azbil

2018 Vol.3
azbil Group PR magazine

azbil FIELD
Narita International Airport Central Heating and Cooling Plant

azbil MIND
Supplying Products to Chinese and Global Markets as a Core Production Site for the azbil Group

Special Feature

Magical Film That May Bring About Changes in Agriculture

Japanese Technology for Sweet 'Fruit Tomato' Production

Magical Film That May Bring About Changes in Agriculture

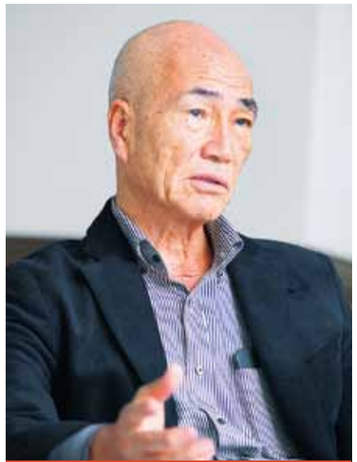
They look like ordinary tomatoes—but with a surprisingly sweet flavor and strong umami taste. These tomatoes, which are silently gaining popularity, are grown in a special way, using a farming method called Imec® (film farming). Imec makes it possible for anyone to easily grow high-quality crops, by using a sheet of film instead of soil.

Dense, fine roots hold the surface of the film

Imec® is a new culture system that is distinct from soil culture or hydroponics used in plant factories, etc. At first glance it looks similar to hydroponics, but the roots are not immersed in water; rather, they spread out laterally on the surface of a transparent film. It is as if the roots are floating on the surface of water, along with the film. Even if the film is turned upside down, the crops will not fall. This is a sign of how firmly they are taking root on the film.

Dr. Yuichi Mori, who developed the Imec film, explains that the film has two major functions. The "membrane function" is one of them.

"This film is made of carbon, oxygen, and hydrogen. There are numerous nano-sized pores that let through water and nutrients such as phosphoric acid, nitrogen, and potassium, but shut out bacteria and viruses, which are larger than the pores. In this way, the risk of plants getting a disease is greatly reduced. Degradation of water is a major issue with hydroponics, and once disease-causing bacteria enter the water system, the plants quickly come under their influence. On the other hand, through the Imec film, bacteria and viruses can be eliminated even if water is rotten, so we can control the use of pesticides and thereby increase safety."

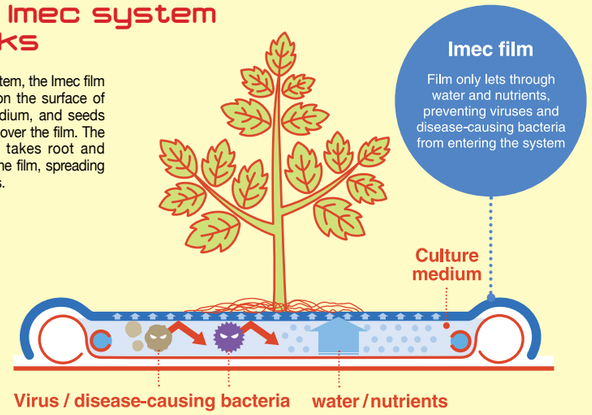


Dr. Yuichi Mori
Chief Executive Officer, Mebiol Inc.

Born in Tokyo in 1942, Dr. Mori received a Ph.D. in engineering from the Department of Applied Physics, Waseda University Faculty of Science and Engineering. He then worked for major corporations in Japan as well as the United States, including Toray Industries, Inc., Terumo Corporation, W.R. Grace, and founded Mebiol Inc. in 1995.

How Imec system works

In Imec system, the Imec film is floated on the surface of culture medium, and seeds are spread over the film. The plant then takes root and grows on the film, spreading out its roots.



Imec tomatoes are grown in the middle of the desert in Dubai.

Dense, fine roots are growing from the root.

Another function is the "hydrogel function." Hydrogel, a substance that contains water within, is used when there is a need to render the material moisture-absorbing. Products that utilize this technology, which may be familiar to many, include diapers. "Hydrogels used in diapers absorb roughly 10 cc of fluid per 1 g. Once absorbed, the fluid would not come out even if the gel is squeezed, and the surface remains dry. The Imec film is provided with the same hydrogel function. The Imec film, which is spread over the surface of culture medium, absorbs a large amount of medium from the bottom side of the film without letting it out at the top. So the film surface is dry. In other words, it automatically controls water content, and hence, the plant grown on the film keeps spreading its roots out in order to take up nutrients within the film."

Some interesting facts were revealed when the roots of baby leaf greens grown by Imec system were investigated. The thick part of the root was the same as that observed in plants grown by a general farming system, but some parts were covered with a tremendous amount of fine roots.

"In soil culture or hydroponics, plants extend their roots in search of water and nutrients so they don't grow a massive amount of fine roots, unlike the case of Imec. Those fine roots on the film are characteristic in that the thickness is roughly 1/100 of the root of plants grown in soil culture or hydroponics, while the surface area is tens of thousands times greater. This means that the ability to absorb water and nutrients is greatly increased. Thus, crops grown on the film can survive in harsh environments, and what is more, they are likely to have high nutritional value."

Towards production of functional foods with excellent nutritional value

In farming, the amount of water or fertilizer is sometimes intentionally reduced in order to improve the taste of crops. Unable to take in water and nutrients, plants try to protect themselves by increasing their own nutrient content. Moreover, the lack of moisture results in condensed sweetness and umami taste. By taking advantage of these reactions, it is possible to improve the taste of crops (e.g., increased sugar content). With Imec system, a similar condition is created naturally.

'Fruit tomatoes' grown in Imec farms have a strong sweet taste with moderate tartness, and they have a reputation for having a 'strong tomato flavor. Moreover, unlike general sweet tomatoes, their sweetness does not remain in the mouth, and there is no peculiar raw, green smell.

"The sugar content of Imec fruit tomato is high, at roughly 10 degrees, and their nutritional value is also known to be high. Tomatoes contain high levels of glutamic acid, an umami component, as well as lycopene that has an antioxidant effect and GABA that has an anti-stress effect. According to data from an independent survey conducted by a farm, Imec fruit tomatoes contain almost three times as much glutamic acid as common fruit tomatoes do, and nearly nine times as much lycopene and more than 60 times as much GABA. As such, Imec fruit tomatoes are not only tasty, but there is also a functional aspect that they contribute to our health."

Imec system makes it possible to carry out farming even in barren lands, as it requires no soil. A new industry can be created as long as there is sunlight, air, and a little bit of water. It is also meaningful from a perspective of addressing expanding food demands. "Today, degradation of soil is a problem faced globally. Also, while much of precious fresh water is used as agricultural water, in reality, it is only partially absorbed by plants since most of it sinks through the soil or evaporates into air. I believe that Imec system may also contribute as a solution to these problems related to soil pollution and water shortage. Currently, we are promoting the production of Imec tomatoes in Rikuzentakata City, which was damaged by the 2011 Great East Japan Earthquake and tsunami, as well as in areas near Shanghai where soil contamination is feared and other places where water is valuable, such as the desert in Dubai. The number of offers from across the world is rapidly increasing, and I feel that expectations for Imec are strong. I would like to spread Imec throughout the world as a technology of Japan that we take pride in".

This innovative tomato production might spearhead significant changes in global agriculture.

* Imec are trademarks of Mebiol

Narita International Airport Central Heating and Cooling Plant

At Narita International Airport, a central heating and cooling plant provides chilled and hot water for air conditioning and heating to about 50 facilities inside the airport. As part of its ongoing efforts to conserve energy, Narita International Airport initiated an energy service company (ESCO) project to introduce a system that would ensure optimal heat source operation. The system, which provides guidance for optimally starting and stopping various heat source equipment based on the demand projections calculated from weather information, has resulted in energy cost savings far exceeding the targets.

Energy Conservation at the Plant Providing Chilled and Hot Water to Airport Facilities

Narita International Airport is a hub airport and, for international travelers, a representative of Japan. Since the number of inbound tourists has rapidly increased in recent years, Narita's presence as an air gateway welcoming international passengers to Japan has also increased.

Since the airport opened in 1978, it has been working on measures to lessen the local environmental impact caused by the airport's operation and to help preserve the Earth's environment and contribute to establishing a sustainable society.

The monitoring room of the airport's central heating and cooling plant, where Advanced-PS and the utility optimization software package are installed.

"In recent years, we have been searching for a way to reduce the energy of the central heating and cooling plant, which is a large energy plant providing chilled and hot water for air conditioning and heating to about 50 facilities located in the airport, such as passenger terminals, cargo buildings, etc.," explains Akira Kondo, a manager in the Facilities Management Department of Narita International Airport Corporation.

"We had already introduced energy-saving equipment and cogeneration technology along with operational changes, but more drastic measures were needed to achieve further energy savings," adds Tetsuya Yamamoto, a section manager in the Mechanical Systems Department of Narita Airport Facilities Corporation.

Dramatic Reduction of Heat Production Costs without Decreasing Heat Supply

It was Azbil Corporation, early in 2012, that proposed a way to save energy at the central heating and cooling plant. According to the proposal, adding a utility optimization software package to Advanced-PS™, which is used as the DCS[*1] for monitoring and controlling the heat source equipment, would provide heat production cost savings without decreasing the heat quantity supplied from the central heating and cooling plant to each facility.

The utility optimization software package determines when to start and stop the heat source equipment by making calculations based on weather forecast data. It also shows predicted and measured temperature values, and charts of the planned and measured amounts of heat production.

"A general energy-saving measure to decrease the heat supply to each facility would have an impact on the comfort of customers and employees," comments Mr. Kondo. "In this respect, Azbil's proposal, which would raise heat production efficiency without changing the supplied heat quantity, made good sense for our facility management."

"Azbil's proposal allowed us to use the existing monitoring and control system so that large-scale upgrade work was not required, which we valued as well," adds Shugo Ohba of the Facilities Management Department. "Furthermore, it was an ESCO project.[*2] For that reason it did not require a large initial investment, but achievement of the preset target was guaranteed, which was a big attraction for us because we could minimize the investment risk."

An electric chiller in the central heating and cooling plant.

A two-drum water tube steam boiler.

Narita International Airport adopted Azbil's proposal and introduced the utility optimization software package to the existing facilities in 2013. In April 2014, service began based on the 5-year ESCO contract.

Cost Minimized by Guidance for Optimized Starting and Stopping of Individual Heat Source Units

A substantial portion of the passenger terminals at the airport is covered with glass, and therefore the heating load or cooling load needed for heating or air conditioning depends on the weather. The main goal of the utility optimization software package is to calculate the demand for chilled and/or hot water for air conditioning and heating based on external weather forecast services. The utility optimization software package predicts the energy needs in half-hour periods for up to 24 hours based on the latest weather information, which is updated every 60 minutes, and provides operators with guidance on which heat source equipment in the central heating and cooling plant to select—for example, whether to use an electric or a gas unit—and when to start or stop the equipment. Taking into consideration the unit cost of energy, which changes every month, it supports heat supply operation by a best mix of equipment, electricity and gas, to minimize the cost at each moment.

"In the past, operators started or stopped the heat equipment at their discretion, based on the weather that day or the temperature on the previous day. But after installing the utility optimization software package, we were able to start or stop the equipment on a more optimal and detailed timeline. For example, we previously started the equipment with a margin of 1 hour, but the software guidance shortened that to 30 minutes. Small amounts of cost savings can lead to a big result," says Mr. Yamamoto.

Additionally, according to Eiichi Shimada, a chief engineer for the Mechanical Systems Department, "Since the start of operations, we have shared with Azbil the advice given by the utility optimization software package, along with the actual operational status of the site's facilities. Based on that information, Azbil has tuned the system and increased the accuracy of the advice."

Final decisions on starting or stopping the plant equipment are made by a frontline operator. Through the past 3 years of system operation, onsite know-how accumulated by the operators, combined with the knowledge that Azbil has incorporated into the utility optimization software package, has taken the cost-efficient operation of the system to a higher level.

The target preset for energy cost reduction was achieved in the very first fiscal year. Furthermore, an unexpected level of improvement, 140 % of the target, was reached in the 2nd and the 3rd fiscal years, which was the equivalent of about a 700 ton reduction of CO_2 emissions per year. The energy-saving project helped the environment as well as producing savings.

"At trimonthly meetings, Azbil reports to us in an easy-to-understand way about the results from the utility optimization software package. Additionally, we appreciate Azbil's support in resolving problems that occur on the site, and its positive efforts to provide us with information and know-how on energy-efficiency in general," comments Masato Hagiwara of the Facilities Management Department. "We would also like Azbil to deliver not only help with further energy cost reduction, but also proposals for energy-saving measures from a broader perspective, beyond the framework of the measures taken this time," says Mr. Kondo.

Narita International Airport Corporation

Address
NAA-Bldg., Narita International Airport, Narita, Chiba Prefecture

Establishment
July 30, 1966 (New Tokyo International Airport Authority)
April 1, 2004 (Narita International Airport Corporation)

Business profile
Management of Narita International Airport, retailing such as operating shops and other facilities, facility leasing, railway service

Akira Kondo
Manager, Mechanical Systems
Facilities Management Department
Airport Operations Division
Narita International Airport Corporation

Shugo Ohba
Mechanical Systems
Facilities Management Department
Airport Operations Division
Narita International Airport Corporation

Masato Hagiwara
Mechanical Systems
Facilities Management Department
Airport Operations Division
Narita International Airport Corporation

Tetsuya Yamamoto
Section Manager
Cooling and Heating Energy Supply Section
Mechanical Systems Department
NARITA AIRPORT FACILITIES CORPORATION(NAFCO)

Eiichi Shimada
Chief Engineer
Cooling and Heating Energy Supply Section
Mechanical Systems Department
NARITA AIRPORT FACILITIES CORPORATION(NAFCO)

glossary

1 ▶ *DCS (Distributed Control System)
A system that monitors and controls the manufacturing process or production facilities in plants and factories. To achieve even distribution of load, the DCS distributes the functions of each device over a network, resulting in safety and excellent maintainability.

2 ▶ *ESCO (Energy Service COmpany) project
A project in which an energy service company guarantees a certain level of energy savings through the provision of comprehensive services for the reduction of energy consumption in a factory or building. There are two types of contract.
Guaranteed-savings contract: The facility owner bears the project costs and the energy service company guarantees the energy savings.
Shared-savings contract: The energy service company bears the project costs and the customer pays a fee for the energy savings and other services.

azbil MIND vol. 31

Supplying Products to Chinese and Global Markets as a Core Production Site for the azbil Group

Azbil Dalian opened in April 1995 in the Dalian economic and technical development zone in China. Since its opening, the company has achieved steady expansion of the items produced and of production capabilities while ensuring product quality. As the azbil Group looks toward the global market, Azbil Dalian will play a greater role as one of the Group's main factories and a core production site that boosts the azbil Group's sales strength.

Staged Expansion of Products and Capabilities Contributes to Product Development for the Overseas Market

The city of Dalian in Liaoning Province, where Azbil Control Instruments (Dalian) Co., Ltd. (hereafter "Azbil Dalian") is located, has developed as a major center for international shipping in North East Asia. China's first economic and technical development zone was created in Dalian, an event which introduced the name of the city to the world. Attracted by preferential treatment from Dalian's administration, foreign-owned companies in a variety of industries have begun operation there, such as companies from the petrochemical, equipment manufacturing, information technology, and shipbuilding industries. Among these companies, the number of Japanese firms surpasses that of all other countries, accounting for a quarter of the total.

Ichiro Kayama
General Manager
Azbil Control Instruments (Dalian) Co., Ltd.

With a view to penetrating the then-rapidly growing Chinese market, as well as the global market, Azbil Corporation established Azbil Dalian (formerly known as Dalian Yamatake Instruments Co., Ltd.) in Dalian's economic and technical development zone in 1995 with the aim of establishing a core production site that would strengthen the sales strength of the azbil Group.

Azbil Dalian initially manufactured mainly valves for air conditioning for the building market and product components such as mechanical switches for the industrial market. Since then, it has increased the variety of items produced as a result of production transfers from Japan. It began to manufacture industrial valves for plants and factories around the year 2000, positioners for those valves starting in 2007, and differential pressure and pressure transmitters (etc.) starting in 2014.

The company's well-equipped site includes two factory buildings, an employee recreation building, a company dormitory, and a gym.

To Ensure Quality, Azbil Establishes a System that Integrates Processes from Production to QA

While strengthening its production capabilities, Azbil Dalian has also been absorbing the technologies accumulated over more than 100 years since the founding of Azbil Corporation, as well as pressing ahead with efforts to provide high-quality products.

As part of its commitment to ever better quality, Azbil Dalian has introduced the latest production equipment and has prepared an environment for non-destructive inspection using technology such as radiography, liquid penetrant, and magnaflux testing, which are used to assess the casting that serves as the core of a valve. In addition, a three-dimensional measurement device and roundness measuring machine were introduced to evaluate products at the site, instead of sending them to Japan for evaluation. The result has been shorter evaluation times, higher-quality products, and higher-accuracy assessment. Azbil Dalian has acquired and maintained various certifications in China by preparing the above-mentioned facilities and inspecting products itself.

Production line for assembly of ACTIVAL™ valves for air conditioning. Valves are shipped to various countries, but mainly to Japan.

Non-destructive radiographic testing is used to check a casting for a valve.

Assembled valves for industrial applications are inspected before shipment.

In the past, defective products were sent to Japan for an investigation of the cause. Now, however, investigation is performed by engineers at Azbil Dalian who have acquired the necessary skills and know-how from Japanese engineers. This has enabled prompt problem analysis and quality improvement, which are highly appreciated by customers.

Additionally, a facility to calibrate flowmeters was built at Azbil Dalian to measure the flow rate of liquids and gases according to Chinese measurement laws in order to strengthen the evaluation system, which is based on inspection, analysis, and calibration. In this way, an integrated product production system encompassing the range of processes from production to inspection, evaluation, and quality assurance was established.

Proactive Production Site Improvements as an Organization "That Never Stops Learning"

Azbil Dalian is also making strong efforts in the area of personnel development, which is necessary for product quality assurance. For example, producing valves requires a series of processes, from welding or machining parts to assembling those parts into a finished valve, which is done on the site, but only experienced engineers can weld or machine parts. Furthermore, Azbil Dalian engineers need to know how to design the products. To master these technologies, Azbil Dalian invited engineers from Azbil Corporation to come to China and also sent engineers to Shonan Factory, the azbil Group's core production site in Japan. As a result of mastering the needed technologies through these exchanges, Azbil Dalian is able to design a valve to customized specifications using the basic valve designs created in Japan.

Moreover, it is active in finding new targets for improvement. "Being a corporate organization that never stops learning, so that it can continuously grow stronger" is one of the three fundamental principles of the azbil Group that are mentioned in the medium-term plan for FY 2019. Following this principle, Azbil Dalian is proactively taking measures to identify production site improvements, in addition to receiving instructions or requests from Azbil Corporation. As an organization, it uses the PDCA cycle to evaluate whether existing problems have been resolved and to handle new issues.

In the future, the azbil Group will continue to expand production and strengthen the functions of its production sites with a view at shipping to the global market, based on a three-pillar production system consisting of Shonan Factory in Japan, Azbil Dalian, and Azbil Production (Thailand) Co., Ltd., which was established in 2014 and mainly manufactures components such as sensors and controllers. At the same time, it will establish an optimized distribution system to supply products efficiently to the global market. Azbil Dalian will surely be one of the core factories in the azbil Group in 2019, and additionally it will strive to expand its market in cooperation with Azbil Control Solutions (Shanghai) Co., Ltd., and Shanghai Azbil Automation Co., Ltd., which are handling sales, and Azbil Information Technology Center (Dalian) Co., Ltd., which is developing software. Also, a further system will be established to supply more products to sales offices, production sites, and group companies in Asia. A greater variety of products will be assigned to Azbil Dalian for production, and the company will supply products to the global market as well as the Chinese market.

In addition, the azbil Group, by strengthening its production system in order to sell to the global market, will provide products satisfying the needs of customers in each region, thereby maximizing value for customers' businesses.

Keywords A to Z Vol.17

Keyword Cogeneration/Trigeneration

Cogeneration is a technology for generating two types of energy, electricity and heat, from energy resources like natural gas and oil. Trigeneration generates one additional product such as carbon dioxide. These technologies contribute to efficient energy use.

Generating electricity and heat from one type of energy

How efficiently do we use our limited energy resources? Cogeneration is one widely used solution to help solve this critical global problem.

In Japan, electrical energy, which is so important in our lives, is mostly generated in fossil-fuel power plants using energy resources such as natural gas and oil. Electricity is transmitted to consumers through long power lines, resulting in energy loss. Only about 40 % of the primary energy consumed for power generation can actually be used by us. Energy that is not converted into electricity is mostly lost as heat energy.

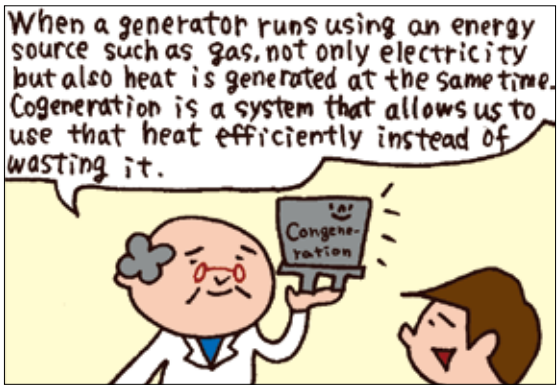
Cogeneration is a system for efficiently using heat energy before it is lost. Because it has the advantage of generating and supplying electricity as well as heat at the place where the energy is consumed, cogeneration facilities are often installed in buildings which consume both electricity and heat. Buildings that can benefit from cogeneration require heat throughout the day to meet the demand for heating, air conditioning, and/or hot water. Twenty-four-hour hospitals and hotels are good examples. Diesel engines, gas turbines, and gas engines are used to generate electricity and heat, allowing the efficiency of primary energy to be raised to 75–80 %.

Cogeneration has a long history. It is said to have begun in the late 19th century when steam was supplied from the Poststrasse power plant to the Hamburg city hall in Germany. Later, it spread widely, especially in Europe and the United States, as the development of the related technologies moved ahead. In Japan, it began to be introduced into the industrial market in factories, etc., because of the 1979 oil crisis. In 1981, cogeneration using city gas was adopted for the National Stadium in Tokyo and also began to be used in the private sector.

Further development of cogeneration is still ongoing. Better power generation efficiency has been accelerated by improved functions and performance of the cogeneration equipment itself. Research on control and energy management is constantly advancing in order to use electrical and heat energy without waste.

In recent years, cogeneration has also received attention as a reliable method of supplying energy. A tight power supply situation caused by the Great East Japan Earthquake in 2011 resulted in a growing need for energy efficiency and for a reliable power supply. Under such circumstances, cogeneration has been increasingly introduced for the disaster preparedness or BCP*1 to ensure the supply of power in case of an emergency as well as for its primary function, generating electricity and heat simultaneously on a daily basis.

What is more, using cogeneration during peak power demand times, such as hot summer afternoons, helps to level the load of the power systems supplying electricity from electric companies to consumers.



©ad-manga.com

Efficient use of carbon dioxide from exhaust gas for cultivation of plants

As stated above, cogeneration is a system for efficiently using electricity and heat. Trigeneration is a technology for using one additional type of product, such as the carbon dioxide (CO_2) in the exhaust gas that is produced during power generation. The prefix “tri” means three, and in this case refers to electricity, heat, and CO_2.

Currently, CO_2 is used in agricultural and industrial markets. In the agricultural market, it is used in greenhouse cultivation and “plant factories” (closed growing systems for plants) to accelerate photosynthesis. In the industrial market, CO_2 is used in the manufacture of some building materials or methanol, and in the neutralization of industrial wastewater. A variety of ways to use CO_2 will be sought in the future because using CO_2 efficiently contributes to reducing CO_2 emissions.

There are high expectations for cogeneration and trigeneration as technologies that promote preservation of the Earth’s environment and energy efficiency, two of the most important themes for our society.

*1: BCP (Business Continuity Planning)
Planning in advance by companies for response in times of emergency, in order to be able to continue with core business or recover rapidly after a natural disaster or other emergency.

Cover photo : United Kingdom London, by Koji Mizutani, MERRY PROJECT Representative

azbil
http://www.azbil.com/
Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.

azbil Group PR magazine, azbil 2018 Vol. 3, No. 8
Issued by Mikako Takahashi, Public Relations Section, Corporate Planning Department, Azbil Corporation
19F Tokyo Building, 2-7-3 Marunouchi, Chiyoda-ku, Tokyo 100-6419 Japan TEL: 81-3-6810-1006 FAX: 81-3-5220-7274
URL: http://www.azbil.com/

PRINTED WITH SOY INK
MIX Paper from responsible sources FSC® C002215

PR-3001E-1807 (1807-4K-D)

Company/Branch office