

**azbil
FIELD**

Solaire Resort & Casino

**azbil
MIND**

Developing Software to Create Value for
Customers While Striving to Become a
Self-Reliant Group of Experts



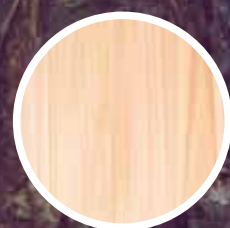
Special Feature

Made in Japan : A Novel Dream Material Made from Trees
The Potential of Cellulose Nanofiber

Made in Japan: A Novel Dream Material Made from Trees

The Potential of Cellulose Nanofiber

Layered structure of tree cellulose



Tree

A tree is an aggregation of plant cells, which are composed of cellulose nanofibers as their basic frame.

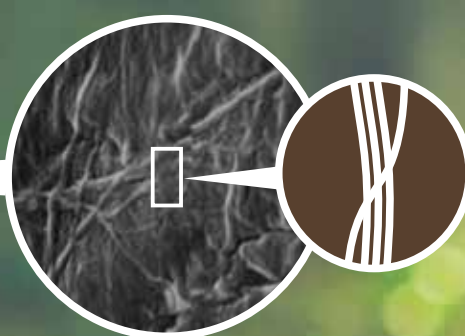
Extraction of wood fibers

Filament (Pulp)

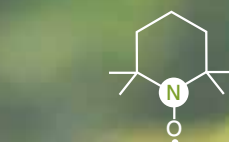


Pulp isolated from plants is composed of fibers with a thickness equivalent to that of a single hair, and is used as raw material for paper.

Surface of a filament



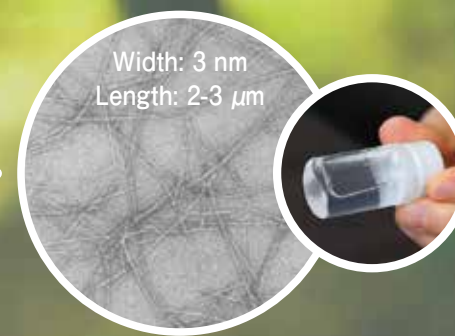
A single filament is composed of approximately 15 nm-wide cellulose microfibril bundles.



TEMPO catalytic oxidation*

Fibers are broken down in the water

Cellulose Nanofiber



Cellulose microfibrils are broken down into individually separated cellulose nanofibers using TEMPO catalytic oxidation, a chemical reaction occurring in water under ambient temperature and pressure.



Carbon neutral material with many useful features

Professor Isogai, along with experts in nano dispersion technology, established the TEMPO-catalytic oxidation method that can efficiently break down cellulose fibers to cellulose nanofibers with low energy. Cellulose nanofiber prepared by this method has homogeneous widths, approx. 3 nm wide each, regardless of different plant species or their growing regions, and is extremely stable. After the publication of the corresponding research paper in 2006, cellulose nanofiber has become rapidly known worldwide.

"The sizes of nanofibers prepared from wood cellulose by the TEMPO-catalytic oxidation method are uniform and smaller than the wavelengths of visible light. The nanofiber gel therefore is transparent without reflecting light. Furthermore, a transparent film with excellent oxygen-barrier properties can be formed from the nanofiber/water dispersion by casting and drying. Packaging materials made of this film can protect food and pharmaceutical products against oxidation by atmospheric oxygen and maintain high quality for a long time. Since the plants absorb CO₂ during their growing process, this packaging material can be regarded as carbon neutral, offsetting CO₂ discharge caused by incineration. This is an extremely unique, novel material."

Cellulose nanofiber is expected to be used as construction material for buildings, as well as for vehicles such as airplanes and cars, by taking advantage of its light weightness and strength. In addition, cellulose nanofiber can be used as a thickener with unique viscosity behavior to improve the quality of cosmetics and coatings.

Currently, more than 100 types of cellulose nanofibers are on the market. However, high-quality products manufactured using TEMPO-catalytic oxidation method result in higher cost. One strategy to reduce cost and fully expand the use of TEMPO-cellulose nanofiber is development of new, highly functional, and value-added products, which can be produced only using TEMPO-cellulose nanofiber. Therefore, in the utilization of cellulose nanofiber, innovative ideas coming from wide collaborations and research networks are required.

Man has discovered and taken full advantage of various materials, including iron, glass, rubber, plastic, and carbon fibers. Each new material has promoted the evolution of existing technology and further development of science. Now, cellulose nanofiber, produced from trees, is attracting attention as a new material originating from Japan. We spoke with Akira Isogai, professor at the University of Tokyo and a leading researcher in the fundamental research on cellulose nanofiber and its potential as a new material.



One fifth the weight of iron, yet five times stronger

Cellulose is a form of carbohydrate and is the main component in the cell wall and fiber of plants. Cellulose is said to be the most abundant carbohydrate on the planet. It forms the pillars in the innumerable layers of cell walls to support grasses and trees. Cellulose nanofiber is made from cellulose fibers such as wood celluloses extracted from plants, and refined to the nanometer level (nm=one millionth of a millimeter). Cellulose nanofibers are 3-100 nm in width, with a weight one fifth of iron, but five times stronger. Furthermore, unlike iron, it has excellent physical properties such as dimen-

sional stability, resulting in almost no thermal expansion and contraction under dry conditions. Due to these superior features, the application of cellulose nanofiber in various fields as a highly functional dream material is expected.

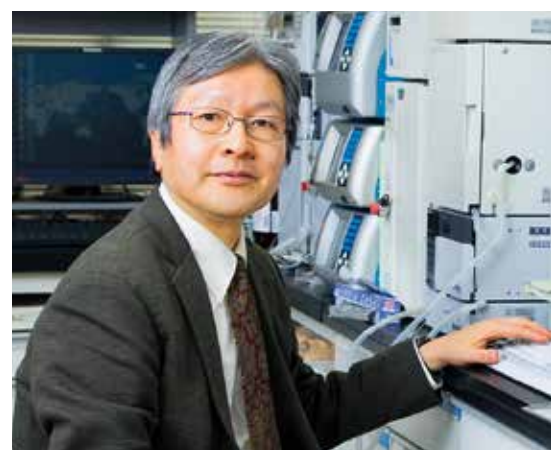
Professor Akira Isogai was a key figure in

Professor Akira Isogai

Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo

Born in Shizuoka Prefecture in 1954. Graduated from the Faculty of Agriculture, The University of Tokyo. Doctor of Agriculture. Jointly awarded the Marcus Wallenberg Award, known as the "Nobel Prize for Forestry" in 2015.

creating opportunities for cellulose nanofiber. Cellulose nanofiber was discovered many years ago. However, an effective method to break down cellulose fiber, which consists of numerous bundles of cellulose nanofibers, into individually separated nanofibers had not been established. Professor Isogai's laboratory succeeded in converting cellulose fibers into cellulose nanofibers using a catalyst. The new



cellulose nanofiber is an ultra-fine fiber one ten-thousandth that of a single human hair.

He explains "We were studying how to utilize cellulose as a renewable resource to replace petroleum-based fossil resources. However, conventional chemical reactions of cellulose required large amounts of organic solvents and chemicals because of high stability of native cellulose. We therefore had sought more efficient and environmentally friendly chemical reactions to cellulose.

In 1995, a research group in the Netherlands succeeded in a position-selective reaction of water-soluble polysaccharides using a catalyst in the water under the ambient temperature and pressure. This catalytic reaction is environmentally friendly and innovative, similar to biological reactions caused by enzymes in living bodies. Professor Isogai has applied this catalytic reaction to water-insoluble cellulose and chitin since 1996. Although various scientific data had been accumulated during the first 10 years, these data did not directly lead to the



A transparent, oxygen-impermeable and durable film can be produced using cellulose nanofiber.

development of cellulose nanofiber. However, after an additional decade later, i.e., in 2006, a breakthrough occurred. When wood cellulose or paper-grade pulp was oxidized in the presence of a catalyst, its fibrous morphology did not change. However, the mechanical agitation of the oxidized cellulose in water using a blender resulted in conversion from the oxidized cellulose/water slurry to a highly viscous and transparent gel. Upon careful examination, it was discovered that the wood nanofibers were individually and completely separated.

* Oxidation reaction of organic compounds using TEMPO (Abbreviation of 2,2,6,6-Tetramethylpiperidine 1-Oxyl) as the catalyst.

Solaire Resort & Casino



Manila Bay Entertainment City is a national development project underway in the Philippines near the Ninoy Aquino International Airport. The Solaire Resort & Casino, located in the Bay City area of Paranaque, is being developed as a resort complex that includes five-star hotels with a total of 800 guest rooms, suites and villas. Due to inconveniences of equipment monitoring and control experienced in the preceding project, a new partner was selected to develop the monitoring and control system. Through this new partnership, a comfortable indoor environment was realized, leading to improved customer satisfaction.

Seek for solutions to the inconveniences in phase 1 of the project

The Republic of the Philippines is a country consisting of more than 7,000 large and small islands in the Pacific Ocean. Tourists from all over the world enjoy marine sports on beautiful resort beaches as well as shopping and spa treatments in a lively atmosphere unique to Southeast Asia. The Philippine government has been actively promoting tourism since the presi-

dency of Gloria Macapagal Arroyo. The government's efforts to attract more tourists have included to construct new roads and other infrastructure and to launch worldwide advertising campaigns.

Currently, the Philippine government is developing the Manila Bay Entertainment City resort site in the bay area near the Ninoy Aquino International Airport in Manila.

Four large-scale casino resort complexes are participating in the development of this area, one of which is Solaire Resort & Casino, developed by Bloomberg Resorts Corporation. The Solaire complex includes hotels, a theater, shopping mall, casino, restaurants, and conference rooms. The construction of the complex is proceeding in phases. In March 2013, Bay Tower, a 500-room hotel, and other facilities were completed in phase 1 of the project.

"For phase 1 of the project, a company in the Philippines was the system integrator which constructed the monitoring and control system for the air conditioning and electrical equipment. However, after the Bay Tower area opened, various problems related to the equipment occurred. For example, there was a problem with tempera-

ture measurement: although 22 °C was displayed by the central monitoring system, when the temperature in the room was measured in response to a customer complaint, it was 27 °C. There were more than a few cases in which the room temperature displayed on the central monitoring unit was different from the actual temperature," explains Michael Ordaniel of the Engineering Department.

Operation quality of equipment dramatically improved by switching to a proven partner

After that experience, Solaire started the development of the Sky Tower, a 300-room hotel, and related facilities as an extension of phase 1. In consideration of the inconveniences that were experienced at the Bay Tower, Solaire chose Azbil Philippines Corporation as a new partner, and decided to introduce a monitoring and control system built around the savic-net™FX building management system.

"Azbil Philippines has a lot of experience providing monitoring and control systems for equipment in large-scale office buildings and commercial facilities in the Philippines, and Azbil is well known as



The savic-net FX system manages the operation of an air conditioner for realizing a comfortable environment.



A hotel room in Solaire Resort & Casino. Azbil's monitoring and control system provides an optimal environment, making guests comfortable during their stay.

a superior supplier of building management systems in the Philippines as well as Japan," says Mr. Ordaniel. "We highly evaluated the performance of the company and decided to select it as our partner."

The Sky Tower area facilities opened in December 2014. The new system developed by savic-net FX provides proper control and operation based on accurate temperature measurement, and also prevented the temperature monitoring problem in the Bay Tower area.

"Once the operator sets the room temperature to 24 °C on the central monitoring system, you can keep the room at 24 °C," says Mark Pajid, an operator of the building management system. "Due to this system, customer complaints concerning air conditioning have disappeared. For a resort facility offering a comfortable space for an extraordinary level of enjoyment, accurately controlling the room temperature is very important for customer satisfaction. Also, the monitoring and control screens of savic-net FX are very easy and simpler to use than those of the previous central monitoring system, which has significantly reduced the burden on the operators."

"Achieving proper equipment control based on accurate measurement also contributes to energy conservation," adds Mr. Ordaniel. "In addition, I am convinced that both the hardware and the software of the system are excellent in quality. We monitor the operation of the equipment 24 hours a day, 365 days a year, so it is a great help to our operators when

Azbil Philippines so quickly provides the instructions we need if a situation occurs. We are very satisfied with their quick support."

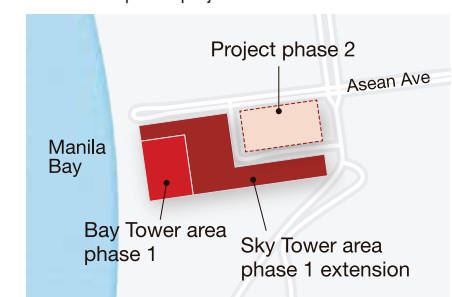
Envisioning future integration of the monitoring and control system of the facilities

Solaire Resort & Casino has achieved the hoped-for results in the Sky Tower area. It also has a vision of integrating the system used in the Bay Tower area, which began operating earlier, into savic-net FX in the future to enable centralized management of the equipment in both facilities.

"Meanwhile, we are preparing for phase 2 of the project on the same premises following the completion of Bay Tower and Sky Tower, as well as the construction of a new casino resort complex in Quezon City. We will be recommending Azbil Philippines as our partner in these projects as well. In the future, we would like to explore the possibility of integrating the equipment management of all three facilities," says Mr. Pajid.

"Currently, about 3,000 customers visit the facilities we operate in Manila Bay

●The development project of Solaire Resort & Casino



Solaire Resort & Casino



Address
1 Asean Avenue Entertainment City, Tambo, Paranaque City 1701, Manila, Philippines

Grand opening
March 16, 2013

Facility profile
Operation and management of hotels, shopping mall, theater, casino, restaurants, and conference rooms



Michael Ordaniel
Electromechanical Supervisor
Engineering Department



Mark Pajid
BMS operator

The savic-net FX system monitors and controls the equipment in the Sky Tower area, which was constructed as an extension of the phase 1 project. The intranet of the Solaire Resort & Casino was utilized for the communications for savic-net FX monitoring and control, in order to eliminate the burden of building a new network, as well as to prepare for future extensibility within Solaire.

Developing Software to Create Value for Customers While Striving to Become a Self-Reliant Group of Experts

Azbil Information Technology Center (Dalian) Co., Ltd., began operations in Dalian, China, in April 2007 with the task of spearheading efforts to improve the azbil Group's software development capabilities. As the company celebrated its 10th anniversary, it announced its new business themes, "becoming a group of experts" and "strengthening our self-reliance." Moving beyond its previous framework of development on the basis of contracts with Azbil Corporation, it now deals directly with customers as well and concentrates on establishing a company structure that provides value.

A base for software development in the city closest to Japan

The city of Dalian is located at the southernmost tip of the Liaodong Peninsula in the province of Liaoning in northeastern China. The area is known in China as a place where a large number of Japanese businesses operate. Azbil Information Technology Center (Dalian) Co., Ltd. (Azbil Dalian) began



Tsuneo Murate

General Manager
Azbil Information Technology Center (Dalian) Co., Ltd.

operations in Dalian in April 2007.

Azbil Dalian was established to lead the efforts to improve the azbil Group's software development capabilities. At the time, when IT use was rapidly spreading in society in general, there was a fast-growing demand for software technology and graphical user interface design technology in the azbil Group as well. As a result, Azbil Corporation established Azbil Dalian as a base for accomplishing a series of software development tasks, from system design and programming to testing and maintenance, and as a base for accumulating know-how in these areas. The reason why Dalian was chosen instead of Beijing or Shanghai is that the city is the closest to Japan. Geographically, it is easy to access from Japan, and it has a much greater number of students studying the Japanese language than other areas of China.

Step-by-step expansion of business scope while becoming a competitive powerhouse of professionals

Since it was established, Azbil Dalian has developed software related to automation products for the azbil Group's Build-

ing Automation (BA) and Advanced Automation (AA) businesses. In the BA business domain, it is responsible for developing part of the application programs for the savic-net™ FX and savic-net™G5 building management systems, as well as their human-machine interface. For the AA business, it is in charge of developing part of the software for the Harmonas-DEO™ automation system. It is also performing related work that is indispensable in the era of IT, including the development of the azbil Group's operation management system, as well as administrative work for Chinese translation and for desktop publishing.

Focusing on software development, Azbil Dalian aims to acquire and accumulate knowledge and skills in peripheral areas such as instrumentation in order to grow as a team of professionals that is competitive in the marketplace. Currently it has 110 employees, and the number increases every year as the company expands. The workforce consists mainly of senior engineers, programmers, and test engineers and includes employees involved in instrumentation and quality assurance. All personnel pos-



Implementation testing of programs developed for the savic-net FX and savic-net G5 systems.

sess a high level of software development skills, and in addition, about 70 % of them have passed the Japanese-Language Proficiency Test (JLPT). Over 30 % of the employees can work with customers to discuss specifications in Japanese. That puts Azbil Dalian's engineers and programmers in the top level of Japanese language ability in Dalian's software industry.

Strengthening self-reliance by improving worksite engineering abilities

Azbil Dalian has chosen two themes for business development for the next ten years, "becoming a group of experts" and "strengthening our self-reliance." These reflect Azbil Dalian's goal of dealing with customers directly and seizing the initiative to create customer value independently, in addition to developing software according to prescribed specifications as it has done in the past. As part of its measures to strengthen self-reliance, it is expanding its business scope to include the provision of original products to companies for which it is developing software, in order to meet the needs of the local

manufacturing industry. One example is a temperature measurement system for high temperature ranges using an infrared camera. Azbil Dalian is also supporting quality management for casting furnaces and related equipment through its proprietary software technology.

To accelerate these initiatives, it is necessary for each employee, particularly engineers, to refine their technological know-how and improve their skills. Azbil Dalian aims to nurture skills especially in the area of project management. So far, eight employees have become certified project management professionals (PMPs), an internationally recognized qualification, and Azbil Dalian encourages more of its employees to acquire PMP certification. In 2017, it assigned five employees to a training program at an external organization and subsidized their expenses, stepping up its efforts to support employees in acquiring PMP certification. Previously, Azbil Dalian has mainly undertaken development on contract for Azbil Corporation, but it is now trying to provide employees with more opportunities to gain on-site engineering experience,

including preliminary discussions with customers about specifications, in an effort to proactively provide products to local Chinese customers. Azbil Dalian is working with subsidiaries such as Azbil Control Instruments (Dalian) Co., Ltd., a manufacturing base in China that entered the Chinese market earlier, as well as two sales bases, Azbil Control Solutions (Shanghai) Co., Ltd., and Shanghai Azbil Automation Co., Ltd., to improve its technological capabilities and bolster worksite abilities. In addition, Azbil Dalian continues to operate as an engineering and technological base for the entire Asian region as part of azbil Group globalization.

As we enter an age when things will be more closely connected with people as the Internet of Things (IoT) and other technologies spread, the role of software is becoming even more important. Through software development based on the azbil Group's philosophy of "human-centered automation," Azbil Dalian aims to create new value and to assist in the Group's rapid progress as it expands in the Asian market beyond China and in the wider global market.



The spacious Azbil Dalian office. With no partitions, communication is easy.



Azbil Dalian employees discuss the progress of the development process in a videoconference with a development unit of Azbil Corporation in Japan.

savic-net, savic-net FX, and Harmonas-DEO are trademarks of Azbil Corporation.

The word “vacuum” may evoke an image of a space which contains nothing, but more accurately it is the state of a space where the pressure is lower than atmospheric pressure.

Pressure in a vacuum is below atmospheric pressure, and a vacuum is not a space where there is nothing.

We often think of a vacuum as a state in which there is no air, no pressure, and no anything. In reality, however there is no space where nothing exists. Even outer space outside the Earth's atmosphere, which is generally considered to be a vacuum, is not absolute nothingness, although there is no air there.

Even if you do not fly to outer space, there are vacuums all around you. According to the definition of the Japanese Industrial Standards (JIS), the term vacuum refers to the “state of space filled with gas at a pressure lower than normal atmospheric pressure.” Such a state can actually be experienced at any high place like the top of Mt. Fuji.

The air pressure on the plains where most people live is 1 atm or 1013 hPa (hectopascals = hundreds of pascals). Atmospheric pressure decreases by about 1 hPa as the altitude increases by 10 me-

ters, up to several thousand meters, so the atmospheric pressure drops to about 630 hPa at the top of Mt. Fuji at an elevation of 3,776 meters. At the top of Mt. Fuji where the atmospheric pressure is about two-thirds of the atmospheric pressure at ground level, phenomena different from those seen in a 1 atm environment can be experienced, such as difficulty in catching one's breath because of the thin oxygen, and the ability to boil water at about 20 °C lower than at sea level.

Many advanced technologies in everyday life come from improvements in vacuum technology.

Vacuum technology is used everywhere, contributing to the improvement of industrial technology and everyday life. Examples are the replacement of the gas in fluorescent lights, vacuum deposition to manufacture mirrors for automobiles, distillation of distilled liquors, suction used to pack eggs in egg packs, and so on.

The progress in vacuum technology that made it possible to create high-level vacuums that do not have even the slightest amount of impurities has contributed to the evolution of semiconductor devices such as microcomputers and flash memories. Vacuum technology also plays a large role in increasing memory capacity, utilizing big data for advanced computation, achieving Artificial Intelligence (AI), and making improvements on many other fronts.

Different technologies are used to create the right vacuum level for the application.

According to the classifications defined by JIS, a space filled with gas at the pressure found at the top of Mt. Fuji is a “low vacuum.” Higher levels of vacuum are “medium vacuum,” “high vacuum” and “ultra high vacuum.” The level of vacuum in outer space is even higher than ultra high vacuum.

Different levels of vacuum are used for specific purposes. Examples are low vacuum for oxidation prevention and vacuum insulation, and high vacuum for semiconductor processing.

The simplest way of making a vacuum is to suck air out of a container using a vacuum pump or the like. When an ultra high vacuum is required for ultrafine semiconductor processing, for example, the air in the manufacturing area is sucked out to a certain extent, and then turbomolecular pumps are used to blow even small molecules to the outside of the area with high-speed rotating blades.

Vacuum gauges for high-precision measurement of the vacuum states inside vacuum chambers have evolved along with vacuum technology. The technology for creating, using, and measuring vacuums has evolved in tandem. As a result, various manufacturing technologies have improved, contributing to the development of our modern information-oriented society. If vacuum technology evolves further in the future, we can expect the birth of technologies and products that we have never seen before.



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Using advanced signal processing technology, Azbil's sapphire capacitance diaphragm gauge measures pressure with fewer errors due to temperature characteristics of the sensor or lack of linearity in the measured data. Thanks to a sapphire sensor created by micromachining technology, this self-heating diaphragm gauge features not only excellent repeatability in high-temperature environments, but also small size and light weight.



Cover photo : Nepal Kathmandu, by Koji Mizutani, MERRY PROJECT Representative

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<http://www.azbil.com/>

Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.

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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/>



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