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Special Feature

Using Microsatellites to Create an Infrastructure for Earth Observation

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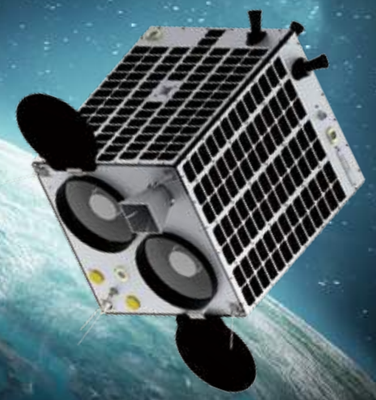


Since the launch of Sputnik 1 in 1957, thousands of satellites have been launched and used in various fields, such as communications, broadcasting, and weather observation. Now, a Japanese startup company is trying to build a new infrastructure for Earth observation using microsatellites.

Development of Low-Cost, Fast, and High-Quality Microsatellites

Axelspace Corporation, established in 2008, is engaged in the development and commercialization of private commercial microsatellites, based on microsatellite technology developed by University of Tokyo and Tokyo Institute of Technology. “We are aiming to make microsatellites with lower cost and higher quality,” says Yoshitaro Ikeda, responsible for business development and sales.

The world's first private commercial microsatellite “WNISAT-1” was launched by the company in 2013 and is contracted by Weathernews Inc., a provider of weather information services. The satellite was custom-developed for observing sea ice in the Arctic Ocean. By shortening shipping routes, companies have succeeded in reducing fuel costs and shipping times.

With a focus on low cost and short development time, Axelspace developed “Hodoyoshi-1” as a demonstration to prove the viability of Earth observation as a business. It was jointly developed with the Next Generation Space System Technology Research Association, and was launched in 2014. While the cost of manufacturing large satellites is usually tens of billions of yen, the cost of developing microsatellites is several hundred million yen. Although Hodoyoshi-1 was small when completed at about 50 square centimeters and weighed 60 kg, it has the ability to observe the ground in great detail. Before Hodoyoshi-1, satellites weighing 150 kg or more were required to observe the Earth with the same accuracy, so it was a dramatic evolution.

Yoshitaro Ikeda
Business Development and Sales Group
Axelspace Corporation

Varied potential uses of satellite imagery

Ikeda says that Hodoyoshi-1 played an important role in establishing the business of selling Earth observation data.

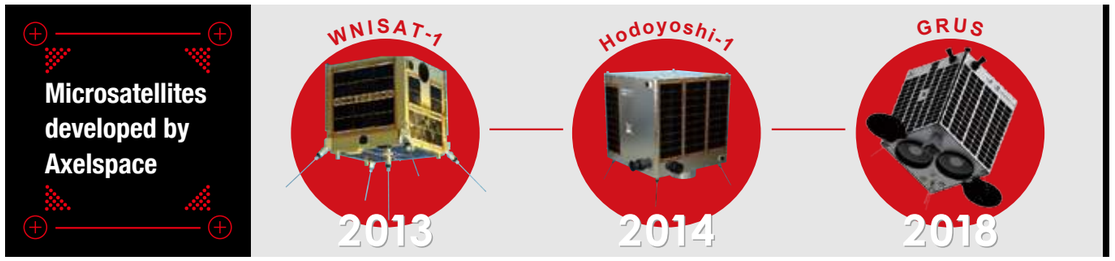
“By launching a large number of low-cost microsatellites, we can build an almost real-time Earth observation network. Based on the Hodoyoshi demonstration project, we are developing the next-generation microsatellite ‘GRUS’ for use in turning Earth observation image data into a business. At present, we are aiming to construct an underlying infrastructure called ‘AxelGlobe’ for Earth observation using GRUS.”

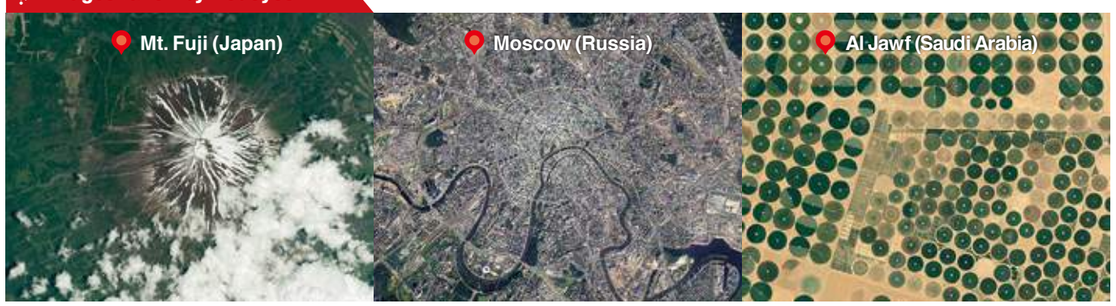
The performance of a satellite is generally evaluated based on its ground resolution of images. This indicates the size of an object on the ground that the satellite can identify. For example, a ground resolution of 10 meters indicates the satellite can identify an object on the surface that is 10 meters or larger, such as a building. The smaller the numerical value, the higher the performance. GRUS boasts a ground resolution of 2.5 meters for black and white images and 5 meters for color images. Furthermore, a wide area of more than 50 kilometers can be captured. The company’s goal is to launch dozens of GRUSs into orbit by 2022, and establishing this system will enable capturing of the entire land surface of the Earth every day.

Typical applications for the images include ground coverage surveys. Such surveys can be widely used for forest management and measures to counter so-called “heat island phenomenon.” Moreover, they are highly useful for creating maps. In agriculture, such surveys can be used for creating harvest plans and for efficient application of fertilizers. Furthermore, when a disaster occurs, the satellites are expected to allow authorities to understand the current state of the affected area.

Currently, there is an overseas company that provides image data using more than 100 satellites. However, there are variations in image quality and precision of when images are captured. AxelGlobe seeks to homogenize the data by making the image quality and capture timing as consistent as possible.

“There is value in continuing to collect homogenous data that is easy for anyone to use and can be effectively analyzed by machine learning. Our goal is to build a new Earth observation infrastructure. I imagine a future in which schoolchildren will be able to enjoy having a commemorative photo taken by gathering in the schoolyard right before the satellite overhead is scheduled to capture an image. This type of casual use by many people is also a reason we are striving to create the AxelGlobe infrastructure.”





PT Pertamina (Persero) Refinery Unit IV

Indonesia's largest gas and oil company, PT Pertamina (Persero), joined hands with the azbil Group to participate in a Japan-led Joint Crediting Mechanism (JCM) project with Indonesia as the partner country. In this project, Pertamina used advanced Azbil control technology at a power plant to optimize boiler operation, and succeeded in reducing CO_2 emissions by significantly more than the initial target.

Installing low-carbon technology aids environmental management

PT Pertamina (Persero) is an oil company established by the Indonesian government in 1957. It was privatized in November 2001 and grew into one of the largest oil and gas companies in the country. Pertamina has oil and natural gas mining bases throughout Indonesia and six oil refineries that produce a wide variety of products, from various fuels (gasoline, light and heavy oil, liquefied natural gas [LNG], jet fuel, etc.) and non-fuel products (asphalt, coke, etc.) to petrochemical products (benzene, paraxylene, etc.).

Indonesia's high economic growth has continued since 2001, and currently the demand for gasoline and other sources of energy is rapidly increasing, so the strengthening of refinery capacity is a national policy in Indonesia. As an Indonesian state-owned limited liability company, Pertamina is taking the lead in boosting the capacity of oil refineries and additionally in working on environmental issues as well as industrial ones. For that reason it is proactively tackling management issues such as the environment and energy efficiency. No surprise, then, that it chose to participate in the Joint Crediting Mechanism (JCM) demonstration program, which was established and is implemented by Japan.

Operational status of boilers can be checked from an office PC.

JCMs involve Japan and a partner country, and aim to disseminate leading low-carbon technology, products, systems, and services among developing countries and to reduce greenhouse gas emissions. Japan's contributions to greenhouse gas reduction through JCMs are evaluated in a quantitative manner, and are used to achieve Japan's reduction targets. Azbil was entrusted by the New Energy and Industrial Technology Development Organization (NEDO) with a project entitled "JCM Demonstration and Verification Project: Utility Facility Operation Optimization System in Indonesia." The boiler system of Pertamina's Refinery Unit IV, which is located in Cilacap in Central Java province, was selected for the demonstration project.

Optimized boiler system operation cuts 35,000 tons of CO_2 emissions

An oil refinery consists of an oil refining facility and a utility plant. The utility plant consumes about half of the fuel used in the entire refinery, so the project aimed to reduce CO_2 emissions by installing Azbil's advanced control technology in the utility plant to make it more efficient.

"Previously we saw significant results when Azbil's advanced control technology was installed in an atmospheric distillation tower. Based on that achievement, we had great expectations for energy savings at the power plant," says Facility & Quality Officer Nidlom Muddin.

In April 2017, Azbil's advanced process control solution was installed for the boiler system. In December the advanced control technology was installed, and in January 2018 operation began. The utility plant's boiler system was a dual fuel type that could burn both oil and gas. Because boiler efficiency depends on the characteristics of the individual boilers, it was important not only to optimize boiler load allocation but also to determine which boilers should use gas to maximize efficiency. Azbil calculated the ratio of oil and gas, built a control system for distributing gas to high-efficiency boilers, and achieved considerable energy savings compared to the previous situation.

"In the past, we allocated fuel manually to each boiler from a distributed control system (DCS).*1 After the introduction of Azbil's advanced control technology, fuel is allocated automatically, which increases system efficiency and reduces CO_2 emissions," comments Didik Bahagia, Engineering & Development Manager.

"Previously, Azbil provided PID tuning for the existing DCS, which made the boilers run very stably. Afterwards, when the advanced control technology was applied to the boiler system, we definitely saw positive results," adds Auromi Fitranurkhaliq of the Process Engineering I Department.

"Our initial target for CO_2 reduction was 20,000 tons a year, but we obtained 35,000 tons of CO_2 reduction in 10 months. The amount of fuel reduction is valued at more than 300 million yen," notes Nanda Dharma Parayana, Senior Specialist in the Refining Process Solution Department.

Onsite personnel training results in continuous benefits

Azbil was deeply involved in the training of operators and other onsite personnel when the advanced control technology was installed.

Looking back on that time, Herry Saleh, a manager in the Process & Product Improvement Department, remembers, "There was a delay caused by some trouble with equipment, and other problems, but Azbil communicated closely with onsite personnel and completed the installation on schedule. Also, in spite of frequent personnel changes, Azbil staff patiently trained newly assigned operators."

In the event of a problem with the equipment, boilers are manually operated. After they return to stable and steady operation, the operators can switch to automatic operation of the advanced control technology at their discretion. Pertamina's operators learned about the advanced control technology and other boiler operation know-how through training by Azbil. Equipped with this detailed knowledge, they understand how to handle the boilers. As a result, the operating rate of the advanced control technology is kept high, leading to a definite reduction in fuel and CO_2 emissions.

"Azbil has continuously provided training for Pertamina's operators. This has had a positive effect on Pertamina's sustainability goals, specifically, continued energy conservation," explains Mr. Saleh.

"When we faced a problem, such as a communication error between the advanced control technology and the existing control system, Azbil responded to it very quickly. First PT. Azbil Berca Indonesia dealt with the problem, and additionally Azbil Corporation investigated the root cause and solved the problem by remotely accessing the system," says Mr. Muddin.

"Because we are working on several projects, such as improving the octane number of gasoline, expanding the capacity of our oil refineries, and complying with European diesel regulations, it is very important for us to improve energy efficiency. Also, the advanced control technology is essential for producing high-value products," says Lead of Process Engineering I Hermawan Yudhistiro.

"Azbil has achieved both targets, namely fuel and CO_2 reduction, which is challenging, and it has also trained our personnel, which was a management goal. We are looking forward to further cooperation with Azbil as a business partner," says Vice President Yulian Dekri.

glossary

***1 ▶ Distributed control system**
A system designed exclusively for the monitoring and control of manufacturing processes and production equipment in plants and factories.

PT Pertamina (Persero) Refinery Unit IV

Address
Jl. Mt. Haryono No. 77, Rawakeong, Lomanis, Cilacap Tengah, Kabupaten Cilacap, Jawa Tengah 53221 Indonesia

Beginning of Operation
1974

Business
Development and refining of crude oil and natural gas, distribution and sale of petrochemical products

Yulian Dekri
Vice President
Refining Performance Excellence
Head Office

Nur Qadim
Senior Manager
Operation & Manufacturing
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Herry Saleh
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Didik Bahagia
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Business Development & Performance Excellence
Refining Directorate
Head Office

Hermawan Yudhistiro
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Refinery Unit IV

Auromi Fitranurkhaliq
Process Engineering I
Refinery Unit IV

azbil MIND vol. 35

New Organization Accelerates Business in Southeast Asia

Newly created organization takes on the role of promoting business, creating strategic plans, and managing business for azbil Group companies throughout Southeast Asia in order to promote Group synergy.

Until recently, Azbil Corporation conducted business in Southeast Asia solely through its subsidiaries. Then in April 2018, it established the Strategic Planning & Development Office for Southeast Asia, which reports directly to Azbil headquarters. With the primary objective of driving comprehensive business development and growth throughout all of Southeast Asia, the newly established organization cooperates with individual overseas subsidiaries to undertake initiatives including business promotion, strategic planning, and business management that take regional circumstances into consideration, and to provide the azbil Group's unique products and services to customers.

A region-wide strategy aids business in Southeast Asia

Azbil Corporation opened the Strategic Planning & Development Office for Southeast Asia (hereafter, ASPO) in Singapore in April 2018 with the aim of achieving further business growth throughout Southeast Asia by providing region-wide business support and management.

Anju Jaswal
ASPO Managing Director
Strategic Planning & Development Office for Southeast Asia
Azbil Corporation

Until that point, the azbil Group developed its Building Automation (BA) business (for offices and large-scale buildings) and Advanced Automation (AA) business (for industrial facilities) through its subsidiaries in Southeast Asia. However, there is an accelerating trend towards economic integration in the region, and the region's presence in the worldwide economy is growing. As the region's economy grows, the azbil Group must also grow and respond rapidly to changing demographics and needs. The new organization was established in Singapore with the aim of strategically raising the level of business activities pursued by the subsidiaries.

The azbil Group already had one company in Singapore, Azbil Singapore, which has a 20-year history of business operation. Also, the Singapore government has been actively involved in the adoption of Industry 4.0 and Industrial Ethernet cutting-edge technology, so many potential customers in the city-state are proactively considering the adoption of Azbil's products and services, which use next-generation technology like artificial intelligence (AI) and the Internet of Things (IoT). Leveraging this kind of advanced business environment, ASPO is working together with the azbil Group's overseas subsidiaries to expand sales activity to Southeast Asian customers.

ASPO aims to stimulate business activity in the region and to achieve business growth by assisting and strengthening subsidiaries in the six countries of Vietnam, Thailand, the Philippines, Malaysia, Singapore, and Indonesia, including region-wide business promotion, strategic planning, and business management for all of Southeast Asia. ASPO also initiates activities that are challenging for individual subsidiaries, enabling the provision of a wider range of products and services to customers in Southeast Asia. Furthermore, ASPO approaches the market with a regional perspective, understanding the current and future needs of the region and its customers, and takes action with a medium- and long-term view.

Know-how developed in Japan contributes to energy conservation and smart industrial safety

Southeast Asia has seen a growing interest in energy conservation and smart industrial safety. For example, Singapore has a certification system called the Green Mark Scheme for environmentally friendly buildings, and aims to have 80% of the buildings in the city-state certified by 2030. In Thailand, smart industrial safety using the latest technology, such as the IoT, AI, and big data, is gaining more attention in order to cope with aging equipment, retirement of skilled operators, etc.—challenges which are seen in Japan as well. ASPO would like to meet this kind of societal demand and contribute to its customers' businesses in Southeast Asia by suggesting solutions based on the abundance of technology and know-how developed by Azbil in Japan.

ASPO has the additional role of strengthening industry-academia-government collaboration. ASPO has been involved in enhancing collaboration with the Singapore Economic Development Board, "a government agency under the Ministry of Trade and Industry … responsible for strategies that enhance Singapore's position as a global centre for business, innovation, and talent."* An example of ASPO's activities in this regard is its advancement of an R&D project currently in progress with Nanyang Technological University, a leading public university in Singapore.

Through active communication between subsidiaries in the region and between subsidiaries and Japan, effective strategies can be shared and collaboration can be deepened.

In October 2018, the Asian version of the Hannover Messe (the world-famous industrial trade fair held in Germany every year) was held for the first time in Singapore with the title "Industrial Transformation Asia-Pacific" (ITAP). Led by ASPO, the azbil Group participated in the trade show and exhibited Azbil's unique products and services. The Azbil showroom was chosen as one of the best industrial transformation showcases and a technical tour was organized for visitors by the ITAP organizers after the exhibition. This year, the azbil Group will once again participate in ITAP, with ASPO leading the effort. Through such endeavors, Azbil is increasing its presence in the region.

Marketing of selected products to potential new customers

It has been slightly over one year since ASPO was established. In fiscal 2018, ASPO initiated regional research to understand the market characteristics and conditions of each country.

ASPO conducted comprehensive research of the BA market, one of the azbil Group's core business areas. The research was aimed at identifying potential customers who have not been addressed previously by individual subsidiaries. The subsidiaries will begin sales activities based on the results of the research. Collaboration in sales activities among subsidiaries and related Azbil departments, etc., is already progressing, and the azbil Group is also building new relationships with customers by providing solutions for their businesses in various countries.

For the AA business, a decision was made in 2018 to focus on promoting Azbil smart valve positioners, which have functions essential for achieving smart industrial safety. This significantly boosted sales activities in the region. The business promotion framework for positioners is used region-wide, and will be applied to other products in the future. In the same way as for the BA business, market research was conducted for the AA business. The research results identify common requirements among Southeast Asian countries. Approaches that are successful in promoting a product or service will be applied to other products or services that can contribute to the same industry.

By closer cooperation with Southeast Asian subsidiaries and related Azbil departments in Japan, ASPO will facilitate providing high value-added products and services to customers in the region.

In May 2018, a showroom to benefit stakeholders in Southeast Asia was established next to the Strategic Planning & Development Office for Southeast Asia. The showroom has a direct communications link to the showroom at Fujisawa Technology Center in Japan, allowing shared real-time presentations and discussions between the two.

*Source: Economic Development Board webpage (https://www.edb.gov.sg/en/about-edb/who-we-are.html).

Keywords A to Z Vol. 21

Keyword Sustainable Development Goals

The Sustainable Development Goals are international goals adopted at a United Nations summit in 2015, for the period from 2016 to 2030. Seventeen goals and 169 targets were established in order to achieve a sustainable, diverse, and inclusive society where no one will be left behind.

United Nations adopts goals to "leave no one behind"

The Sustainable Development Goals (SDGs) were adopted by the 193 member countries of the United Nations at a UN summit in September 2015. These goals are the successor to the eight Millennium Development Goals (MDGs), which were aimed at eradicating poverty and hunger, and which achieved some progress during their 15-year period. In addition to some of the MDGs that must be continuously addressed, problems that have newly come to light were included among the SDGs' 17 goals and 169 targets.

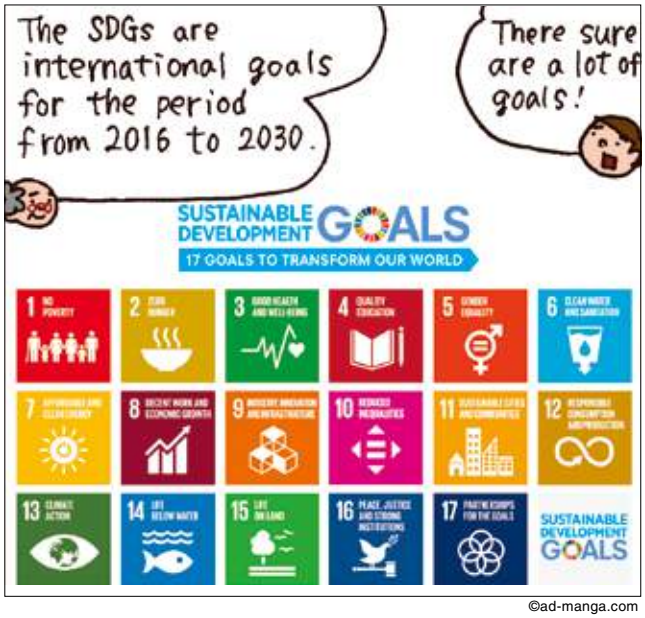
Not only have the number of goals increased but also the range covered has been broadened, so that it includes economic growth, social inclusion, and protection of the environment. The key message of the SDGs is "Leaving No One Behind." The SDGs are said to include all people, regardless of differences of nationality, ethnicity, religion, politics, economy, etc.

A big change from the MDGs is that business enterprises were included in the main parties expected to take action. To date, governments and non-governmental organizations (NGOs) have played a central role in the UN's activity, but in the SDGs business enterprises are positioned as important players who are requested to tackle the demands of sustainable development. A number of global companies have already incorporated the SDGs into their activities and also utilized them for marketing and publicity to increase enterprise value.

Targets are comprehensive, involving everyone in the world

Some of the SDGs may not seem relevant to your daily life. For example, Goal 2, "Zero hunger," is surely important, but in developed countries we do not often see local news about serious hunger so we might feel that it is a problem somewhere far away.

On the other hand, Goal 8, "Decent work and economic growth," is important in every nation, and companies doing business overseas need to think about it together with local people. Also, among the SDGs are some with a global scale, such as Goals 13 to 15, "Climate action," "Life below water," and "Life on land," which pertain equally to all people.



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People's degree of interest in each of the 17 SDGs may not be the same, but every goal has a point of contact with people somewhere. Admittedly, it might be easier for enterprises in primary industries or for the food processing industry to feel a connection to the starvation issue. The goal for climate change is a formidable one but concrete efforts are increasing, such as conducting emergency drills and creating emergency maps in order to prepare for natural disasters that may occur locally.

Not temporary support, but sustainable activity

It is important that activity to achieve the SDGs be sustainable. Donations or support based on surplus earnings will not continue if the principal is lost, so they are not a fundamental solution to the problem. Ideal solutions must be economically viable. In other words, the idea is not to take action on the SDGs in order to make a contribution to society, but rather to solve society's problems through the natural course of a company's business.

In addition, it is important for each employee to work with an awareness of the SDGs. The key is to incorporate them into the business goals of each department, and to continue to work on them on an individual level.

The sustainable development goals for 2030. What they are aiming for is to end poverty, eliminate the gap between rich and poor, preserve the Earth's environment, and foster peace, which are universal and cross-border goals. How should we move forward from here? By launching initiatives corresponding to the 17 SDGs, as part of international partnerships.

Cover photo: Osaka, Japan, by Koji Mizutani, Merry Project representative director

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