

# 2020 No. 3 azbil Group magazine

azbil Osaka Municipal Central FIELD Wholesale Market (Honjo Market)

azbil MIND Contributing to Our Customers' Prosperous Future through Product Design



Special Feature Supreme Craftsmanship of Unique Creations Made by Independent Watchmakers



# Supreme Craftsmanship of Unique Creations Made by Independent Watchmakers

Mechanical wristwatches attract watch enthusiasts as decorative or luxury items. Craftsmen who singlehandedly create these mechanical wristwatches, combining tiny screws and gears of less than 1 mm in diameter, are known as "independent watchmakers."

We spoke with Hajime Asaoka, an independent Japanese watchmaker who is known for working on highly difficult watches, about his thoughts on making watches and his unique craftsmanship.

Original manufacturing down 6 to individual screws by a "perfect manufacturer"

Mechanical watches began as large clock towers indicating the time with a bell and were subsequently downsized into pocket watches along with the discovery of the laws of physics that govern such things as pendulums and springs, and technological innovation. These pocket watches evolved into wristwatches as the level of decorativeness and precision improved, especially in early modern Europe.



Hajime Asaoka

Born in Kanagawa Prefecture in 1965. After graduating from the Department of Design, Faculty of Fine Arts at Tokyo University of the Arts, he established the Hajime Asaoka Design Office. Becoming involved in the design of wristwatches he started making watches himself, and in 2009, he released the first Japanese high-end mechanical wristwatch equipped with a highly difficult tourbillon mechanism. His intensely original tches attract attention from all over the world.

In the present age of widespread smartphones and inexpensive guartz watches, mechanical wristwatches are increasing in value not only as tools for knowing the time but also as decorative items or works of art. High-end watches with beautiful and sophisticated mechanisms can cost as much as a house, but demand continues to be strong.

In the world of mechanical watches, independent watchmakers produce and sell their own watches under their own brand, without belonging to a manufacturer. Hajime Asaoka is one of only a few dozen people in the world to be a full member of the Swiss AHCI, Academy of Independent Creators in Watchmaking. Some watchmakers purchase movements from other companies and are known as *établisseurs* while others manufacture their own movements inhouse and are known as manufactures. Asaoka is known as a "perfect manufac*ture*" since he handles everything from design to manufacturing of individual parts such as gears, screws, and hands, as well as assembly of the movement, to create his watches from scratch.

Asaoka did not attend a watchmaking school but majored in product design at Tokyo University of the Arts. After graduation, he worked as a designer.

"I worked on a variety of designs for advertisements and magazines. But, even when designing watches, if you are working for a client, you have to meet their demands and it's difficult to make things the way you want to.'

Eventually, Asaoka decided that he wanted to make things in his own way, so he set about acquiring the skills and started making watches as a hobby while working. In 2008, he started making watches in earnest and took on the challenge of creating a watch equipped with a complex mechanism called a tourbillon, one of the most difficult components on a mechanical wristwatch. His reasoning was "it's meaningless unless it's interesting." His intense quest for creator-like manufacturing motivated him. The following year, the first watch with a tourbillon that was built by a Japanese national was released. The elaborate design, reliable technology, and sophisticated appearance earned high praise from Japan and abroad, and Asaoka joined the ranks of independent watchmakers.



What Asaoka emphasizes in making watches is to bring to life the mecha-



More than 100 parts make up a mechanical wristwatch Asaoka manufactures and assembles screws and gears of different shapes and sizes one by one



nisms and designs that he has envisioned. If he can purchase the parts to achieve this with high precision, he will outsource them, even though he is a "perfect manufacturer" who can make the parts himself. Dedicating the time he saves in this way to other tasks also improves the quality of the watch itself.

"However, I make the parts that require high accuracy by myself. For example, the machining of the parts of the pendulum, which is the heart of the watch, can only be adjusted to five thousandths of a millimeter by machine. From there, it is necessary to refine the parts by hand and fine-tune them, so it is easier to make adjustments with parts I made myself, because I can see the degree of error."

Asaoka uses machine tools to machine multiple parts at once using computer control, which may contrast with the image of a craftsman performing work manually. But he has the flexibility to incorporate the latest technology without hesitation if it means increasing the precision of the parts. Rough sketches are not used in the design. When he has an idea for a new movement mechanism or design, he thinks about how to assemble it and make it work, puts together a rough design in his head, and then creates an image of the completed parts using 3D computer graphics. By working in this way, he says that he can create detailed design drawings and produce watches that flawlessly match his ideas. An insatiable commitment to

In mechanical wristwatches, the components are affected by gravity due to changes in the position of the watch, such as how it is worn or set down on a surface, which causes errors to occur. To overcome this problem, the genius watchmaker Abraham-Louis Brequet invented the tourbillon mechanism in the early nineteenth century to balance the effects of gravity. It is known as one of the world's three most complex mechanisms, along with minute repeaters and perpetual calendars, and very few craftsmen in the world can make one.

precision and dedication to bringing his ideas to life are the basis of watchmaking for Hajime Asaoka.

For Asaoka, there is no essential difference between his own watches and collaborations with companies in terms of the watches being his own creations. More important than this, he says, is to "make what you wanted to make in the beginning" and to "not compromise on the method in order to bring your idea to life.'

"For example, take the watch exterior. As the material, precious metals and bronze are easier to process, but I choose stainless steel for its practicality and appearance. It is resistant to impact and scratches and has a beautiful finish when polished. This means, in terms of the design, I only make watches that I

ure on the left shows a chronograph (a watch equipped with a stopw that was released by Asaoka in 2017 and highly praised around the world. The beautifu movement can be seen, thanks to the see-through design. The picture on the right is a computer graphic diagram called a "rendering" in which the parts are arranged in layers. ons and overlapping of each part are expressed realistically.

# One of the world's three most complex mechanism What is a tourbillon?



would want to own. I make watches that only I can make for people who feel a connection to my watches. I think I have to focus on the uniqueness of my watches because I operate on a small scale."

Regarding his future plans, Asaoka says, "I want to make sure I don't miss any technological breakthroughs so I can utilize them in my watchmaking." Asaoka has been able to broaden his scope, thanks to improvements in machining technology and the breadth of his designs. With the name HAJIME ASAOKA emblazoned on the dials of his watches, we felt his unwavering determination to manufacture watches in his own name and in his own unique way.

The information in this article is accurate as of December 2018.

# Case Study





The Osaka Municipal Central Wholesale Market, also known as the Honio (Central) Market, serves as Osaka's "kitchen," supporting the eating habits of residents. It is a center for collecting, distributing, and trading vegetables, fruit, and marine products. Recently Azbil upgraded the cooling towers for the aging freezers and refrigerators at the market, as well as the equipment for the HVAC system, using an ESCO business model. Thanks to a variety of measures that went beyond mere upgrading of the equipment, Azbil provided significant energy savings, greatly exceeding the initial targets.

### Aiming for energy savings for the entire market using an ESCO plan to upgrade cooling towers and HVAC equipment

azbil FIELD

The Osaka Municipal Central Wholesale Market opened in its present location, Noda in Fukushima Ward, in November 1931 and was the largest general market in Asia at that time. Since then, together with the Tobu (East) Market, which opened in Higashi-Sumiyoshi Ward in 1964 to respond to the increased business that accompanied the rapid growth of the Japanese economy, the Honjo Market has supported the eating habits of Osaka-ites as the city's "kitchen," handling vegetables, fruit, and marine products. At present, over 260 billion yen changes hands there every year, making it the third largest market in Japan (after the Toyosu Market and Ota Market)

It is widely known that Osaka, which operates the market, has pioneered energy conservation measures at public facilities using an ESCO business model\* ahead of other local governments in Japan. Starting with the Osaka City General Hospital in 2005, the ESCO business model has been used at several facilities, including city offices, sports facilities, research institutes, and museums

"At the Honjo Market, the cooling towers for the freezers and refrigerators, and the hot and chilled water generating equipment for the HVAC system, had been operating for more than 20 years, and their age had become noticeable. As part of the ESCO project, we decided to upgrade to more efficient models in order to save energy," explains Honjo Deputy Director Isao Fujii.

For this purpose, the city of Osaka established requirements for developing an ESCO project, which was to continue for a maximum of 15 years from fiscal 2018, and ran a public tender in June of 2016. In the competition, which was judged by private experts, Azbil Corporation was selected as the best supplier based on its proposal of a 10% or more energy savings rate target for the entire market, utilizing business support

subsidies that are available for reducing energy consumption.

"The selection process assessed specific effects, such as the reduction of energy use and of carbon dioxide (CO<sub>2</sub>) emissions, as well as details on the results of the ESCO project, proposed innovations, construction plans, and the maintenance regime afterwards. The suppliers were scored on these points, and Azbil's proposal came out with the highest overall rating," says Honjo Subsection Manager Junji Nakajima.

## Avoiding disturbances to the market's daily operations with careful preparation and planning for construction

Subsequently, a business subsidy project to



Azbil's building automation system for small- and medium-sized facilities installed in an air-conditioning control



Cooling towers for freezers and refrigerators on the roof of the market.

upgrade of the first one was completed, the bypass valve was switched and the other cooling tower was upgraded. This allowed the replacement to be completed without interrupting the freezers and refrigerators or otherwise disturbing market operations.

2017, and construction began in September. The main elements of the project were the replacement of aging cooling towers for the freezers and refrigerators and replacement of the HVAC system's hot and chilled water generators with high-efficiency aircooled heat-pump chillers. In addition to installing variable speed drive units for the air supply/exhaust fans, Azbil provided LED lighting to replace the inefficient mercury and fluorescent lamps.

reduce energy use was adopted in August

Azbil also introduced its building automation system for small- and medium-sized facilities. This system is connected to Azbil's Dataware Center via the Internet so that Azbil can appropriately manage energy consumption trends at the market.

In the construction phase, Azbil followed a construction plan that did not disturb the wholesalers or other operations at the market. "For example," explains Mr. Nakajima, "the most important pieces of equipment at the market are the freezers and refrigerators that keep the food fresh-and at Honjo Market, we have some 500 freezers and refrigerators. They range in size from large units that are shared to small ones installed in individual stores. The key issue for the project was how to upgrade the cooling towers, which are indispensable for the operation of these freezers and refrigerators, without affecting daily operations."

All the freezers and refrigerators in the market are connected to the cooling towers by piping. Azbil devised a method whereby bypass piping installed between the two cooling towers and the freezers/refrigerators was utilized so that each cooling tower could substitute for the other one. This method was adopted during construction, allowing the equipment to be replaced without stopping the operation of the freezers and refrigerators. While one of the cooling towers was stopped for upgrade work, the other one continued operating, and when

"Before the actual upgrade," continues Mr. Nakajima, "we carried out a large-scale operation verification test in which we switched the bypass valve. We also took steps such as checking the volume of water and measuring how the cooling water temperature changed before starting construction. As a result, we were fully prepared for the cooling tower upgrade, and we completed the actual work without any problems. We were able to effectively take advantage of Azbil's expertise in air-conditioning and HVAC control."

"We anticipated that it would be difficult to install the LED lights in the market since we needed to install 6,000 units using aerial work platforms," adds Mr. Fujii. "Again, in cooperation with Azbil, we worked closely with market stakeholders in advance and followed a detailed construction plan. As a result, we were able to convert all the lights within the project scope to LEDs in just three months. I think Azbil did a great job in achieving this in such a short period of time."

# Significant energy savings achieved. far exceeding initial goals

As a result of the upgrade, Azbil delivered significant energy savings at the Honjo Market. For equipment within the scope of the ESCO project, the target CO2 reduction rate proposed by Azbil in the public tender was about 20.34%, equivalent to about 1106 kl/year of crude oil. But after one year, the results far surpassed that figure. Furthermore, on a monetary basis the project exceeded the planned reduction by 23%.

"Going forward, we expect to see various changes in the business environment.



Air-cooled heat pump chillers for the HVAC system. With a unified and redundant design, backup operation is possible in the event of a failure, providing security as well as energy savings.



An early-morning auction, Approximately 6.000 mercury and fluorescent lamps used in the market were converted to LEDs

such as an increase in the number of vendors entering and exiting the market, and it is important for us to figure out how to achieve even greater energy savings in spite of these changes. Our contract with Azbil lasts for 15 years, and over that time, we expect that Azbil will continue to support our efforts and provide advice on how we can fine-tune and improve the operation of our equipment," says Mr. Fuiii.



### glossary

\* Energy Services Company (ESCO) business model A business model in which a service provider guarantees the effectiveness of comprehensive services related to energy savings in factories and office buildings. There are two types of ESCO contract: a "guaranteed-savings contract" in which the custome provides collateral for the investment and acts as guarantor, and a "shared-savings contract" in which the ESCO company provides all the investment and the customer does not have to act as guaranto



# **Contributing to Our Customers' Prosperous Future through Product Design**

Incorporating into product development "a new type of automation where people and technology create together"

Based on our Group philosophy of "human-centered automation," we at Azbil focus on operations at the sites where people work in various markets, and we promote design that is oriented for the people who use the products at those sites. Our vision for automation is not only to provide convenience, comfort, safety, and security, but also to enrich people's ways of working and living, and to pursue innovation. Using peopleoriented design, we provide new value for our customers.

# Managing design across the company to express Azbil's unique character

he azbil Group's business development rests on three pillars: building automation (BA), advanced automation (AA) for industry, and life automation (LA), which more directly helps to enrich people's lives by utilizing the measurement and control technology cultivated in the areas of buildings and industry. Applying the philosophy of "human-centered automation" at customers' sites, we work together with customers to create new value and to solve problems. That philosophy is also embodied in our product design.

Azbil Corporation has made changes in order to promote user-oriented design across the entire company. Aiming for "a world of automation created by human ingenuity and technology" as a vision for the future, Azbil is establishing design guidelines common to the entire company. These guidelines are intended to inculcate human-centered design and encourage thinking about design during development.

The markets where Azbil does business are diverse, including buildings, factories, and plants. For these markets, in a unified way, Azbil designs and develops products ranging from monitoring systems to controllers, and also the sensors, valves, etc., connected to them, with a scope extending from the top to the bottom of the manufacturing process.

Design is useful not only to unify the outward appearance of these diverse products, but also to make complex functions more easily comprehensible, and thereby to help customers solve problems at their work sites. That's why we are working on product design. For example, for hardware and graphical user interface (GUI) design, we are devising means so that developers in any business unit can design a product that has uniform characteristics as an Azbil product. In the design process, we consider not only how customers will use Azbil products, but also how we can help customers in the field to spend less time thinking about how to use the products so that they can spend more time creating new value.

### Consistent design across business units contributes to user-friendliness and improved productivity

zbil provides products and services to customers in a wide variety of markets and industries, usually working behind the scenes to support every kind of manufacturing industry, infrastructure, and office environment. Most of our products are rarely seen by the general public, but we believe it is just such products that call for user-oriented design. Accordingly, Azbil is focusing on user-centered design in order to ensure that customers can do the right work at the site, that they can enjoy excellent product usability and operability, and that products resist damage and deterioration. This is because we believe that products embodying these qualities will provide safety, reliability, and efficiency.

As an example of the importance of consistent design, because Azbil operates in many markets, there are cases where products for the industrial market are used for building management, or where products for the building market are used in factories. Even though the same type of electrical signals are involved, if the user interface, etc., uses different expressions than other equipment in the building or factory, users may feel that it is confusing or inconvenient. Despite differences in business units, careful and consistent design of the details of each product can help to provide products that customers can use

Award-winning Azbil products

Red Dot Award: Product Design 2020 iF Design Award 2019 Good Design Award 2018



Controllers and input/output modules for savic-net™G5

### Good Design Award 2017



with peace of mind.

In addition, Azbil's human-centered design concept places importance on optimizing the user's experience with the hardware and GUI. The optimizing process begins with a thorough survey of why and how each type of assumed user will use our products. For example, at a building management location, some employees work on maintaining equipment like air conditioners, and others monitor the operation of the equipment. By gaining a full understanding of the details and purpose of each type of task, Azbil gathers the information it needs to provide an optimal GUI for each user.

In addition, to verify that the product can be used without errors, usability testing is incorporated into the design process. Customers and employees other those in the product's development department also use the product on a trial basis so that problems can be identified and improvements can be made, as part of a process that is repeated many times before a design is finalized.

# Winning high praise and design awards in Japan and abroad

A s a result of these efforts, the design of Azbil products has been highly rated, and a number of products have won prominent awards in domestic and international design competitions.

For the BA business, the controllers and input/output modules for the savicnet G5 building automation system received the Red Dot Award 2020, iF Design Award 2019, and Good Design Award 2018. The ceiling-mounted temperature sensor (round type), with its minimalist design form that allows it to blend in with its surroundings, received the iF Gold Award 2020, which is the top iF Design Award, Red Dot Award 2020, and Good Design Award 2019.

For the AA business, the compact digital mass flow controller, which controls gas flow with high precision in factory production processes, received the Good Design Award. For the consumer market, Azbil's residential cen-

# iF Gold Award 2020 Red Dot Award: Product Design 2020 Good Design Award 2019



Good Design Award 2018

tral air-conditioning system VAV specification, which is sold in Japan, received the Good Design Award. The award judges appreciated the fact that a tablet is used as a remote control and provides a wide range of controls while featuring intuitive operation.

At Azbil, we consider the comfort of the people employed at every work site, and we seek to express the unique Azbil character by paying special attention to design, not merely for appearance, but also for usability. This way of thinking helps to shape the brand for the entire azbil Group. As an automation manufacturer, our mission is to provide the products and services that people need to live comfortably and abundantly, and to make sure that the products and services that we provide for society are easy to use and safe. Going forward, guided by our philosophy of "human-centered automation" and building upon the foundation of technology we have developed, we will continue to work on product design in order to provide everyone with a more abundant future.



# Keyword Open Platform Communications Unified Architecture (OPC UA)

An international standard for a safe and highly reliable information communication infrastructure for industrial communication that enables data exchange between products from different vendors and between different platforms (operating systems, programming languages, data formats). OPC UA is a standard that is expected to support the automation of various devices and the realization of smart factories.

# Standardization of specifications and data linkage between devices that differ depending on the vendor

In factories, various manufacturing equipment, control devices, and systems are linked to achieve an automation system that supports production activities. The equipment and systems that make up an automated system usually consist of products made by multiple vendors, and the procedures and specifications for exchanging data are generally different for each vendor. Therefore, to link data between these different devices and systems, the creation of linking programs has been necessary. Naturally, this requires considerable labor and cost.

To solve the problems related to data linkage, OLE for Process Control (OPC) was created in 1996 with the cooperation of manufacturing machine and control equipment vendors and the manufacturers that use their products. If the interface mechanism for data integration built into each vendor's equipment and system complies with OPC, there is no need to create a separate program for connection, and data interoperability between products from multiple vendors is possible.

# A new international standard that supports the linkage of systems in a wide range of industrial fields

However, starting in the 2000s, the equipment and systems at factory sites were required to link not only within the automation area of the factory, but also with other production bases, with corporate headquarters, and with systems in a wider range of industrial fields, which gave rise to problems with OPC.

For example, OPC was based on Microsoft's data exchange mechanism, Object Linking and Embedding (OLE), so its use is limited to a Windows platform. In order to achieve data linkage beyond the framework of a factory, it was necessary to create a system that could be used on various platforms, not just Windows.

So instead of OLE, a technology called service oriented architecture (SOA)\*1 that inherited the data interoperability of OPC was adopted, and Open Platform Communications Unified Architecture (OPC UA) was created as an international standard. In OPC UA, the requirements of connection, communication, and safety, which were identified as the basic principles of data interoperability by the OPC Foundation, have been comprehensively incorporated. The OPC Foundation has led the formulation of the standard since the old version of OPC (OPC Classic).

First of all, regarding connection, OPC UA is based on the above-mentioned SOA and supports various platforms, including Windows and Linux, as well as iOS and Android installed on devices such as smartphones and tablets. Applications that use OPC UA can be built without dependence on an OS or programming language.

Regarding communication, in OPC UA, rules are established for defining metadata for each field or application. Metadata tells the meaning of the data that is actually exchanged,



so that, for example, the user can store data on temperature in one place and data on pressure in another.

Furthermore, regarding safety, in recent years various systems are interconnected by networks. These are not only general IT systems, but also operational technology (OT) systems, such as manufacturing machine and factory control systems. In this environment the danger of cyber attacks is increasing. When OPC UA is used, however, the general security countermeasure technologies used in the IT world, such as encryption, authentication, and digital signatures, are available.

# Adopted as an Industry 4.0 standard and used for smart production

Today, with the proliferation of Industrial Internet of Things (IIoT) initiatives, production sites and a wide range of systems and devices in industry are being connected to networks. The OPC UA concept of platform-independent safe information interoperability has won support in various fields.

An example is Industry 4.0, \*<sup>2</sup> which originated in Germany. The trend toward smart production sites using digital technology such as IIoT and Artificial Intelligence (AI) is spreading on a global scale. OPC UA has been adopted as a standard approach for data linkage in Industry 4.0.

To support the accelerating flow of networking and digitization in manufacturing and elsewhere in the industrial sector, OPC UA is expected to play an increasingly important role.

### \*1. Service Oriented Architecture (SOA)

The idea of building an IT system by implementing computer software functions in independent "services" and combining those services.

\*2. Industry 4.0

Also called the Fourth Industrial Revolution, this technological concept aims at automation, digitization, and computerization of the manufacturing industry. The Internet of Things (IoT) and cloud computing are part of Industry 4.0.

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