

**azbil**  
**FIELD**

**Subaru Corporation**  
**Gunma Oizumi Plant**

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**MIND**

**“Work-Style Reform” Leads to Employee  
Health and Well-Being**



## **Special Feature**

### **Japanese Armors Reviving in the Present Times**



# Japanese Armors Reviving in the Present Times Condensing Traditional Crafts

Japanese armors condense a variety of Japanese traditional crafts, including hammering to mold metals by hammering, chasing, leather processing, woodwork, japanning, dyeing and weaving, cord-braiding, and sewing.

We interviewed Mr. Fumio Nishioka, who has been working for more than thirty years as an armorer to manufacture armors.



A reproduction of "Akaito-odoshino-yoroi, Yoroi Type Armor with Red Lacing," of the late *Heian* Period. A national treasure owned by Musashi-Mitake Shrine. Mr. Nishioka worked upon it and faithfully reproduced the original. Picture presented by the Ome Municipal Museum of Provincial History.

## Armors mirror the battles of the ages in which they were manufactured.



Japanese armors, condensing the excellent techniques of Japanese traditional crafts, are very important historical heritage in the eyes of art, handicraft, archaeology, and folklore. Nonetheless, we can rarely find original armors preserved in a good condition. Urgently needed are preservation, restoration, and reproduction of armors. It is Mr. Fumio Nishioka, Director of NISHIOKA KOUBOU (NISHIOKA SAMURAI'S ARMOR & BRAIDING STUDIO), who tackles

these challenges.

Armorers are rare to find in Japan. Up until the *Edo* Period (1603-1868), there had been very active manufacturing of armors, and the professionals were able to take care of the specific process in which they were experts. Presently, however, one armorer has to take care of numerous processes alone and shape the whole armor. Although Mr. Nishioka does outsource some partial processes such as a special type of chasing, he has to manipulate almost all processes by himself.

The armor in the picture is a reproduction of "Akaito-odoshino-yoroi or

*Yoroi* Type Armor with Red Lacing," a national treasure, which became the work of art that brought him fame throughout Japan.

"Protective equipment, armors change their styles according to the weapons used in each age. They used *yoroi* type armors with red lacing in the *Heian* Period (794-1185), when arrows and bows were major weapons. In order to protect themselves from arrows, they attached articulated plates called *shikoro* to their helmets, and large sleeves and loin guards to their armors, both of which had different sizes on left and right sides to make it easier to shoot a



1 Ornaments manufactured through a traditional gold-plating technique.  
2 Braiding work (*odoshi*) to vertically combine small cards called *kozane*.

bow. Judging from the fact that large armors weigh twenty to thirty kilograms, we believe that only upper-class privileged *samurai*s in the positions high enough to ride a horse were able to use them. Almost all parts of this armor consist of combined small leather or iron cards called *kozane*, which were japanned more than ten times. *Odosu*, the verb form of the word, *odoshi*, means to combine those cards by passing braids through the holes in them. The patterns created by colors and lines of those braids became the characteristics of Japanese armors."

## The diversity of raw materials and rich decorativeness are the attractive characteristics of Japanese armors.



Mr. Nishioka told us to take note of the two aspects in appreciating Japanese armors. One of them is the diversity of their raw materials. "While Western armors, putting priority to defense, mainly used metals, Japanese armors consisted of a variety of raw materials and small parts such as iron, leather, wood, braid and cloth, condensing the excellent techniques of various handicrafts. We believe such a style resulted because Japanese armors not only satisfied the function of defense but also the function of showing the dignity of those wearing them."

Another aspect is their rich decorations. Armors used in the *Heian* and *Kamakura* Periods (1185-1333) such as *yoroi* type armors with red lacing equipped themselves with attached

pictorial leather cards with pictures or patterns depicted on them, and with lining braids made of beautifully dyed threads, emanating a rather strong impression of gracefulness. In the Age of Civil Wars, overall, armors became simpler in shape in pursuit of mobility. Nevertheless, they began to attach large and striking designs on their helmets such as emblems, showing that they began to more insistently demonstrate their personalities.

## Keeping passion toward armors in his heart, he hands over his knowledge and technique to future generations.



Mr. Nishioka receives many requests from public institutions to preserve, restore, as well as reproduce original armors which are to be exhibited in museums. He faces many challenges while trying to completely satisfy one request.

"The first challenge is procurement of the raw materials. At present, many of them are unavailable in the general market. When it is impossible to procure them at all, I need to search for the best possible substitutions. Next challenge is the method. For example, dyeing and weaving and japanning have various methods. I have to find the best method to faithfully restore the original nuance. In addition, indispensable is the technique to completely carry out that method. Moreover, economy is also another challenge. In addition to material cost, this kind of work requires a tremendous amount of time and effort, which in many cases results in spending



## Fumio Nishioka

Born in 1953. He became an armorer at the age of 25 after working as a graphic designer. He studied under Armorer Asajiro Morita.

more money to restore armors than buying them."

Knowing how hard it is to live the life of an armorer, Mr. Nishioka does not allow any candidate to become his student easily. He would spend several months or even years to examine the candidates on their true motive and enthusiasm to be engaged in an armorer's work. He accepts only the youth with a firm resolve.

"When it comes to properly restoring valuable armors, and leaving their precise reproductions for future generations, we are decisively lacking in the number of armorers. Nonetheless, we cannot allow to lower the technical level. I fervently wish that my disciples will master all techniques of mine and become independent armorers as soon as possible," says Mr. Nishioka. He believes that it is the mission of one who lives the life of an armorer in the present age to hand down to future generations the knowledge and technique, which he has single-handedly accumulated through trial and error up until today.



# Subaru Corporation Gunma Oizumi Plant



**Subaru Corporation's Gunma Oizumi Plant has standardized on Azbil TA's mist lubrication units for its machine tools. The plant has also consolidated its maintenance work, including the checking of any problems found in inspection of the large number of lubrication units, catching predicted failures, and replacing parts. These changes have allowed the plant to operate continuously and reliably at full capacity.**

## Higher Added Value for Further Growth as a Global Brand

Subaru Corporation does business mainly in the automotive and aerospace fields. Its automotive business and the Subaru brand are widely known from popular car model names like Impreza, Crosstrek, and Levorg.

In April 2017, the company changed its name from Fuji Heavy Industries Ltd. to Subaru Corporation, and expressed its determination to thrive as a brand that delivers value under the slogan "From a company making things, to a company making people smile." Subaru continues to provide "enjoyment and peace of mind" to customers around the world. It also works to raise its value added business to an even higher level to continue growing as an attractive global brand.

Subaru's Gunma Oizumi Plant is a production base for Subaru engines and transmissions. These products are supplied to the company's body factories.

"The first factory at the Oizumi Plant began operation in 1983," recalls Kazuya Saeki, a senior manager in Production Department 3. "Since then, a second, third, and fourth factories began operation at three-year intervals to respond to increased demand for production. In July 2010, a fifth factory was established to produce the new generation of boxer engines, which have low fuel consumption and excellent environmental performance."

## Standardizing on Azbil TA's mist lubrication unit to Solve Lubrication Unit Problems

Factories 1 through 4 were using two different types of lubrication system, grease lubrication (grease-prefilled bearings) and mist lubrication (spraying of a lubricant as needed), to reduce frictional heat and wear in the bearings of the main spindle (for rotating a tool) in machine tools such as a machining center\*1 for molding and processing a product. The mist lubrication units being

used were provided by Azbil TA Co., Ltd.

"With grease lubrication, prefilled grease decreases due to aging, which often causes problems such as sudden locking of the spindle. To refill the grease, the spindle and bearing have to be replaced, which results in stopping the equipment," explains Atsushi Kurashina, a group manager in the Factory 1 Maintenance Group.

In view of this situation, the Oizumi Plant decided to standardize machine tool-related specifications when establishing the fifth factory. Based on the results from Factories 1 to 4, Azbil TA's mist lubrication unit was adopted as a standard because this highly durable system lubricates properly, with fewer machine tool breakdowns. With the mist lubrication unit, the problems associated with grease lubrication were solved. Currently, more than 1,000 Azbil TA's mist lubrication units are running at the five factories.

However, another problem arose,



An Azbil TA's mist lubrication unit, incorporated into a machine tool, sprays lubricant on a spindle and bearing.



An Azbil Corporation photo-electric sensor monitors oil dropping to the venturi of Azbil TA's mist lubrication unit.



A machining center processes the head cylinder of engines at the production site at Factory 5 of the Oizumi Plant.

which was the maintenance of the lubrication units.

"Machine tool breakdowns due to lubrication failure directly cause factory equipment to stop. This causes a delay in the supply of engines and transmissions to the body factories here and overseas, eventually leading to a delay in delivery to customers. How to properly maintain over 1,000 lubrication units became a new matter for us to consider," says Mr. Saeki.

In response to a request from the Oizumi Plant, Azbil TA proposed a service providing regular inspections, maintenance plans including replacements, and identification of lubrication units where there is a problem or where warning signs are found. The Oizumi Plant immediately decided to accept the proposal.

## With an Optimized Maintenance Service, the Plant Operates Dependably at Full Capacity

Azbil TA inspects the five factories every year, reports the results to the maintenance department of the Oizumi Plant, and at the same time provides comprehensive support, including maintenance plans, parts procurement, and repair work.

"Azbil TA checks the status of each unit from its professional viewpoint as a

manufacturer, so it doesn't miss warning signs of a breakdown. The status of all the units is summarized in an easily understandable list. This allows us at the factory to make prompt decisions about repair work," says Norihiro Morita, a group manager in the Maintenance Section 3 Technical Group.

"Replacing a bearing for a main spindle stops production for about 8 hours. That kind of problem, requiring a bearing replacement, used to happen two to three times at each factory per month when the grease lubrication method was used. After adopting the mist lubrication unit, the factories rarely face a main spindle bearing problem that causes the equipment to stop. In addition to this achievement, a maintenance service that prevents equipment failure provides a great sense of security that factory operation will continue to run at full capacity at all times," said Makoto Sugita, a group manager in the Factory 5 Maintenance Group.

The automobile industry is in the midst of change against the background of technological innovation in various areas. Particularly in response to the growing concern for preserving the environment around the world, automobile manufacturers are rapidly developing fuel-efficient, lightweight, compact, and high-performance engines.

"Our company watches industry trends and always strives to understand what kind of next-generation automobiles our customers want. The Oizumi Plant assists the company with production and is also required to continuously improve its production system, so we are looking forward to good support from Azbil TA in the area of facilities," says Mr. Saeki.

## Subaru Corporation Gunma Oizumi Plant



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Beginning of Operation
1983
Business
Production of automotive engines and transmissions



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## Terminology

### \*1 ▶ machining center

A machine tool equipped with an automatic tool changer. It can perform different kinds of machining such as milling, boring, and tapping, depending on the need. Mainly used for cutting processes, the tool's magazine stores various cutting tools. With computer control, the machine center can automatically change tools and process parts.



## “Work-Style Reform” Leads to Employee Health and Well-Being

Since 2016, Azbil has promoted “work-style reform” and made various efforts related to its three policies of reduction in the total working hours of each employee, realization of healthy lives both physically and mentally, and creation of harassment-free workplaces. These efforts on behalf of health-conscious management were recognized, and Azbil was selected as a “White 500” company in an award program by the Ministry of Economy, Trade and Industry in 2018. Azbil continues to work on issues that have been identified by analyzing data collected in various surveys, and continues to promote work-style reform.

### Work-Style Reform Strengthens Initiatives for Reducing Total Working Hours

Since 2016, the Japanese government’s “work-style reform” initiative has sought to realize a society of “dynamic engagement of all citizens.” One of the pillars of the reform effort is the reduction of long working hours. In Japan, there has been a value system in which working long hours is admired, and long hours and overtime work are seen as natural. However, these labor practices can sometimes have tragic consequences, such as death from overwork. Prompt action to improve labor practices is therefore necessary. Japanese society is also facing problems like fewer workers due to a decreasing birthrate and aging population, in addition to the diversifying needs of workers, many of whom raise children or nurse a family member. Work-style reform is a pressing issue for society, and it calls for responsible action from businesses.

Azbil Corporation has been improving its personnel system with a focus on implementing work-style reform since 2016, with its three policies of reduction in the total working hours of each employee, realization of healthy lives both physically and mentally, and creation of harassment-free workplaces.

In addition to improving employees’ work-life balance so that they can lead fulfilling lives, and keeping them happy and healthy, with both sound mind and body, these efforts aim to increase productivity at work, improve customer satisfaction, and put our Group philosophy into practice.

Increasing productivity is essential in order to provide customers with ever greater value while reducing working hours. Accordingly, Azbil is promoting various measures to improve productivity. The company began to take action to reduce working hours 20 years ago on account of consideration for the lives of employees and their families. Prior to fiscal year 2016, when the work-style reform initiative began, Azbil was already taking measures such as introducing no-overtime days and restricting the annual total of working hours. As part of our efforts to implement work-style reform, we set the target of limiting overtime work for all employees. In the first fiscal year of this effort, the target was 80 hours per month or less, a criterion provided by Japan’s Labour Standards Inspection Office for the purpose of preventing industrial accidents. For this year, we set a stricter target to further reduce overtime work. We track employee attendance using our own access control system and utilize the

information to understand employees’ working hours and achieve the reduction target.

Reducing the total number of work hours cannot be accomplished by employees’ individual efforts only, so we as an organization are supporting the reform effort by means of *framework*, *personnel*, and *systems*.

First, we have established a *framework* that allows us to level the workload across organizations. We did a detailed analysis of the workload of departments with a higher total of working hours, reduced the workload by making adjustments or by cooperation with related departments, and thereby established a framework for reducing overtime work.

We also have a system to forecast workloads with high accuracy. This helps to secure *personnel* for busy seasons by forecasting and analyzing when, in which department, and by how much the workload will increase due to a long-term project, etc.

Regarding *systems*, we have implemented a working system that enables employees to flexibly work according to the needs of customers or working hours in the field. In addition, we established satellite offices and a system for work support by in-house staff at sales offices to shorten travel time and im-

### ■ A full picture of Azbil work-style reform

Societal pressure to reduce long work hours and new trends (for realization of “dynamic engagement of all citizens” )

Ever higher value delivered to customers

#### Steps Promoting Work-Style Reform

Step 1. Set a (target) limit on overtime

Step 2. Strive to achieve the target

- ① Measures to cut work hours (framework, personnel, systems)
- ② Change of culture and way of thinking

Step 3. Check progress of initiatives with regular follow-up

Achieving better work-life balance increases the added value of work (=implementing the corporate philosophy)

prove work efficiency.

Within two years after the work-style reform initiative began, these various measures have reduced the total number of employees with more than 45 hours of overtime per month to one fifth of the previous number.

We are also encouraging employees to use their annual paid leave. Our target for fiscal year 2018 is for every employee to take 12 days or more of paid leave. We introduced a system in 2014 that allows employees to use annual paid leave in hourly units, and we established a leave system in April 2018 that assists employees to study in Japan or abroad with the aim of improving company productivity.

### Using Health and Survey Data, Creating Workplaces That Are Healthy for Both Body and Mind

To implement our policy of realizing healthy lives both physically and mentally, we are working together with the azbil Group health insurance association in Japan.

In response to an increasing risk of lifestyle diseases or cancer, we now have more extensive health checkups. In addition, we carry out a physical fitness test aimed at preventing falls, and we have daily exercise breaks in the

workplace.

The Ministry of Health, Labour and Welfare is promoting a health data plan in which health insurance associations analyze data from employee health checkups and utilize it to promote better health. Starting in fiscal year 2015, all health insurance associations have been required to formulate a health data plan. Prior to 2015, the azbil Group’s health insurance association was chosen as one of 52 health insurance associations to formulate a model plan.

Azbil is also making efforts to maintain employees’ mental health by increasing the number of industrial physicians. Moreover, training for managers includes mental health-related content in order to foster an understanding of mental-health issues in the workplace and to identify mental disorders earlier.

In fiscal year 2016, we initiated stress checks for all employees in Japan. These checks investigate whether the amount of workload and duties of each person are appropriate and whether assistance received from supervisors and coworkers is sufficient. In workplaces where many employees have high stress, the Human Resources Department has conversations directly with employees and gives advice for

improving the workplace environment. Additionally, we conduct an employee satisfaction survey and a compliance awareness survey every year. The results of these surveys are utilized to design personnel policies that create healthy and happy workplaces, and the results are conveyed to supervisors in each workplace to improve management.

### Azbil Selected as a White 500 Company for Its Health-Conscious Management

Thanks to praise for its various initiatives on health, the azbil Group was selected as a White 500 company in the large enterprise category of the Ministry of Economy, Trade and Industry’s 2018 Certified Health and Productivity Management Organization Recognition Program, which recognized outstanding enterprises engaged in health-conscious management.

Azbil is continuing to enhance communication in the workplace using various data, such as attendance information and survey results, and is continuing to promote work-style reform while providing products and services that are valuable to customers.

In the area of measuring instruments, calibration maintains an instrument's accuracy by comparing it with a more reliable standard instrument and clarifying the differences between the two.

## Calibration of Measuring Instruments Affects Product Quality

When you weigh a thing, if the instrument says "100g," you will probably accept that it weighs 100 grams. But what if the instrument is not displaying an accurate number? Here is a familiar example. If your bathroom scale does not show the proper weight when you are working hard on a diet, you cannot see the effects of the diet.

So, the accuracy of measuring instruments is important, and particularly so in the field of manufacturing. Measurement is carried out in various contexts at production sites, including manufacturing, processing, maintenance, and pre-shipment inspection. If measuring instruments are not accurate, product quality and safety cannot be ensured.

Calibration is done to check that measured values are accurate. (The term calibration, however, is used differently in other industries, such as IT

or finance.)

To check that measuring instruments are accurate, comparison is made with a standard instrument of higher accuracy. Of course, the standard instrument used for calibration must itself be reliable and highly accurate. It is calibrated with an even more accurate, higher level standard instrument. In this way, a chain of comparisons eventually reaches a national or international measurement standard. This is called "measurement traceability." This kind of chain of calibration proves that the tested measuring instrument is accurate.

In Japan, there is a measurement traceability system called "the Japan Calibration Service System (JCSS)." JCSS is the system that accredits calibration laboratories. The system was introduced by the Measurement Law to improve quality control, etc., by ensuring the reliability of measurements. Also, if a calibration laboratory is accredited by an international Mutual Recognition Arrangement (MRA), calibration results measured by the laboratory in Japan are accepted in MRA member countries in Europe, America, and Asia.

### Accuracy of Calibration Improves as Standards Become More Highly Accurate

If measuring instruments were always accurate, calibration would not be necessary. However, parts deteriorate and wear out over time, which makes it difficult to maintain accurate measurement. Moreover, even though measuring instru-

ments are maintained and managed properly, if they are used incorrectly, they will be unable to measure accurately.

That is why periodic calibration is essential. A calibration cycle should be determined for each measuring instrument in order to check that it is measuring accurately.

As the capabilities of industry improve, measuring instruments can measure more accurately. Take a look at rulers, which are measuring tools, as an example. Some rulers can now measure down to the micron level. They are made from materials that are almost unaffected by the environment and are etched with fine graduations or are digitized.

Even increased precision and management of measuring instruments does not always ensure accurate measurement, so an engineer with expert measurement knowledge is indispensable for calibration.

For example, a measurement (numerical value) may vary according to the environment or measurement method. If the same person is weighed in Japan and in Africa, the weight (the measured value) will not be the same, because the gravitational acceleration differs depending on the place on the Earth.

So, unless the person who is calibrating has a deep knowledge of measurement principles and takes into account environmental changes and other factors, accurate calibration cannot be carried out.

The accuracy of measuring instruments can be maintained because technicians possess a knowledge of physics, mathematics, and statistics that enables them to continue to calibrate accurately and honestly.



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Cover photo: Yuriage, Miyagi Prefecture, Japan, by Koji Mizutani, Merry Project representative director

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

azbil Group magazine, *azbil* 2019 Vol. 1, No. 9

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