popularize the device.

From demonstration experiments to standardization and productization

Sharp Display Technology conducted demonstration experiments at three railway facilities. The transparent display was installed (1) on a fall prevention barrier on the platform of Tokyo Metro Toyosu Station, (2) on the drivers' cab door windows of Saitama New Urban Transit trains, and (3) on the windows of a train running on a test track owned by Mitsubishi Heavy Industries, Ltd., in order to collect opinions from ordinary passengers regarding, for example, how the image and device itself are affected by ambient conditions, such as outside light.

Sharp Display Technology then worked with the National Institute of Advanced Industrial Science and Technology to standardize the method for evaluating the characteristics of transparent displays by utilizing the data obtained from the demonstration experiments. Reproducing the ambient brightness in a laboratory, the ergonomic performance was evaluated by 20 test subjects. Strongly backed by this data, the measurement method of transparent displays was registered as an ISO technical report in March 2017, helping to support commercialization.

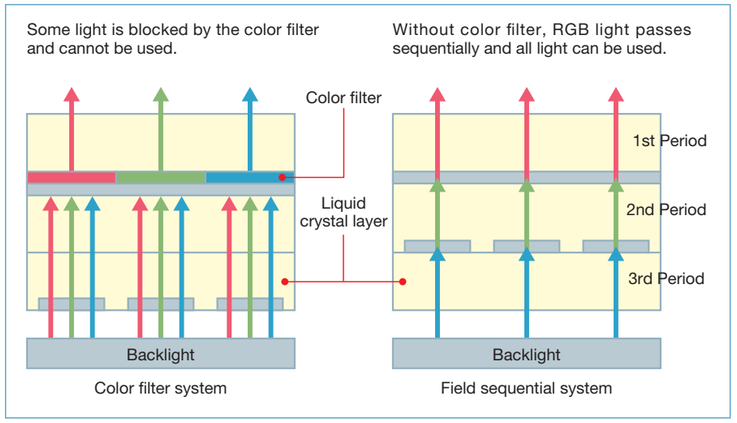
Adoption of the transparent display in the amusement industry

Even after this project ended, Sharp Display Technology continued to improve the transparent display and finally achieved commercialization. The transparent display is already in use in the amusement industry, where it has established a good reputation as a remarkable device.

However, to expand the market, Sharp Display Technology still needs to solve challenges such as cost and size. For further development, its engineers will continue to move forward with their belief in the potential of transparent displays.

(Interview: August 2022)

▶ Differences between the color filter system and the field sequential system



The transparent display was installed on the windows of trains running on a test track owned by Mitsubishi Heavy Industries, Ltd. In this verification, a non-transparent film was hung to verify the case in which a transparent display is used on smoked glass. (Data provided by Sharp Display Technology Corporation)

Energy Conservation

Mitsubishi Heavy Industries, Ltd.

▶Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation and others

Leading the World in Commercialization of 1700°C-Class Gas Turbines for Next-Generation Thermal Power Generation

M501 JAC/M701 JAC Gas Turbine (Photo provided by Mitsubishi Heavy Industries, Ltd.)

Takasago Machinery Works of Mitsubishi Heavy Industries, Ltd. (Photo provided by Mitsubishi Heavy Industries, Ltd.)

T-point 2, combined cycle power plant at Takasago Machinery Works, which is in operation (Photo provided by Mitsubishi Heavy Industries, Ltd.)

Aims

Test environmentally friendly, high-efficiency, high-power gas turbines

Challenges

Develop 13 elemental technologies for higher-temperature gas turbines

Achievements

Successfully commercialized the world's first 1700°C-class gas turbine and won the world's top market share

Developer Profiles ▶ P.15

Comments by NEDO Personnel in Charge ▶ P.17

Toward realizing next-generation thermal power generation

As a global warming countermeasure, including efforts for carbon neutrality, and to address increasing demand for power generation, it is necessary to commercialize high-efficiency next-generation thermal power generation technologies that reduce CO_2 emissions and enable the use of various fuels.

Because the development of gas turbines, which plays a key role in thermal power generation, is extremely costly, it is essential to continue to work on it as a national project.Mitsubishi Heavy Industries participated in projects led by the Ministry of Economy, Trade and Industry and NEDO to develop a high-efficiency, high-power, 1700°C-class gas turbine.

Development of 13 elemental technologies

Gas turbines have higher thermal efficiency at higher temperatures, but increasing a gas turbine's temperature is not easy. Doing so requires not only developing heat-resistant materials but also improving all components. In a NEDO project entitled Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation, Mitsubishi Heavy Industries developed 13 elemental technologies in the fields of reliability enhancement, performance enhancement, advanced design, advanced manufacturing, and verification and inspection technologies.

This development was conducted with various perspectives being considered, including improving high-temperature parts (e.g., turbine blade profiles and coatings) and adopting acoustic dampers to suppress combustion instabilities. In the field of manufacturing technologies, casting simulation technology and advanced laser welding technology were developed. In addition, advanced manufacturing technologies, such as metal additive manufacturing technology (3D printing technology), were adopted.

Takasago area, which is a development base of Mitsubishi Heavy Industries, greatly contributed to the realization of these technologies. It is the only environment in the world where all processes from R&D to design, manufacturing, and verification can be conducted on the same site.

Achieved world's top market share

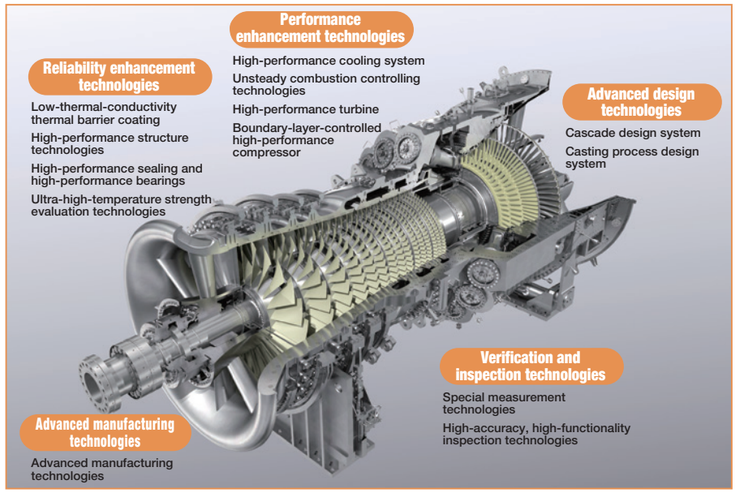
The developed gas turbine has the world's highest turbine inlet temperature of 1650°C*, achieving a thermal efficiency of 64%. In July 2020, Mitsubishi Heavy Industries successfully commercialized this gas turbine as the M501 JAC/M701 JAC Gas Turbine. It boasts of 840 MW of power output for the 50 Hz region as the combined cycle power plant with steam turbine power generation using waste heat. This amount of electricity covers about 2 million households. Also, this gas turbine can reduce CO_2 emissions by 65% compared to coal-fired thermal power generation, and its stable operation led to an increase in orders not only from inside Japan but from all over the world, including Thailand, the U.S., Canada, and Uzbekistan. In 2022, Mitsubishi Heavy Industries achieved the highest market share globally, followed by Siemens and GE (among OEMs in all capacity ranges).

Based on the achievements of this development, in another NEDO project, Mitsubishi Heavy Industries is working on next-generation thermal power generation technologies that use hydrogen and ammonia fuels to achieve zero emissions. With a view to realizing a carbon-neutral society, NEDO and Mitsubishi Heavy Industries will continue working to promote the introduction of next-generation thermal power generation while adopting new technologies.

(Interview: August 2022)

*At the demonstration power generation facility, verification is underway at 1650°C by using the 1700°C-class gas turbine as the test model.

13 elemental technologies developed for commercialization of the 1700°C-class gas turbine



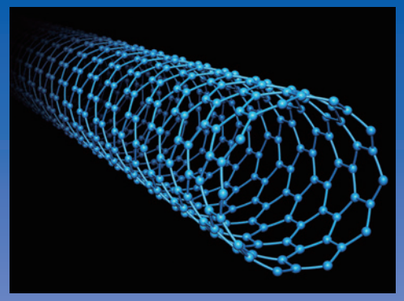
Material

GSI Creos Corporation

▶ Project for Practical Application of Carbon Nanomaterials for a Low Carbon Emission Society

Ultra-High Dispersion Mass Production Eliminates the Biggest Obstacle, “Aggregates”, to Utilize Carbon Nanotubes

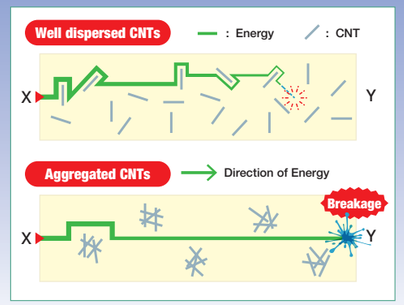
Right: CNTs having disentanglement and dispersion treatment. Left: CNTs with no disentanglement and dispersion treatment. Differences in sedimentation are evident. (Data provided by GSI Creos Corporation)



Molecular structure of Single-Wall Carbon Nanotubes (SWCNTs) (Data provided by the National Institute of Advanced Industrial Science and Technology)

Mitsubishi Electric’s in-vehicle speaker, DIATONE DS-G400 (Data provided by Mitsubishi Electric Corporation)

Schematics showing energy attenuation by degree of dispersion of CNTs in composite material



Aims

Elimination of aggregates that prevent CNTs from performing their inherent properties

Challenges

Development of CNT disentanglement and dispersion technologies that can be mass production

Achievements

CNTs applied in various products, such as coating materials, batteries, and speakers

Developer Profiles ▶ P.15

Comments by NEDO Personnel in Charge ▶ P.17

Aiming to resolve weaknesses in a “dream material”

Carbon nanotubes (CNTs) are regarded as “dream material” because they are highly electrically and thermally conductive, lighter than aluminum, and have far higher tensile strength than steel. CNTs are mainly used as additives to enhance the functionality of the base materials, such as resins. However, CNTs tend to aggregate easily, which prevents them from fully performing their inherently excellent properties. GSI Creos has developed mass production technology to disentangle and disperse aggregated CNTs supported by NEDO’s “Project for Practical Application of Carbon Nanomaterials for a Low Carbon Emission Society”, which was carried out from FY2014 to FY2016.

Highly dispersed CNTs show the intrinsic performance of CNTs

When CNTs are mixed with a base material, the behavior of externally applied energy differs greatly between the dispersed and aggregated states of CNTs. If the CNTs are well dispersed, the CNTs act as “obstacles” to attenuate the energy, but if the CNTs are aggregated, there is a higher probability that the energy will penetrate and crack the object before the energy is fully attenuated.

To solve this problem, GSI Creos first decided not to use chemicals such as surfactants, which are “foreign” to the base material, and then tried various methods, finally choosing the method of dispersing CNTs by adding energy. However, this method had the problem that the CNTs would “break off” and become shorter, making it difficult to reinforce the base material. GSI Creos developed disentanglement and dispersing technique that did not affect the length of the CNTs by devising a way to apply energy. Observation with an electron microscope confirmed that there was almost no change in the length of the CNTs while the aggregates were well disentangled.

Adoption in various products

GSI Creos' CNTs have already been used in many products. Nanotect®, a coating that greatly improves the strength and durability of the coating film, can be applied to bolts and other objects to protect them from rust and corrosion, and is effective in harsh environments because the toughening of the coating film makes it difficult to break or delamination.

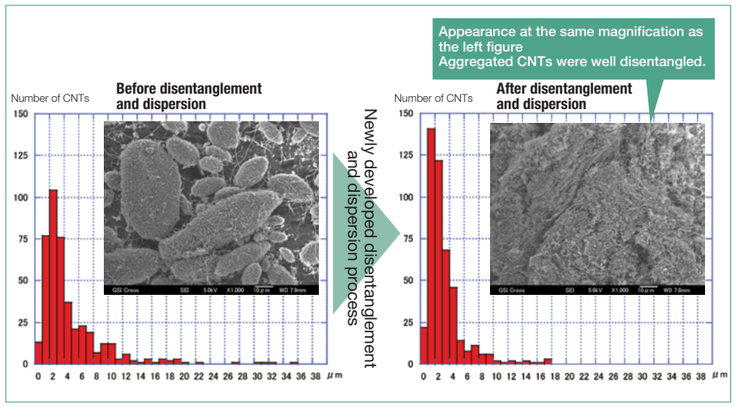
Also, Mitsubishi Electric's in-vehicle speaker, which CNTs are dispersed, developed by GSI Creos into the diaphragm, achieves ideal sound quality with increased speed of sound transmission and less reverberation. This speaker system received the highest award as speakers in the Auto Sound Web Grand Prix 2021.

This NEDO project has supported to a solution to the problem of CNT aggregation that we have been facing for many years. When research and development on CNTs continues to achieve CNT as "the super materials", it could be the "catalyst" for a complete change in our lives in the coming near future.

(Interview: September 2022 to January 2023)

Bolts and springs coated by Nanotect®
(Data provided by GSI Creos Corporation)

Length and number of CNTs before (left) and after (right) the disentanglement and dispersion treatment, and images by electron micrographs.



Developer Profiles

Thoughts of Developers Who Dared to Innovate

Face

Resolution of Global Environmental Problems

Development of a Hydrogen Power Generation System That Enables Local Production and Local Consumption of Clean Energy

Alhytec Inc.

MIZUKI Nobuaki, who had previously worked in the general affairs department and sales department, transitioned to a very different field, the environment business. He thought that as president, he must have a technical background to promote commercialization, so he decided to earn a doctorate.

“At the Graduate School of the University of Toyama, I wrote a doctoral thesis. It was tough because the style used in theses is quite different from that used in regular documents. I continued writing the thesis while working and finally obtained a doctorate the day after my 61st birthday,” reflected Mizuki.

By studying for a doctorate, Mizuki reaffirmed the importance of learning about the environment. He spends his holidays conducting educational activities, such as visiting elementary and junior high schools as well as communities to give lectures in order to raise interest in environmental and energy issues within the region.

“I imagine a future hydrogen energy society in which cars run using household garbage directly as fuel, like the DeLorean in the movie Back to the Future. By telling such a fantastic story when lecturing at schools and in communities, I hope to encourage more people to share in our vision,” he continued.

ASO Yoshiyuki, Manager of the Product Development & Assurance Management Office, said, “I did not know a lot about aluminum or hydrogen, but I enjoy working on things related to the environment because I was interested in doing so since before I joined the company.”

He explained his motivation by saying, “Alhytec is a venture company and does not have many employees, so each of us has many different jobs to do. We are very busy, but we can feel that we are producing something that will change society, sharing an ethos of ‘Do whatever is interesting.’ I’m very happy to be involved in it.”

“I got a doctorate to support the project.”

MIZUKI Nobuaki, Ph.D.
President & CEO

“We can make the most of every experience. This is the joy of working for a venture company.”

ASO Yoshiyuki
General Manager
Engineering Department
Product Development & Guarantee Management Office

“The challenges in our lives are accompanied by ups and downs.”

YURI Masanori
General Manager
Gas Turbine Engineering Department
GTCC Business Division
Energy Transition & Power Headquarters, Energy Systems

“Create an environment where researchers and engineers can have face-to-face discussions.”

ISHIZAKA Koichi, Ph.D.
Chief Engineer
General Manager and Regional Representative
(Takasago & Hiroshima)
Research & Innovation Center

We made it!

Electronic/Information

Commercialization of a Transparent Display That Adds a New Function to Window Glass

Sharp Display Technology Corporation/ National Institute of Advanced Industrial Science and Technology

HANAOKA Kazutaka directed the entire team for developing transparent displays from 2012 and led this project.

Asked where he gets his ideas, Hanaoka replied, “Sometimes, ideas come to me suddenly when I’m thinking about how I can make something easier and what I should do. I believe I need to dare to look at something other than displays that inspires me or to give up and forget every idea I’ve ever had when I’m out of ideas.”

SASAKI Takahiro was an adult student around 2012. “At that time, the high-speed response system had an image sticking problem. Honestly, when I was assigned to the transparent display development team, my first thought was what an awful team to be assigned to because the team was considering adopting the high-speed response system. I’m extremely delighted that we’ve developed something unique and unprecedented and made some accomplishments as a development department,” he reflected.

SHIMADA Shinji said, “I’m now working to develop new transparent displays. I think I have basic knowledge because I used to work in a laboratory. I may have been there a little too long.” He continued, “I’m very happy when something that has never been used before comes to market. I originally had this idea, and now I have made it happen, which is a big thing for me.” In the future, he is expected to solve more challenges and commercialize new products.

HOSHINO Satoshi, who was in charge of evaluation, commented, “I really felt that it is important but very difficult to think of what use cases we should consider to popularize this new device because they depend greatly on what people think of and what level they are at.”

“Think about how we can make something easier, and then the ideas come.”

HANAOKA Kazutaka
Former Manager
Development Division I
Next Generation Technology Development Unit
Development Group
Sharp Display Technology Corporation

“Honestly, my first thought was what an awful team to be assigned to.”

Dr. SASAKI Takahiro
Researcher
Development Division I
Next Generation Technology Development Unit
Development Group
Sharp Display Technology Corporation

“What is important to me is that we have made the fantasy a reality.”

SHIMADA Shinji
Research Director
Development Division I
Next Generation Technology Development Unit
Development Group &
Promotion Division I New Business Promotion Unit
Sharp Display Technology Corporation

“Commercialization is not possible without realistic use cases.”

Dr. HOSHINO Satoshi
Senior Researcher
Research Institute for Advanced Electronics and Photonics
National Institute of Advanced Industrial Science and Technology (AIST)

“Team unity through tough experiments”

ANZO Akiko
Nanotechnology Development Dept.

“Ten years from now, CNT could possibly bring about a tremendously wonderful world!”

Dr. YANAGISAWA Takashi
Executive Officer
General Manager
Nanotechnology Development Dept.

“The NEDO project was the first project for me after joining the company.”

TOYAMA Ayumu
Nanotechnology Development Dept.

“I moved into this nano-carbon science from a very different field.”

ISHII Nobuyuki
Nanotechnology Development Dept.

Energy Conservation

Leading the World in Commercialization of 1700°C-Class Gas Turbines for Next-Generation Thermal Power Generation

Mitsubishi Heavy Industries, Ltd.

“I think that in a sense, gas turbines are the ultimate integrated product,” said YURI Masanori. “Gas turbines consist of tens of thousands of parts and do not work properly as a machine without a well-balanced combination of elements, such as combustors and compressors. The development team members are always aware of the importance of such coordination, which may lead to our development being more efficient than expected,” he continued.

“Nowadays, I’m working with the plant engineering, sales, service, and other departments to optimize our gas turbines for GTCC power generation, and I have been involved in the development of gas turbines as a leader coordinating the entire gas turbine project. One of my main motivations so far is that I can contribute to society through this job, and it is very challenging as an engineer. There are few opportunities to make something as large as gas turbines. My hobby is hill climbing by cycle. Development is accompanied by ups and downs like hill climbing, which may be why it is attractive to me and keeps me in my current position.”

ISHIZAKA Koichi specialized in fluid dynamics simulation while in university and obtained a doctorate. He then joined Mitsubishi Heavy Industries, Ltd. and worked at the Research and Innovation Center, which is located adjacent to Takasago Machinery Works. Until 2020, his primary task was to coordinate elemental research for the 1700°C-class gas turbine.

“My work there was to create an environment for researchers to talk face-to-face with engineers in order to coordinate development in terms of both the research and the product aspects. One of the most unforgettable research projects was a simulation conducted from 2016 to 2018 to reduce rotating stall. We experienced considerable difficulties in preventing flashbacks in combustor, but we worked together with other team members and finally identified the problem. The simulation technologies developed at that time has been applied to the development of current gas turbines,” he explained.

Material

Ultra-High Dispersion Mass Production Eliminates the Biggest Obstacle, “Aggregates”, to Utilize Carbon Nanotubes

GSI Creos Corporation

YANAGISAWA Takashi began research and development of CNTs over 20 years ago. He was inspired by Prof. ENDO Morinobu, who is a pioneer of nanocarbon science and discovered that GSI Creos’ CNT has a peculiar structure known as “cup-stacked CNT.”

“I am now a CNT expert, but I am originally a Carbon-Guy”, and it is my mission to analyze and research CNTs. I believe that we will see a different horizon in the next 10 years.” said Yanagisawa, expressing his expectations for the future.

ANZO Akiko was working on the NEDO project, taking data by conducting length measurement and electron microscopic observation on many samples sampled for the project's condition study. In the future, she says, "We would like to further differentiate ourselves by developing and building manufacturing and measurement technologies that other companies do not have.”

ISHII Nobuyuki said, “I was involved in the NEDO project for three years. It was a good development project that helped me to grow. I’m now able to propose the advantages of our material to customers from the perspective of an operator who actually “touches the material.” He enthusiastically continues his research and development of CNTs.

TOYAMA Ayumu joined GSI Creos because he felt an “affinity” for CNT, which is used in familiar products, and wanted to know its physical properties.

He said, “During the mass production study of dispersion process, a hose was disconnected and a large amount of processing fluid splashed out. Unexpected events are bound to occur in R&D projects, but it was a good experience for all the staff to work together to solve the problem. This NEDO project was one of my first projects after joining the company, so I remember it well.”

Comments by NEDO Personnel in Charge

Their thoughts about the projects they worked on with participants and the future

Resolution of Global Environmental Problems

Development of a Hydrogen Power Generation System That Enables Local Production and Local Consumption of Clean Energy

NEDO Project Strategic Innovation Program for Energy Conservation Technologies (FY2012 to FY2024)

My first impression of Alhytec's work was that it is a "groundbreaking theme." It is a truly new approach to realize a system that separates aluminum from aluminum waste, which has been said to be unrecyclable, produces hydrogen, and generates electricity from the produced hydrogen. Toyama Prefecture boasts of local industries such as aluminum processing and pharmaceuticals. This is a meaningful theme because the local communities and companies can work together to plan and implement this project, which will lead to the revitalization of the regional economy and society.

During this project, NEDO communicated closely with Alhytec to quickly address its problems, including developing a system to continuously produce hydrogen and improve the quality of recovered hydrogen. NEDO actively assisted Alhytec in publicizing its development results, such as publishing joint releases (twice), including their development results in our annual report, and exhibiting Alhytec's development results at Pollutec 2016, an international exhibition held in France.

I expect that Alhytec will popularize this system, which enables the effective use of locally collected aluminum waste as a valuable resource and source of energy and will further reduce waste and promote local production and local consumption of energy.

Currently, the Energy Conservation Technology Department is implementing the Program to Develop and Promote the Commercialization of Energy Conservation Technologies to Realize a Decarbonized Society as a follow-up project to the Strategic Innovation Program for Energy Conservation Technologies. NEDO will continue its management activities to promote technical development and commercialization, including having external experts participate in technology promotion committees and dispatching experts to solve technical challenges, and actively publicizing the results to facilitate technology matching and business matching.

FUTAGAMI Masato
Director
Energy Conservation Technology Department
New Energy and Industrial Technology Development Organization

Electronic/Information

Commercialization of a Transparent Display That Adds a New Function to Window Glass

NEDO Project Clean Device Society Promotion Program (FY2014 to FY2016)

This project aimed to explore use cases for excellent technologies and devices with high potential for energy conservation and to verify and commercialize them. NEDO strove to contribute to the realization of an energy conservation society and to enhance Japan's industrial competitiveness through the spread of such new devices. The project consisted of 11 themes, one of which was transparent displays. Encouraging the industry and market to accept such new devices requires the verification of safety and reliability as well as drawing up a roadmap for standardization. In this project, this process was completed in two years, which was challenging.

During the project, my singular hope was that the developed device would be put on the market and the use cases would contribute to everyone's lives. I want everyone to know that NEDO is handling not only technical development but also management for commercialization.

The developed transparent display can be set in the windows of trains and buildings to display traffic information and other information. This futuristic device is expected to make our lives more convenient.

Two years is very short, and the project team did not have time to turn back or to stop and think. The team prepared a project plan based on the opinions of experts in technology and standardization as well as management advisors who are knowledgeable about commercialization. Also, the transparent display is intended for use in both indoor and outdoor environments, including public spaces, and the hue of the image changes depending on the ambient brightness. Therefore, it was difficult to select venues for demonstration. Sharp's researchers and sales personnel, who are familiar with the display's performance, resolved the situation. They found the ideal environments and the project team managed to complete the demonstration experiments.

Through this project, I learned that we could get through any difficult situation by working with the participating companies at the actual research and development sites and by considering the project from the end-user's perspective. I hope to make the most of this experience in project management in the future.

KURIHARA Hiroaki
Technical Researcher
Internet of Things Promotion Department
New Energy and Industrial Technology Development Organization

Energy Conservation

Leading the World Through Commercialization of 1700°C-Class Gas Turbines for Next-Generation Thermal Power Generation

NEDO Project Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation (FY2016 to FY2026)

To achieve carbon neutrality by 2050, it is necessary to introduce renewable energy; to introduce carbon-free fuels for decarbonizing thermal power plants, such as ammonia and hydrogen; and to capture, utilize, and store CO_2 (CCUS: carbon dioxide capture, utilization, and storage). The Sixth Energy Basic Plan, which determines the basic orientation of the energy policy, clearly states that the government will promote measures to reduce CO_2 emissions. At present, NEDO is working on many technical development projects related to thermal power generation in order to achieve this goal.

Renewable energy sources, including photovoltaic power generation, face the challenge that they are easily affected by time and weather. The stable supply of electricity requires a system for responding flexibly to fluctuations in electricity supply and demand using thermal power generation. In the Developing elemental technologies of Gas Turbine Combined Cycle (GTCC) systems, NEDO is developing systems that enable rapid startup when power demand increases, for example, in late afternoon, and technologies to reduce standby energy consumption when the amount of electricity generated by renewable energy sources is large during the daytime.

Also, in the R&D and Demonstrations on Technologies for Ammonia Co-Firing Thermal Power Generation project, NEDO is developing combustion technologies to use ammonia, which does not emit CO_2 when burned, as a fuel for thermal power generation. Enhancing the power generation efficiency of gas turbines contributes to reducing power generation costs. Furthermore, NEDO is developing technologies to separate and capture CO_2 and supply it for CCUS as part of the research and development of CO_2 Separation/Capture Technologies project.

When coal is heated, a pyrolysis reaction occurs, generating coal gas. The next-generation high-efficiency coal-fired thermal power generation system IGFC (integrated coal gasification fuel cell combined cycle) uses this coal gas. By incorporating the 1700°C-class gas turbine into the IGFC system, the amount of CO_2 emissions can be reduced by over 30% from that of conventional coal-fired thermal power generation systems.

These technologies, which are being developed to achieve carbon neutrality, are based on the development results of the 1700°C-class gas turbine. I think that such results are beneficial as they may greatly contribute to enhancing the overall efficiency of CO_2 emission reduction technologies for thermal power generation.

ZAIMA Nobuyuki
Senior Researcher
Environment Department
New Energy and Industrial Technology Development Organization

Material

Ultra-High Dispersion Mass Production Eliminates the Biggest Obstacle, "Aggregates", to Utilize Carbon Nanotubes

NEDO Project Project for Practical Application of Carbon Nanomaterials for a Low Carbon Emission Society (FY2010 to FY2016)

Originally, I engaged in research on fullerene, which is a type of nanocarbon, at a university, then I was assigned to be project manager for the Project for Practical Application of Carbon Nanomaterials for a Low Carbon Emission Society as the first cross-appointed position between NEDO and the university. In this role, I talked with thousands of people from various companies. In particular, I vividly recall speaking with Dr. Yanagisawa from GSI Creos Corporation many times during the progress check and/or on-site inspection to achieve appropriate, more efficient execution of the project fund.

Because the theoretical prediction of fullerene and discovery of carbon nanotubes were done by Japanese researchers, respectively, Japan is ahead of other countries in this area of nanocarbon materials. Both Dr. Yanagisawa and I, as researchers engaged in this field, had a strong feeling to commercialize these technologies and to contribute to society as much as possible.

Through this project, common fundamental technologies such as general procedures for safety tests, evaluation of nanocarbon dispersion, and so on, were developed, which was of great significance to the subsequent product development at individual companies. At the end of the project, these technologies were handed over mainly to public research institutes, such as the National Institute of Advanced Industrial Science and Technology (AIST), and were utilized by companies through consortiums, including the CNT Alliance Consortium and the Graphene Consortium, which I think is a true and major project achievement.

While I got involved in support nanocarbon-related companies, I started to think not only of managing national project for a limited short period but of achieving commercialization with a longer time as a role of researcher. I then returned to the university once and, after repaying their kindness, made a career move to AIST where the core of research and development on the commercialization of nanocarbon materials. I could again work with many nanocarbon companies. In 2020, the first Nano Carbon Open Solution Fair took place as part of the "nano tech" exhibition, which was organized by 25 nanocarbon-related companies. Today, the number of CNT products on the market is gradually increasing. I will continue to support these endeavors, even if I am only able to do but a little, in moving forward, one step at a time.

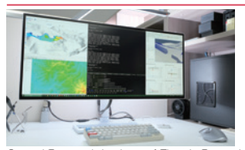
KOKUBO Ken
Principal Research Manager/Leader of Functional Materials Design Team
National Institute of Advanced Industrial Science and Technology
(Former Chief Officer/Project Manager
Materials Technology and Nanotechnology Department
New Energy and Industrial Technology Development Organization)

Examples of Practical Applications of NEDO Projects INDEX

An index of NEDO projects introduced as NEDO Project Success Stories up to 2022.

New Energy 20 themes

Shifting from Large Wind Tunnel Experiments to Simulation Drastically Improves Environmental Assessment Efficiency for Geothermal Energy Generation

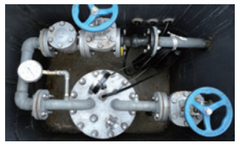


OCT,NOV 2021

Central Research Institute of Electric Power Industry

Research and Development of Geothermal Energy Generation Technologies and on Environmental Conservation Technologies for Power Plants and other projects

Wider Popularization of Aquifer Thermal Energy Storage Systems



NOV 2020

Japan Groundwater Development Co., Ltd.,
National Institute of Advanced Industrial Science and Technology (AIST)

Research and Development for Utilization of Heat as Renewable Energy and other projects

Next-Generation Lithium-Ion Batteries that support New Energy Applications

SEP 2018

Toshiba Corporation

Technology Development Project for the Application and Commercialization of Lithium-Ion Batteries and other projects

New Technology from Japan that Contributes to the Expansion of Bioethanol Production in Southeast Asia

NOV,DEC 2017

Yamaguchi University, SAPPORO HOLDINGS LTD., Iwata Chemical Co., Ltd.

International Projects for Increasing the Efficient Use of Energy and System Demonstration Projects and other projects

Development of Innovative Blowers for Fuel Cell Systems Indispensable for Realization of a Hydrogen-Based Society

NOV 2016

Techno Takatsuki Co., Ltd.

New Energy Venture Business Technology Innovation Program and other projects

The First of Its Kind in Industry! SOKODES Was Developed for Use with Solar Panels to Quickly Detect Faults and Estimate Their Location

JAN 2016

System JD Co., Ltd.

New Energy Venture Business Technology Innovation Program and other projects

Development of Small High-performance Hydrogen Production Equipment for Hydrogen Stations for Fuel Cell Vehicles that will become Popular in the Future

JAN 2014

Mitsubishi Kakoki Kaisha, Ltd.

Development of Technologies for Hydrogen Production, Delivery, and Storage Systems

Achieving Higher Efficiency by Gasifying Coal - "Integrated Coal Gasification Combined Cycle (IGCC)"

NOV 2013

MITSUBISHI HITACHI POWER SYSTEMS, LTD.
JOBAN JOINT POWER CO., LTD.

Project for the Development of an Entrained Bed Coal Gasification Power Generation Plant and other projects

Development of a Residential Fuel Cell System using a High-Efficiency Solid Oxide Fuel Cell (SOFC)

MAR 2013

Osaka Gas Co., Ltd.

Solid Oxide Fuel Cell System Technology Development and other projects

Biomass Gasification Power Generation System that Contributes to Reducing CO_2 Emissions and Enhancing the Local Vitality

OCT 2013

Chugai Ro Co., Ltd.

Development of Technology for High Efficiency Biomass Energy Conversion and other projects

Highly Efficient General Compact Wind Powered Generation System

JUL~SEP 2012

Zephyr Corporation

Industrial Technology Practical Application Development Support Project

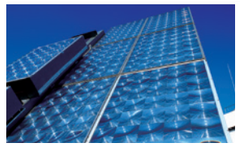
Realizing Energy Conservation with "DC for DC" - Leave it up to a stable supply of electricity!

SEP~DEC 2012

NTT FACILITIES, INC

Quality-Based Electrical Power Supply System Verification Studies and other projects

Developing Solar Cells to Achieve Record-breaking 40% Conversion Efficiency



FEB 2012

Sharp Corporation

Research and Development of Photovoltaic Power Generation Technology and other projects

World's First Gasification System for Sewage Sludge Transforms Fuel Gas into Power

OCT 2011

METAWATER Co., Ltd.
Bureau of Sewerage Tokyo Metropolitan Government

Development of Technology for High Efficiency Biomass Energy Conversion

High-efficiency Power Generators That Use Hydrogen: Development of Fuel Cells for Household Use

MAR 2011

TOKYO GAS Co., Ltd.

Establishing Platforms for the Widespread Use of Fuel Cells and other projects

From Wind Power Generating Systems for Remote Islands to Large Downwind Turbines

SEP~NOV 2010

Fuji Heavy Industries Ltd.

Technology Development of Advanced Wind Turbine Systems for Remote Islands and other projects

Development of Large-area High-speed Film Deposition Technology for Sharply Enhancing Solar Cell Productivity

MAR 2010

Mitsubishi Heavy Industries, Ltd.

New Sunshine Project / Research and Development of Photovoltaic Power Generation Technology and other projects

Mass Production of New Non-silicon Solar Cells

FEB, MAR 2010

SHOWA SHELL SEKIYU K.K.

New Sunshine Project / Research and Development of Photovoltaic Power Generation Technology and other projects

Mass Production of Lithium-ion Secondary (Rechargeable) Batteries for Hybrid Vehicles

DEC 2009~ MAR 2010

Hitachi Vehicle Energy, Ltd.

Development of Technology for the Dispersed Storage of Battery Power and other projects

New Hybrid Solar Cells: Promising Technology for the Solar Cell Market

MAR 2009

KANEKA CORPORATION

Development of Technology to Accelerate the Dissemination of Photovoltaic Power Generation Systems

Energy Conservation 19 themes

Commercialization of a Single-Effect Double-Lift Absorption Chiller for More Effective Utilization of Unused Thermal Energy in Industrial Plants

OCT 2021

Hitachi-Johnson Controls Air Conditioning, Inc.

Research and Development Project on Innovative Thermal Management Materials and Technologies

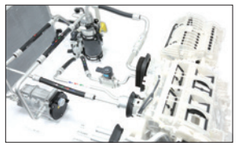
Toward the Application of 3D Nano Structure Control Development of Super Fuel-Efficient Tires

OCT 2019

Bridgestone Corporation, JSR Corporation

Innovation Promotion Project, Nanotech Advanced Component Utilization Research and Development, and other projects

High-Efficiency, Energy-Saving Heating Technology Completion of a Heat Pump for Use in Vehicles

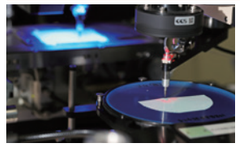


OCT 2019

DENSO Corporation

Research and Development Program for Innovative Energy Efficiency Technology

Commercialization of an Energy-Saving LED Lamp With Ultrahigh Intensity and Ultrahigh Flux



SEP 2018

Shikoku Instrumentation Co., Ltd.

Strategic Energy Saving Technology Innovation Program

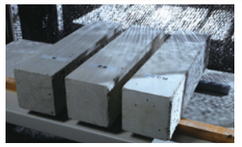
Practical Application of "SiC Power Semiconductor" That Contributes to a Next-Generation Electric Society, as Rolling Stock Inverters Used in Railways

DEC 2016 ~FEB 2017

National Institute of Advanced Industrial Science and Technology (AIST)
Mitsubishi Electric Corporation
Odakyu Electric Railway Co., Ltd.

Next-Generation Power Electronics Project Realizing Low Carbon-Emission Society and other projects

ECM Cement Reduces Energy Consumption and CO_2 Emissions by More Than 60%



DEC 2016 ~FEB 2017

ECM Joint Research and Development Team

Research and Development Program for Innovative Energy Efficiency Technology and other projects

Achieving Energy Saving on the Level of Industrial Complexes through the Sharing of Heat between Factories

DEC 2013 ~JAN 2014

Chiyoda Corporation

Strategic Development of Energy Conservation Technology Project and other projects

Optimally Adjusting the Ratio between Heat and Electricity to Suit the Place of Utilization - Development of a Gas Engine System that Expands the Scope for the Popularization of Natural Gas Cogeneration

DEC 2013

Mitsui Engineering & Shipbuilding Co., Ltd.

Strategic Development of Energy Conservation Technology Project

Ultra-low-temperature Freezing System that Achieves -60°C Using Air as the Refrigerant

NOV 2013

MAYEKAWA MFG. CO., LTD.

Strategic Development of Energy Conservation Technology Project and other projects

Clean Diesel Engine with the World's Highest Level Fuel Efficiency and Environmental Performance

JUL 2013

Mazda Motor Corporation

General Technological Development of Innovative Next-generation Low-emission Vehicles

Distillation Facilities Boasting Maximum Energy Conservation Effects of 60%

MAR 2013

Kimura Chemical Plants Co., Ltd.

Development of Energy Saving Distillation Technology using Internal Heat Exchange and other projects

Improving Fuel Efficiency of a Belt CVT by Increasing the Coefficient of Friction

MAR 2013

JATCO Ltd.

Development of Material Surface Control Technology for Low Friction Loss High Efficiency Drive Machines

Residential Heat Pumps - Contributing to Expanding the Market for EcoCute

MAR 2013

DENSO CORPORATION

Strategic Development of Energy Conservation Technology Project

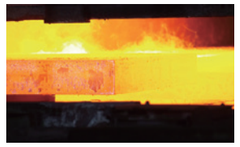
Contributing to Solve Global Environment and Energy Issues with a World's Highest Level High Efficiency Large Sized Gas Turbine

DEC 2012

Mitsubishi Heavy Industries, Ltd.

Development of High Efficiency Gas Turbine and other projects

High Performance Industrial Furnace Greatly Contributing to Energy Conservation and Environmental Load Reduction in Industrial Fields



JUL 2012

Japan Industrial Furnace Manufacturers Association

Development of High Performance Industrial Furnace and other projects

Development of World's First Hybrid Hydraulic Excavator Contributes Greatly to Energy Saving and CO_2 Reduction

MAR 2012

Kobelco Construction Machinery Co., Ltd.
Kobe Steel, Ltd.

Strategic Technology Development for Energy Use Rationalization and other projects

Air-conditioning System Uses Hydrate Slurry to Cool Large Facilities, Save Energy

SEP 2011

JFE Engineering Corporation

Strategic Development of Energy Conservation Technology Project and other projects

Micro Steam Energy Generator Effectively and Thoroughly Utilizes Manufacturing Steam

MAR 2011

Kobe Steel, Ltd.

Strategic Development of Energy Conservation Technology Project and other projects

Trucks and Buses Also Follow Hybrid Trends

DEC 2009

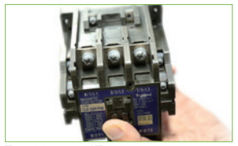
Mitsubishi Fuso Truck and Bus Corporation

R&D of Advanced Clean Energy Vehicles (ACE Project)

Resolution of Global Environmental Problems

20 themes

Realization of Widespread Use of Refrigerants with Low Greenhouse Gas Effects Revision of International Standards Based on Safety Evaluation Methods



NOV 2019

The University of Tokyo,
National Institute of Advanced Industrial Science and Technology (AIST)

Technology Development of High-Efficiency Non-Fluorinated Air-Conditioning Systems

Significant Reductions in Energy and Costs through Integrating Seawater Desalination with Sewage Treatment

SEP 2017

Global Water Recycling and Reuse Solution Technology Research Association (GWSTA)

Water Saving and Environmentally-Friendly Water Recycling Project and other projects

Recycling of Waste Plastic Reduces CO_2 Emissions in a Blast Furnace. Pulverization Further Improves Efficiency

FEB 2015

JFE Steel Corporation

Development of Technology to Recycle Waste Plastic Into a Blast Furnace Reducing Agent

Construction of a New White Goods Recycling System in Collaboration with Local Governments and Manufacturers

JAN 2015

Hitachi, Ltd.
Tokyo Eco Recycle Co., Ltd.

Development and Demonstration of a Home Appliance Recycling Plant

Development of "RPF", an Inexpensive New Fuel that Emits a Smaller Amount of CO_2 than Fossil Fuels

JAN 2014

EARTHTECHNICA Co., Ltd.
SEKISHOUTEN Co., Ltd.

Research and Development to Develop Revolutionary Environmentally-friendly Energy Technologies with Immediate Effects

A Technology that Halves the Consumption of the Rare Earth Element that Is Indispensable for Glass Grinding

AUG 2013

KOKONOE ELECTRIC CO., LTD.
Ritsumeikan University

Rare Metal Substitute Materials Development Project

Mass Production of Freon / Halon Substitute with a World's First Composition Methodennfou

FEB 2013

TOSOH F-TECH INC.

Energy Saving Freon Substituting Substance Composition Technology Development and other projects

An Innovative Device that Prevents Leaking of Gasoline Vapor

DEC 2012, MAR 2013

Tatsuno Corporation

Research and Development of Toxic Chemical Substance Risk Reducing Platform Technologies

Dual-Arm Construction Machinery, Expected to be Active in Sites of Building Deconstruction

DEC 2012

Hitachi Construction Machinery Co., LTD.

"Strategic Advanced Elemental Robot Technology Development" Project

Destruction of HFC-23 Through Burning and Cooling

FEB 2012

Tsukishima Kankyo Engineering Ltd.

Development of HFC-23 Destruction Technology and other projects

Asbestos Removal Robot Contributes to Safe and Efficient Workplace Through Remote Control and Automation

FEB 2012

TAISEI Corporation

Urgent Development of Fundamental Technologies for the Practical Reduction of Asbestos and other projects

From Tohoku to the World! Innovative Coating Process Reduces Use of Harmful Chemicals

DEC 2011

KAMI ELECTRONICS IND CO., LTD.

Development of Fundamental Technologies for Risk Reduction of Hazardous Chemical Substances

Non-Fluorinated CO_2-cooled Refrigeration System for Supermarket Showcases

DEC 2011

SANYO Electric Co., Ltd

Development of Non-fluorinated Energy-saving Refrigeration and Air Conditioning Systems

On-site Processing System for Safe, Stable and Highly Efficient Neutralization of Asbestos

NOV 2011

Hokuriku Electric Power Company

Urgent Development of Fundamental Technologies for the Practical Reduction of Asbestos and other projects

Development of a High-performance Insulating Coating Resin

DEC 2010

Showa Denko K.K.

Development of Fundamental Technologies for Risk Reduction of Hazardous Chemical Substances

Creation of a Safer Heat-resistant Material as a Replacement for Asbestos

OCT 2010

JAPAN MATEX CO., LTD.

Urgent Development of Fundamental Technologies for the Practical Reduction of Asbestos and other projects

Birth of COF_2: New Clean Gas for Semiconductor Manufacturing with Very Low Greenhouse Gas Effects

DEC 2009

Kanto Denka Kogyo Co., Ltd.

Research and Development of Semiconductor CVD Chamber Cleaning Systems for Electronic Device Manufacturing Using New Alternative Gases as a Substitute for SF6, PFCs and Other Gases and other projects

Achieving More Efficient, Cleaner Waste Incineration with New Technology

MAR 2009

JFE Engineering Corporation

Research and Development on Advanced High-temperature Air Combustion Control Technology

Developing an Eco-Diesel Engine with Clean Exhaust Gas

NOV 2008

NISSAN DIESEL MOTOR CO.,LTD.

R&D of Advanced Clean Energy Vehicles

New Catalyst for Maximum Cleaning of Diesel Fuel Oil

NOV 2008

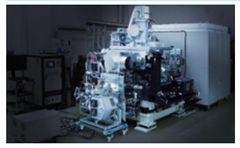
COSMO OIL CO., LTD.

Research and Development of Petroleum Refining Pollutant Reduction

Electronic / Information

16 themes

Establishment of Next-Generation Inspection Technology for the Semiconductor Manufacturing Process



AUG 2018

Lasertec Corporation

Development of Next-Generation Semiconductor Microfabrication and Basic Evaluation Technologies

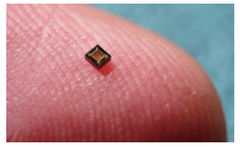
Development of an Eyewear Device for Low-Vision Aid That Uses Semiconductor Laser Technology

OCT 2017

QD Laser, Inc.

Development Promotion Project for Practical Use of Welfare Equipment and other projects

Realization of Compact, Light-weight, and High-performance Devices with “Moving” Semiconductors

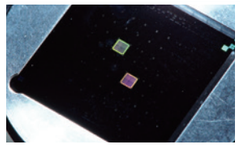


FEB 2014

OMRON Corporation

Micromachine Technology Research and Development Project and other projects

Realized the World’s Smallest Scale Assuring a Single Atom Size Error

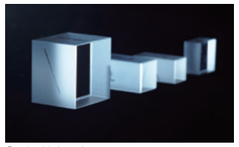


DEC 2013 ~FEB 2014

National Institute of Advanced Industrial Science and Technology (AIST)
Hitachi, Ltd. Hitachi High-Technologies Corporation

R&D of 3D Nanoscale Certified Reference Materials Project

World’s First Realization of an All Solid-state UV Laser Source with Advanced Waver-length Conversion Characteristic

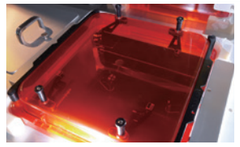


DEC 2013

Osaka University
Kogakugiken Corp.

Research and Development for Photon Measurement and Processing and other projects

Electronic Beam Mask Writing Device Boasting an Overwhelming Share in the World

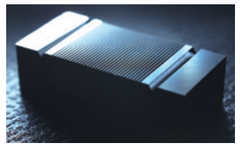


NOV 2012

NuFlare Technology, Inc.

Super Head Electronic Technology Development Promotion Project

High Precision Machining Equipment Enabling Accurate Optical Connector Mold Marking



FEB 2012

NACHI-FUJIKOSHI CORP.

Integrated Development of Materials and Processing Technology for High Precision Components

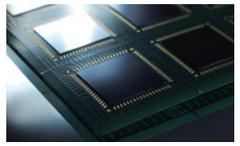
Improvement of Curved-Surface Displays for Ultra-Large Screens

DEC 2011

Shinoda Plasma Co., Ltd.

Research and Development of Energy-saving Ultra-thin Film Large Light-emitting Display Devices and other projects

Development of Die Bonding Film Contributes to High Performance in Electronic Devices



OCT 2011

Hitachi Chemical Company, Ltd.

R&D on Nanostructured Polymeric Materials

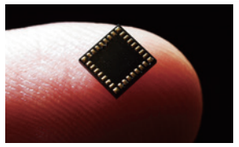
Revolutionary High-qua2lity Semiconductor Production Equipment

DEC 2010 ~JAN 2011

Tokyo Electron Limited

Development of Infrastructure Technology for High-efficiency Semiconductor Production Processes and other projects

Evaluation Technology Leads to Remarkable Improvement of Nonvolatile Memory Reliability



DEC 2010

Fujitsu Limited
FUJITSU SEMICONDUCTOR LIMITED

Research and Development on Next-generation Ferroelectric Memory (FeRAM) and other projects

Commercialization of a Perpendicular Magnetic Recording Method to Achieve High-density, Highly Reliable HDD

OCT 2010

HGST Japan

Super-advanced Electronics Technology Development Promotion Project

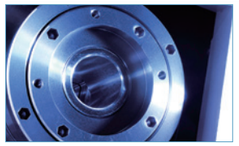
Development of Blu-ray Disc Offering High Image Quality

SEP~NOV 2010

Sony Corporation

Research and Development of a Nanometer-controlled Optical Disc System

Development of a Laser Light Source Indispensable for Surface Machining for Manufacturing Miniature Semiconductor Devices

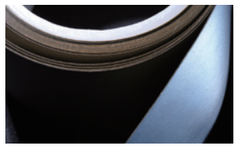


DEC 2009

Gigaphoton Inc.

Development of F2 Laser Lithography Technology and other projects

Development of Metallic Glass for Improving Electronic Device Performance



FEB 2009

ALPS ELECTRIC CO., LTD.

Research and Development of Super Metal Technology

Controlling Your Home Remotely with a Home IT System

NOV 2008

Toshiba Home Appliances Corporation

Digital Information Device Interoperability Infrastructure Project

Material

16 themes

High-Reliability, Low-Cost, High-Speed, High-Precision Electron Beam Metal 3D Printer

OCT 2021

JEOL Ltd.

Project for Modeling Technology Development and Practical Applications of Next-Generation Industrial 3D Printers

Simultaneous Nanofiber and Resin Composite Production–Commercialization of Cellulose Nanofiber Composite Resin

OCT, NOV 2020

SEIKO PMC CORPORATION, Kyoto University

Development of Fundamental Technologies for Green and Sustainable Chemical Processes and other projects

Development of New Materials for a Highly Sustainable Society through Artificial Synthesis of Structural Proteins

NOV 2020

Spiber Inc.

Support for Ventures Involved in Innovation and Practical Application / Development of Super-high Function Fibroin Fiber for Commercialization and other projects

Succeeded in Commercialization of the World’s Highest Spec Sand 3D Printer for Casting

OCT 2019

National Institute of Advanced Industrial Science and Technology, Gun Ei Chemical Industry, Co., Ltd.,
CMET Inc., KOIWAI Co., Ltd.

Next-Generation Industrial 3D Printer Modeling Technology Development and Commercialization Business

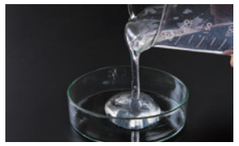
Development of a High-Performance Bio-Resin from Plant Seeds

AUG 2018

Hitachi Zosen Corporation, Osaka University

Technology Development of Manufacturing Processes for Non-Edible Plant-Derived Chemicals and other projects

World’s First Commercialization of a Promising New Material : Cellulose Nanofiber

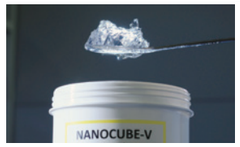


NOV 2018

Nippon Paper Industries Co., Ltd., The University of Tokyo

Innovation Promotion Project, Nanotech Advanced Component Utilization Research and Development, and other projects

DDS (Drug Delivery System) Research into a Medicinal Hair Restorer for Women



OCT 2017

NANOEGG Research Laboratories, Inc.

Innovation Promotion Project

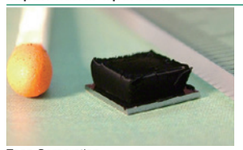
World's First Commercialization of Mass Production Processes Using Microwave Technology

OCT 2016

Microwave Chemical Co., Ltd.

New Energy Venture Business Technology Innovation Program and other projects

The World's First Mass Production Factory for Single-Walled Carbon Nanotubes Developed in Japan Starts Operation



JAN 2016 ~FEB 2017

Zeon Corporation
National Institute of Advanced Industrial Science and Technology (AIST)

Carbon Nanotube Capacitor Development Project and other projects

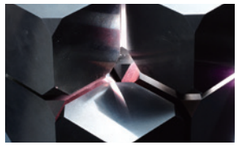
Development of Visible Light Responsive Photocatalyst for Indoor use Provision of Sanitary and Comfortable Living Space

FEB 2014

Showa Denko Ceramics Co., Ltd
TOTO LTD.
Panasonic Corporation

Project to Create Photocatalyst Industry for Recycling-oriented Society

Renovation of "Cutting, grinding, and Polishing" Hardest and Strongest "Super Diamond"



AUG 2013

Sumitomo Electric Industries, Ltd.

Grant for Practical Application on Industrial Technology

Plastics that Soften when subject to High Speed and Strong Impact

NOV 2012

Toray Industries, Inc.

Precision High Polymer Technology Project

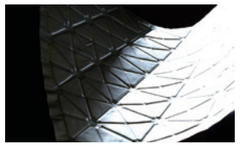
Development of Film Improves Visibility of LCD Displays from any Angle

DEC 2011

Zeon Corporation

Development of High-performance LCD TV Technology

Vacuum Insulation Panel Contributes to Residential Energy Conservation



NOV 2010

Panasonic Corporation

Strategic Development of Energy Conservation Technology Project

Melt-spinning Cellulose to Create Fiber Having Correct Cross-sectional Shape

NOV 2009

Toray Industries, Inc.

Fundamental Technology Research Facilitation Program

Polymer Simulation for Enhancing the Efficiency of Material Development

FEB 2009

JSOL Corporation

Development of Advanced Functional Material Designing Platforms

Robots / AI / Welfare Equipment

14 themes

Commercialization of the "Five Senses" AI-Enabled Camera That Predicts and Prevents Crimes and Accidents by Implementing AI in Security Cameras

OCT 2021

Earth Eyes Co., Ltd.

Development of Core Technologies for Next-Generation AI and Robotics

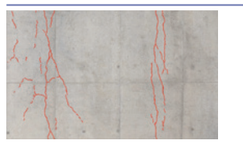
3D Distance Image Sensor for Safety Protection

OCT 2020

Nippon Signal Co., Ltd.

Project for Practical Application of Personal Care Robots / Development of Person-Carrier Robots Based on Safety Technologies

Reduction of Operation Time to One Tenth Development of AI That Can Perform Concrete Crack Detection



NOV 2019

Shutoko Engineering, Co., Ltd.,
National Institute of Advanced Industry Science and Technology (AIST), Tohoku University

Robot and Sensor System Development Project for Infrastructure Maintenance and Disaster Survey: Development of an Infrastructure Status Monitoring System Using Imaging Technology

Realizing Small, Lightweight, High-Precision and Inexpensive Development of an Epoch-Making 3D Vision Sensor

SEP 2019

YOODS Co., Ltd.

Technology Development Project for Robot Commercialization Applications: Development of robot platform technology (hardware), Platform technology development for a general-purpose robot vision system

Realization of Next-Generation Life Support Technology with a Smart Mobility Vehicle

NOV 2018

Tmsuk Company Limited, NTT DOCOMO, INC., Kyushu University

International R&D and Demonstration Project in the Environment and Medical Device Sector, International R&D and Demonstration Project in the Robotics Field, and other projects

Electric Wheelchair that Makes Going out Fun Increased Popularity with the Release of the Standard Model

NOV 2017

WHILL Inc.

Development Promotion Project for Practical Use of Welfare Equipment and other projects

Establishment of Safety Requirements and a Certification System that Underpin the Development of Safe and Trustworthy Service Robots

DEC 2016 ~FEB 2017

National Institute of Advanced Industrial Science and Technology (AIST)
Japan Automobile Research Institute (JARI)
Nagoya University

Project for the Practical Application of Service Robots and other projects

Three-Dimensional Vision Sensor That Gives Industrial Robots Seeing and Thinking Capabilities to Enable Automated Assembly Lines

OCT 2016

3D MEDiA Company Limited

Innovation Commercialization Venture Support Project and other projects

Reducing the Fatigue of Agricultural and Care Work Development of the Smart Suit

JAN~FEB 2016

Smart Support Technologies Inc.
Hokkaido University

Development Support Project for Practical Application of Problem-Solving Welfare Equipment and other projects

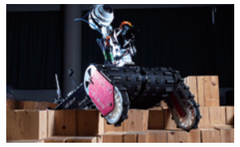
Easy and Safe Transferring from Bed to Toilet Development of New Transferring Equipment to Support Care in a Highly Aging Society

JUL 2013

IDEA SYSTEM CO., LTD.

Promotion of R&D on Practical Welfare Equipment and other projects

A Rescue Robot Displaying High Driving Performance at Disaster Sites with Stairs and Rubble



FEB 2013

CHIBA INSTITUTE OF TECHNOLOGY

Strategic Advanced Elemental Robot Technology Development Project

Automatic Wheelchair and Mattress Washing Machines That Reduce the Burden of Caregivers

JAN 2013

ATAM Giken Co., Ltd.

Promotion of R&D on Practical Welfare Equipment

Robot Suit HAL®: Reading Intention to Support Physical Functions and Improve Quality of Life

JAN 2011

CYBERDYNE Inc.

Project for Practical Application of Next-generation Robots and other projects

Improved Short Lower-limb Brace Offers Patients Better Walking Comfort

OCT 2010

Kawamura Gishi Co., Ltd.

Promotion of R&D on Practical Welfare Equipment and other projects

Medical Biotechnology

19 themes

New Fluorescent Imaging with PID High-Brightness Fluorescent Nanoparticles

NOV,DEC 2021

Konica Minolta, Inc.

Comprehensive Research and Development of an Early Stage Diagnosis Method and Instruments for Treating Cancer and other projects

A4-Size High-Concentration Oxygen Generator

NOV 2020

VIGO MEDICAL Co., Ltd.

Development Promotion Project for Practical Use of Welfare Equipment / Small Oxygen Generator as a Respiratory Aid for Elderly People

Efforts to Reduce Waiting Time and Enhance the Efficiency of Medical Practice Administration Development of an AI-Driven Medical Interview System

OCT 2019

AR advanced technology, Inc., Yokohama National University

Future AI and Robot Technology Development Project: Next-generation artificial intelligence technology area

Development of Groundbreaking Hip Joint Prostheses for an Aging Society

OCT 2018

Teijin Nakashima Medical Co., Ltd., Kyoto University

Innovation Promotion Project and other projects

Peptide Search System that Opened up New Avenues for Drug Discovery

NOV 2017

The University of Tokyo, PeptiDream Inc.

Technology Development for Accelerating Genomic Drug Discovery

Towards Regenerative Cell Therapy by Large-Scale Culture of Synovium-Derived MSCs

AUG 2017

TWOCELLS COMPANY, LIMITED,
Space Bio-Laboratories Co., Ltd.
Osaka University, Osaka Health Science University, Hiroshima University

Development to Accelerate the Practical Application of Human Stem Cells and other projects

Development of Innovative Culture Media for Human Pluripotent Stem Cells (ES and iPS Cells) and an Automated Cell Culture System

NOV 2016

Kyoto University Nissan Chemical Industries, Ltd.
Nipro Corporation

Development to Accelerate the Practical Application of Human Stem Cells / Development of Basic Evaluation Technologies for the Practical Application of Human Stem Cells

Development of Japan's First PET Device Dedicated for Breast Cancer and Able to Perform High-Precision Examinations Without Inflicting Pain

JAN 2016

SHIMADZU CORPORATION

R&D Project on Molecular Imaging Equipment for Treatment of Malignant Tumors

Development of a Procedure That Dramatically Streamlines Essential Screening in Medicine Development

JAN 2016

Mie University
HASHIMOTO ELECTRONIC INDUSTRY CO., LTD.

Innovation Commercialization Venture Support Project and other projects

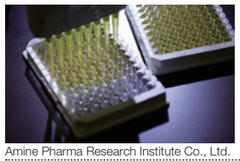
The World's First Reagent to Determine the Progression of Hepatic Fibrosis by Measuring Changes in the Sugar Chain

FEB 2015

Sysmex Corporation
National Institute of Advanced Industrial Science and Technology (AIST)

Technology Development Utilizing Sugar Chain Functions and other projects

The World's First Practical Application of High-Precision Cerebral Infarction Risk Assessment Through Biomarker Measurement

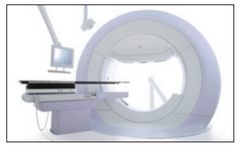


JAN 2015

Amine Pharma Research Institute Co., Ltd.

University-Launched Business Creation and Practical Application Research and Development Project and other projects

Development of a Next-Generation 4D Radiation Therapy System That Enables Irradiation of a Moving Cancer

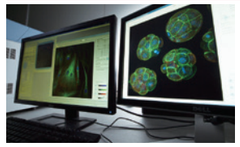


JAN–FEB 2015

Mitsubishi Heavy Industries, Ltd
Kyoto University
Foundation for Biomedical Research and Innovation

Fundamental Technology Research Facilitation Program

Development of a Confocal Laser Scanner for Live Cell Imaging

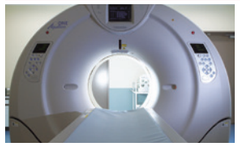


FEB 2011

Yokogawa Electric Corporation

Development of Technologies for the Analysis of Intracellular Network Dynamism

4D X-ray CT System Capable of Imaging a Heart in 0.35 Seconds

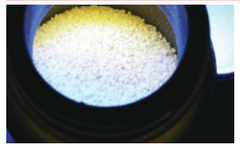


JAN 2011

Toshiba Medical Systems Corporation

Development of a High-speed Cone Beam 3D X-ray CT and other projects

Achieving Mass Synthesis of Glycans, "Third Chain" Molecules Holding the Key to Life Phenomena



MAR 2010

Tokyo Chemical Industry Co., Ltd.

Bio / IT Synthesis Equipment Development Project and other projects

Next-generation Operating Room Improves Brain Surgery Survival Rate

DEC 2009 ~MAR 2010

Tokyo Women's Medical University

Grant for Industrial Technology Research Development of a System for Complete Brain Tumor Removal and other projects

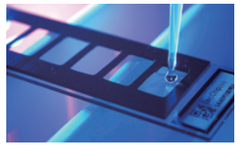
Electron Microscope Assists in Drug Discovery by Analyzing Membrane Protein Structure

DEC 2009

JEOL, Ltd.

Analysis of Biopolymer Conformation Information and other projects

Setting the World Standard in Glycan Profiling with Technology Made in Japan



FEB 2009

GP Biosciences, Ltd

Structural Glycoproteomics Project: Development of Glycan Structure Profiling Analysis Technology

The Laser Scanning Microscope: A Powerful Tool for Unraveling the Mechanisms of Living Things

DEC 2008

Olympus Corporation

Research and Development of a Graphical Analyzer for Human Chromosomes Using a Confocal Laser Scanning Microscope

Background Information

Designation	National Research and Development Agency New Energy and Industrial Technology Development Organization (NEDO) Business name: New Energy and Industrial Technology Development Organization (NEDO)
Foundation	Originally established as a semi-governmental organization on October 1, 1980; reorganized as an incorporated administrative agency on October 1, 2003
History	October 1980 New Energy Development Organization established under the Law Concerning the Promotion of the Development and Introduction of Alternative Energy October 1988 Industrial technology research and development added; name changed to New Energy and Industrial Technology Development Organization October 2003 Incorporated Administrative Agency New Energy and Industrial Technology Development Organization established under the Act on the New Energy and Industrial Technology Development Organization April 2015 Redesignated and renamed National Research and Development Agency New Energy and Industrial Technology Development Organization to reflect the enforcement of a partial amendment of the Act on General Rules for Incorporated Administrative Agencies and the Act on the New Energy and Industrial Technology Development Organization
Missions	Addressing energy and global environmental problems NEDO actively undertakes the development of new energy and energy conservation technologies, verification of technical results, and introduction and dissemination of new technologies (e.g., support for introduction). Through these efforts, NEDO promotes greater use of new energy and improved energy conservation. NEDO also contributes to a stable energy supply and the resolution of global environmental problems by promoting the demonstration of new energy, energy conservation, and environmental technologies abroad based on knowledge obtained from its domestic projects. Enhancing industrial technology With the aim of raising the level of industrial technology, NEDO pursues research and development of advanced new technology. Drawing on its considerable management know-how, NEDO carries out projects to explore future technology seeds as well as mid- to long-term projects that form the basis of industrial development. It also supports research related to practical application.
Details of Major Operations	Operations relating to technology development management

Minister in Charge	Minister of Economy, Trade and Industry
Governing Laws	Act on General Rules for Incorporated Administrative Agencies Act on the New Energy and Industrial Technology Development Organization
Personnel	1,464 (as of April 1, 2023)
Budget	Approximately 1.14 billion US dollars (initial budget for FY 2023) * Additional funding programs are also being implemented.