More Information High Tech Seen Through Numbers, Volume 3

The Power of Skills

—Efforts at the Manufacturing Site Aiming for the World's Leading Edge—

The Naka Div. is a core manufacturing site for the company, shipping many of the world's leading-edge products. Underlying these manufacturing capabilities are the subtle, multifaceted, and diverse skills found at the worksite. Based on on-the-job training available at the manufacturing site, the Naka Div. is using participation in national and international skills competitions to promote continued improvements in skills.

Cultivation of Skills by Taking on Challenges

Electron microscopes, medical systems, CD-SEMs, and other semiconductor-related equipment: the products manufactured by the Naka Div. are all world-class and based on advanced design technology. One major characteristic is that the key parts are almost entirely crafted in-house without reliance on others. Supporting this effort are the skills that are daily nurtured in the Naka Div.

Toru Katouno, a veteran of the Manufacturing Dept. Machinery Section noted for his many years as a milling machine technician, and a recognized "Master Craftsman of the present day," remarked as follows:

"Product life cycles are short, and something new appears one after another. To always stay at the leading edge, we must hone the skills and technologies suited to such manufacturing. This entails great challenges."

He says that this involves assimilating basic skills and then challenging oneself to create new skills and technologies, working together with designers, to realize the advanced specs demanded. On the manufacturing site it is important to pass along previously assimilated skills to others while also learning challenging new skills and technologies, and to continue using these skills when manufacturing products so that "the power of skills" is passed down.

What Skills Competitions Develop

In the Naka Div. senior employees use encouragement of junior colleagues, based on a simple form of on-the-job training, to pass on skills creativity. An integral part of these efforts is skills competitions. Competitors are selected from among newly arrived employees for training in various skill categories and sent to competitions in Japan and abroad. Every year teams from the Naka Div. achieve impressive results.

Katouno, who himself won a gold medal at the 1973 WorldSkills competition, talked about his experience and the irreplaceable value of being selected as a competitor.

"Confronted with ever tougher challenges on a daily basis, I naturally faced them head on. I knew my own limits, and so to get the results I wanted I thought carefully about my stance."

Akira Fujimoto of the Production Engineering Dept., who won a gold model in the CNC Turning category at the 2007 WorldSkills competition, commented as follows:

"Soon after joining the company I was selected as a competitor. I was able to achieve a clear goal, which led to growth later on. At the skills competitions they have a saying: 'training is like the main event, and the main event is like training.' I took this as my personal motto and was able to achieve a good result. More than anything else I realized

Competition

that preparation is all-important."

The competitions are not just for the competitors. Supervisor Yoshihito Waki of the Skills Training Group, and a staff member of the Skills Competition Secretariat, talked about this:

"Our role is to work through the skills competitions to support the development of personnel who can act as on-site leaders. This does not stop with the training of potential competitors. Persons who were once competitors become coaches, and it is important that they work together with competitors in a sort of three-legged race. Helping to guide other competitors also serves to further the coaches' own growth. The competitors and coaches both develop at the same time. This is a special characteristic of the Naka Div. development system."

Akira Fujimoto explaining his future goals (at the 2007 WorldSkills competition)

He noted that among persons who were once competitors with a sparkling record, many do not do well at guidance when they find themselves in a leadership position.

"When I first became a coach for the WorldSkills competition, the competitor I was supposed to be supporting was not showing any improvement, and I wondered if the problem was with my own guidance. In talking this out with the competitor, I realized that the problem was that I was not really trying to understand him and was teaching stuff in a completely one-sided fashion, and so I started over from the basics," recalls Fujimoto.

"Any former competitor could fall into this trap. Only when they have bumped against this wall do they realize for the first time how difficult it is to convey skills to others, and thereafter they cultivate a firm guidance method. Anybody can learn how to teach basic skills. However, using coaching to lead a competitor toward a goal is extremely difficult. That is the core," Katouno said, looking kindly on the growth of the coaches.

Kazutoshi Kanno of the Skills Training Group believes that the key is to properly position human caliber, including communication, and then to supplement it.

"When preparing for the skills competitions both the coaches and competitors must recognize what is important in manufacturing. What needs to be emphasized is human caliber, with communication at the top. The coaches see growth by thinking about how the competitors think, and the competitors use frank discussions with their older colleagues to learn how to live as a person, the philosophy of manufacturing, and the significance of taking on challenges."

Competitors appearing at the 2014 52nd National Skills Competition. Two competitors won gold medals, one competitor won a silver medal, and two competitors won fighting-spirit awards.

Friendly On-Site Rivalry as the Deciding Factor

Competitors who have completed a task at the skills competitions return to their respective work sites and start work about two to three years behind other employees who joined the company at the same time.

"Just because you were in the skills competitions doesn't mean you're special. There are many leaders of work site technicians who have no experience as competitors. Persons at the manufacturing site are all evaluated equally. In the end, experience at the work site and growth later on as a technician are really the determining factors," said Katouno with reference to the importance of what happens later.

"Most competitors worry that on-site they may become 'the kid who can't keep up,' but they get over it while following their senior colleagues. This is another critical point for growth, I believe," said Kanno.

Preparation for the skills competitions is considered to be essential for improving skills at the work site. Competitors and coaches who have a serious determination to win grow through struggling, and after returning they continue to grow alongside the other employees who joined the work site at the same time. One strength of the Naka Div. is the environment of friendly rivalry between employees. It helps to form an unshakeable foundation for developing superior skills.

More Information Hitachi High-Tech Support for Science Education

Encouraging the Scientists of the Future to Spread Their Wings
—Supporting Science Education—

The Hitachi High-Tech Group uses the tabletop microscope, a key product incorporating the company's core technology, to support science education. With young people drifting away from science now a topic of concern, ongoing efforts to get children more interested in science are being undertaken as an important part of the company's CSR management. The efforts to support science education being developed at the company's CSR section, at Hitachi High-Tech Fielding Corp., and at Hitachi High Technologies America, Inc. have attracted a lot of attention.

Utilizing the Advantages of the Easy-to-Use Tabletop Microscope

"These class visits are a game played in real earnest, every time. You never know what's going to happen. You can't let your attention stray for even a moment, until you capture the children's attention." The person making this comment is Daihei Terada, an acting manager in the CSR Division, CSR Promotion Group, who is engaged in efforts to promote science education. He takes the Tabletop Microscope to regions all over the country, spending his days showing children how to look at the micro-world of insects and plants all around them.

Terada says, "The images that get the biggest response are mosquitos. Every child knows what it is like to be bitten by a mosquito. When they see this insect pest that they all know about close up, the children react with cries of 'eww' or 'wow.' When I hear these reactions I know that I have succeeded," he says.

The great thing about the Tabletop Microscope is that it allows anybody to easily experience the minute world of the electron microscope. Hitachi High-Technologies is making full use of this device, which uses an ordinary 100-volt outlet and can be set up in just three minutes, for nationwide rollout of efforts to support science education. These efforts began in 2005, when the Tabletop Microscope first went on the market, and became an aspect of sales and service. At the request of a university professor who used one in his own work, the Tabletop Microscope made its appearance at a science hands-on event targeting children, hosted by an academic society. There it was used in demonstrations presenting the micro-world. Such events then expanded all across Japan, in science classrooms at museums and the like; visiting lectures at elementary, junior, and senior high schools; and touring exhibitions at "Super Science High Schools." The scope grew to include multifaceted and diverse formats. To date, more than 36,000 persons have participated in these programs.

Terada recalls, "At first we were concerned that these efforts would not generate any profit, but the importance of CSR has come to be recognized by society and to be associated with policies for countering the drift away from science. Such activities are deeply significant for the company, and CSR has become an important strategic pillar that also generates growth."

Widening the Circle of Science Education Support

An example of efforts to support science education is a program in Iwanuma, Miyagi Prefecture, which is the birthplace of Dr. Bunya Tadano, the father of the Hitachi electron microscope. In 2009 the Iwanuma municipal board of education purchased a Tabletop Microscope. It is used at primary schools and the city library, something not yet seen anywhere else in Japan. Hitachi High-Technologies provides support for this program and has collaborated since 2011 in the "I Love Science Festival." Atsushi Hama of the CSR Promotion Group remarked as follows:

"Since this is a nice environment that already has a Tabletop Microscope, we worked to develop an independent program that goes beyond simply using the microscope. We have a simple spectroscope for learning the principles of an aurora, and we make and launch rocket leaves shaped like maple seeds. And recently, in collaboration with Hitachi High-Tech Science Corp., we started a program using an X-ray fluorescence measurement device."

Hitachi High-Technologies occasionally utilizes such examples as templates for other projects. Meanwhile, the long-running class visits have now been extended to elementary and junior-high schools in Minato Ward, Tokyo, where the Head Office is located. The program has also been expanded as part of efforts to assist quake recovery. Class visits to primary schools in Fukushima prefecture have taken place since fiscal 2014. By fiscal 2016 the number of Tabletop Microscope in operation had

Class demonstration of the Tabletop Microscope

Hitachi TM3030 Tabletop Microscope utilized at HAMAGIN SPACE SCIENCE CENTER (Hitachi High-Tech GlobalTV)

increased from three to ten units.

"We are working to improve quality, so as to convey the pleasure of science to even more children. As seen in the collaboration with Hitachi High-Tech Science, we have used the technology assets of the group to strengthen planning. I would now like to try worldwide expansion in regions such as Asia," says Terada with enthusiasm.

Long and Narrow: Strength through Continuation

In 2001, as part of the commemorative events for its 35th anniversary, Hitachi High-Tech Fielding held a hands-on learning session using an electron microscope at the nearby Hanazono Elementary School in Shinjuku Ward. Since Hitachi High-Tech Fielding is a company that handles scientific equipment, concern about wanting to resolve the problem of children drifting away from science is deep-rooted. However, at first the reaction of the school was rather tepid. "They want to sell us equipment" was the skeptical reaction. Then, just when it looked like the idea would collapse, there was a new development. A curriculum coordinator looking for a "comprehensive learning" theme expressed interest in the plan. After that, the discussion proceeded much more smoothly. Noriko Yamamoto of the General Affairs Dept., who was one of those in charge of the program at that time, recalls what happened.

"We became involved in lessons for 4th graders, and at the teacher's suggestion we decided to try eating school lunch together to break down the tensions with the children."

As a result, the class was a great success. The program became established as a Hitachi High-Tech Fielding outreach activity to the local community. This year, 2016, is the 15th year this long-term project has been running. The target school age changed partway through the program, but activities have continued without a pause. Recently, with the cooperation of Fumio Nagata, an experienced expert affiliated with Hitachi Ltd. and Hitachi High-Tech Science, it has been possible to add interpretations that are just a little different. Asuka Hasegawa of the Electromagnetic Instruments Dept. in charge of operating the electron microscope gave her impressions of the program, as follows:

"There are children who come running with wide-eyed interest, as if they had just discovered a new toy. When I see them coming, I am reminded of that pure feeling of really loving science."

Yamamoto concurred, saying, "After the class has ended, there are sometimes children who come up with surprisingly advanced questions. I certainly hope to see some kids get inspired to travel the road of science."

HTA's Educational Outreach Program by Tabletop Microscope

Initiatives to support science education are expanding beyond Japan to the international arena.

In 2011 Hitachi High Technologies America (HTA), as a member of an NPO established as part of the government's efforts of STEM program, initiated the "Educational Outreach Program" in the United States to contribute to the local community. In addition to demonstrations of the Tabletop Microscope at schools and science museums that enable teachers and students to experience the nano-world, there are also seminars for teachers. Since September 2011 a total of 500 events thru January 2016 have been held throughout the United States as part of the program. As senior executive Robert Gordon puts it, "Promotional activities involving the Tabletop Microscope scanning electron microscope and efforts to support science education for children are both part of our mission." The program was selected to receive the Inspiration of the Year Global Award, which recognizes efforts to elevate the value of the Hitachi brand, at the Americas Regional Grand Prix (2015).


Electron microscope hands-on session at Hanazono Elementary School

Children experiencing the micro-world

More Information Where Space Exploration (the Hayabusa) Guides Us

Making the "Other" Hayabusa Project Possible
—Taking a Sample from the Asteroid Itokawa—

On June 13, 2010, the "Hayabusa" asteroid explorer returned to Earth. Seven years after lift-off in 2003, and after surviving various mishaps, a bleeding and battered Hayabusa successfully returned to fire up the imagination of the Japanese people. The samples retrieved by Hayabusa from the asteroid Itokawa were minute in size and volume, but the Curation Facility (asteroid substance sample receiving facility) developed and delivered by the project team headed by Hitachi High-Technologies successfully analyzed them.

Asteroid explorer Hayabusa flying toward the asteroid "Itokawa" (illustrator: Akihiro Ikeshita)

Making the "Other" Hayabusa Project Possible Part 1 (HitachiBrandChannel)

The Bullet that Failed to Fire

An accident occurred in November 2005.

Hayabusa arrived without incident at the asteroid Itokawa, about 300 million kilometers from Earth, and touched down on the surface. The plan then called for it to fire a metal "bullet" and catch the resulting particles. Due to some accident, however, the bullet never fired. If sample collection failed, there would be no need for the Curation Facility, on which development had proceeded since 2002.

"But the education team at the Japan Aerospace Exploration Agency (JAXA) refused to give up hope, saying that 'even though the bullet never fired, it is possible that microparticles stirred up by the touch-down impact were collected.' They assumed that these were microscopic particles could not be seen with the naked eye," Tsutomu Tanaka, then manager of the Science Systems Sales & Marketing Division, Science Systems Sales Dept. 2, recalls.

Heartened by these words, the development team imagined what these microscopic particles might be and proceeded with a modification of the facilities so that collection, observation, and processing could be performed.

Development with Hitachi High-Tech as Contract Leader

In anticipation of the development of the Curation Facility, JAXA contacted Hitachi Plant Technologies, Ltd. (now Hitachi Infra Systems Co.) by telephone, requesting that they prepare an estimate for a clean room. The issue was facilities for analysis and storage of the samples brought back home by Hayabusa, and equipment for handling the samples, a scanning electron microscope, etc., would be needed. The Hitachi Central Research Laboratory (CRL), Hitachi High-Technologies Corporation, and also Miwa Mfg Co., Ltd., which had performance experience with the JAXA glovebox, became involved in 2002. Hitachi High-Technologies became the contract leader, making proposals on behalf of the project team.

This was the first involvement of Hitachi High-Technologies in the development of space-related equipment. The team studied specifications at a pace of one meeting a month. The goal was to open the capsule inside a clean room that maintained the same degree of vacuum as deep space, and then to fill the

S-4300SE/N field emission scanning electron microscope
© Japan Aerospace Exploration Agency (JAXA)

FB2200 focused ion beam system

chamber with nitrogen to prevent the sample from deteriorating. Hitachi High-Technologies' product utilized the S-4300SE/N "field emission scanning electron microscope" incorporating an "atmosphere blocking system" allowing observation without contacting with the outside air and the FB2200 "focused ion beam system."

Just when the specifications had been firmed up, news of the Hayabusa accident arrived. If the samples were microparticles, there was concern that careless opening would cause them to scatter. How to collect microparticles invisible to the eye was also an intractable issue. On the technical side, CRL led efforts to handle these difficulties, revising the container opening method and studying the use of needles bathed in static electricity as a way to gather microparticles. In the end the method used for collection was a spatula on the inner wall due to consideration for efficiency, but selection of a spatula material that would not contaminate the sample was a constant worry. At some points discussion on the composite team became quite heated, with the situation reaching the danger level.

"We had to use care in coordinating the opinions of the team members. Whenever the situation hit a wall, or a difficulty was surmounted, we fell into the practice of going out together for drinks to lubricate the situation," said Tanaka.

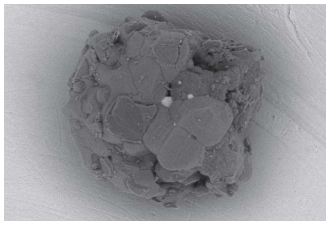
During this time Hayabusa was steadily approaching Earth, and it was scheduled to arrive in 2008. The team was somehow able to finish modifying the specifications in 2007 and make delivery of the equipment. After that a whole year was spent incorporating the opinions of the researchers who would actually be performing the operations and proceeding with continuous fine adjustments and revisions.

Collection and Analysis of Over 2,000 Microparticles

Hayabusa was encountering troubles one after another, including engine problems, fuel leaks, dead batteries, and communication losses, but it miraculously continued its flight.

"At times we were sure that it could never make it back to Earth. In the end the return was delayed into 2010, giving us plenty of time to run repeated simulations," Tanaka recalls.

Hayabusa used its final power to return to Earth on June 13, 2010, and the capsule was retrieved without incident from the Australian desert. The container arriving at JAXA Sagamihara was opened at the Curation Facility, and just as anticipated, nothing could be discerned with the naked eye. A spatula was used to carefully scrape the inner wall, and observation with the S-4300SE/N revealed more than 2,000 particles. The analysis of the particles showed that they came from Itokawa.



SEM image of microparticles brought back from Itokawa
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Making the "Other" Hayabusa Project Possible Part 2 (HitachiBrandChannel)

Benefits of Manufacturer and Trading Company Fusion

In December 2010 JAXA awarded Hitachi High-Technologies a prize for the Hayabusa Project.

"The team responded to the rigorous specifications demanded by JAXA, and were able to deliver the best possible system. This was an achievement combining manufacturer functions and trading company functions, with Hitachi High-Tech Fielding Corp. also active in system maintenance and control. The Itokawa sample has been distributed to researchers throughout the world, and has given rise to diverse asteroid research. In 2015 'Hayabusa 2' was launched, and we hope to be able to contribute to this project as well. In addition, one project achievement, the electron microscope atmosphere blocking system, has come to be widely used in research involving lithium batteries, catalysts, and other advanced materials," Tanaka said, showing how wide its effects have been.

"Letter of Appreciation Award Ceremony for Hayabusa Persons of Merit" (December 2010)
Yutaka Kaneko of the Hitachi Central Research Laboratory is in the second row, fourth from right, and Mikio Takagi of Hitachi High-Technologies is fifth from the right