

Enjoying Work Can Lead to an Innovative Economy



Author Naoyuki Haraoka

By Naoyuki Haraoka

Introduction

The city of Nagoya, the fourth largest in Japan after Tokyo, Osaka, and Yokohama, is the capital of Aichi Prefecture. It was the host city for the World Exposition in 2005 and the original manufacturing home of several gigantic Japanese multinational corporations, such as Toyota and Sony.

Ms. Asako Katsuragi, featured in this article, told me that people in Nagoya are proud of their industries and also of their agriculture as one of the largest producers of vegetables in Japan. They are also proud of three historic heroes — Oda Nobunaga, Toyotomi Hideyoshi and Tokugawa Ieyasu — feudal lords from the Nagoya area in the 16th century who were successful in reuniting a country that was divided at that time into many local fiefs ruled by hundreds of feudal lords. All of them are well-known figures in Japanese school history textbooks.

Ms. Katsuragi was born in Kyoto but moved to Nagoya around six years ago while working for Sanken Corporation, a company engaged in expanding the application of carbon fiber. She has two children, one at elementary school and the other in kindergarten, and seems to be enjoying her life in Nagoya, though she finds people there a little reserved.



Asako Katsuragi working for Sanken Corporation in Nagoya

Carbon Fiber: Amazing Material for a Wide Range of Uses

Carbon fiber is an amazing material that can be used in many industries and products, ranging from golf shafts to airplanes and space satellites. According to the website of the Japan Carbon Fiber Manufacturing Association, carbon fiber is a fibrous carbon material with a micro graphite crystal structure made by fibrillation of acrylic resin, a well-known textile material, or from oil/coal pitch, and then given a certain heat treatment. Ms. Katsuragi told me that carbon fibers could now be largely classified into two categories — those based on Polyacrylonitrile (PAN) and those based on pitch. PAN-based fibers are the mainstream and are produced from acrylic resin and pitch-based ones are made from by-products of coal oil and coal tar. PAN-based carbon fiber is, in short, light, strong and hard. Its specific gravity is one-fourth of steel's and its strength is 10 times higher than steel's. Whereas another strong fiber called aramid does not have conductivity and cannot be cut, PAN-based carbon fibers have conductivity and can be cut. They are also heat-resistant and thus cannot be incinerated under normal conditions. As it has conductivity, one of the major uses of carbon fiber is in personal computers.

By taking advantage of such characteristics, carbon fiber reinforced plastic (CFRP) is used for a wide range of industrial products such as golf shafts, fishing rods and other goods for sports and also in aircraft, automobiles and PCs. As CFRP is used for so many industrial goods and is heat-resistant, in disposing of such products it is necessary to bury them underground. Japan began production of both PAN-based and pitch-based carbon fibers in the early 1970s and is now the No. 1 producer of carbon fiber in the world.

I asked Ms. Katsuragi why carbon fibers do not seem to be so much in use at this time, even though there is such a wide range of usages for them. She told me that one of the reasons could be their high price. A lighter made using carbon fiber is very expensive and could cost tens of thousands of yen. But she also mentioned some new uses of carbon fiber recently developed. One is for the rotor blades on a wind turbine and another is for small heater systems for railways. They produce sheets of heating elements from carbon fiber and use them in small heaters. People living in a cold climate would

find these heaters very convenient.

She also talked about the importance of recycling. CFRP is a mixture of carbon fiber and resin and it is necessary to extract the carbon fiber from the resin to reuse it. But the technology developed so far for recycling is expensive and unlikely to prevail as a common technology. Only a few companies have started it on a commercial base and most of the industrial waste containing CFRP is still buried underground. But if this can be achieved at a reasonable cost and on a larger scale, we could see a more expansive use of carbon fiber by recycling it. With more recycled carbon fiber, we could save large amounts in energy consumption and thus make a significant contribution to a better global environment.

Expanding Uses of Carbon Fiber

Ms. Katsuragi previously worked for a telecommunications venture immediately after graduating from university. She took time off after getting married to raise two children, but when her second child turned nine months old she began working part-time again and then joined Sanken, where she is now in charge of PR and marketing.

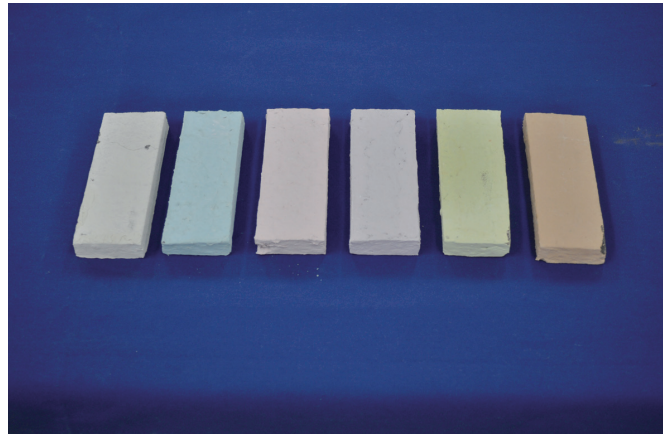
Sanken was founded on Feb. 16, 2011 in Nagoya with a patented civil engineering technology for a carbon fiber-based nonwoven mat. As Sanken's founding members were originally working in the construction business, the company has been closely working on infrastructure construction. Its patented technology using carbon fiber was helpful in the rebuilding of infrastructure. For example, with this mat, repairing old buried pipes was easier and less costly than conventional methods and thus the life of those pipes was prolonged. In October 2013, Sanken was awarded the Nagoya City Industrial Technology Grand Prix, as well as the Prize of the Chairman of the Industry Promotion Corporation of Nagoya. It was provided with a subsidy from METI's Small and Medium Enterprises Agency in 2013, 2016 and 2017. In April 2016, Sanken built a factory in Mizunami city in Gifu Prefecture, around 40 kilometers northeast of Nagoya, and in March 2017 it separated its manufacturing section from the headquarters and founded a subsidiary for manufacturing there called Sankentech. In August 2017, it transferred the headquarters office to a business incubation facility called Creation Core Nagoya provided by the Organization for Small and Medium Enterprises and Regional Innovation, a public independent agency affiliated to METI.

"We created a new composite material from recycled carbon fiber and ceramics in 2017," said Ms. Katsuragi. "This provides thermal insulation and our tile made with this composite material will be useful as a fire-resistant building material. If this tile's utility is correctly perceived by many people and we find a good market for it, we could contribute to establishing a recycle system for CFRP. First

of all, we would be happy to see our new material contributing to the local economy and environment. We are now looking for a market for this and still exploring sales routes in the hope that we can start mass production as soon as possible. The more widely this tile is known, the larger the market will be, as there will be a wide range of usages for it. So the key to our business success will be our promotional activities."

Nagoya is certainly an appropriate place to develop this technology, given that the automobile and aircraft industries are the main locomotives of the region's economy. There is also a big traditional art and craft ceramics industry in this area, with well-known brands of pottery such as *Minoyaki*, *Setoyaki* and *Tokonameyaki*, which would be excellent gifts for inbound tourists in Japan to buy. They can take advantage of the traditional technique used for making *Minoyaki* to produce the tile. The tile has already been authorized by the Japanese Ministry of Land, Infrastructure, Transport and Tourism as a "noncombustible material", as it met the ministry's qualification requirement during experiments. The requirement is to be noncombustible for two hours at a temperature of 1,050 Celsius. Sanken purchases CFRP materials with 85% of resin removed and extracts almost pure carbon fiber by dissolving it with their original technology. In collaborating with the Ceramic Technology Institute in Mizunami, Sanken developed a ceramic material that will not shrink even when being fired, and used this material to coat the tile made of recycled carbon fiber (*Photo 1*). Gypsum board is generally used for such fire-resistant materials. But this newly invented tile could meet such needs with only one-third of the thickness of gypsum board, and it is also a light material. Therefore, although the carbon fiber recycle technology is still costly, we could reduce the amount of wood used in construction and overall it could have the same price competitiveness as gypsum

Photo 1: Sanken Corporation



Hybrid carbon fiber tile

Photo 2: Sanken Corporation



Incubation office

board has. Sanken's factory in Mizunami already has a production capacity of 1,000 30-centimeter-square tiles per month, but the company is still looking for a market large enough to pay for the cost of production, and then hopes to launch a mass production in collaboration with other companies.

Sanken also recently developed a new product from composite fired material of ceramics and graphite in collaboration with Chukyo University. This was perceived to decolorize sewage after livestock manure processing, and would be beneficial in agriculture.

Ms. Katsuragi hopes to see a rising perception of these new products in the industrial community and to launch mass production soon. Sanken's activities, as already noted, involve a network of institutes and organizations such as the Organization for Small and Medium Enterprises and Regional Innovation (*Photo 2*), the Ceramic Technology Institute in Mizunami, Chukyo University and some other supporters of public organizations in Nagoya. Any venture's contribution to the social economy would be greatly encouraged by such a broad network among business, public organizations and academic institutes. No nation or local region has ever been successful in achieving a massive commercial use of recycled carbon fiber. If Sanken is successful, it would be a great contribution not only to Nagoya's local community but also to the global environment overall.

Incentives for Employees Key to Business Success

Ms. Katsuragi believes the Nagoya city administration, with the help of the central government, has been working hard to improve the business environment for new ventures. For example, it has been implementing a "Project for the Creation of SME Innovation" since

2016. The project consists of the three study groups — one on "application of IoT and other new technologies", one on "maximum utilization of design" and one on "business for women". Each study group supports startups of new business as well as development of new goods and services. The "business for women" group invites distinguished business people active in the Nagoya area to give presentations on their work experiences and their strategy for starting new businesses. Participants then engaged in group work on the basis of specific examples and think about how to develop new products or new services and commercialize them by themselves, and at the final stage they organize a presentation session for each group about their own startup strategy.

Ms. Katsuragi herself is not an entrepreneur but in the light of such efforts by Nagoya she believes that business support for ventures should be reinforced. She also notes that social entrepreneurship today is attracting more people's attention, citing the example of a female certified accountant who started a daycare facility in a company. While it is still believed that in Japan entrepreneurship is a rather low-key activity, the business environment around ventures seems to be changing in favor of them.

Ms. Katsuragi is enjoying her work for a carbon fiber venture. As the PR and marketing section chief of Sanken, she is working hard but on flexible time. Her working performance matters, but how many hours she is in her office does not matter. This flexible working style provides her with a further working incentive. As she is well respected as an individual by her boss, the CEO of Sanken, she has a strong incentive to contribute to achieving the company's goal, which is to commercialize their unique fire-resistant tiles.

I asked her whether she thinks flexible working hours could boost anybody's incentive and working performance. She answered, "No, I do not think so. What is important in raising a person's working incentive is to find the best working environment for each person. Somebody may like a flexible working style, but somebody else may not and prefer working to a rigorously scheduled timetable. Management should know best about each employee's preference. Applying a single rule or criterion for working to all employees could result in many complaints from them. Respecting an individual's values and treating each employee differently would make them all happy with their job and they would then have an incentive to work hard. And thus eventually your company would achieve success."

Innovative ventures should start with management treating the employees in accordance with their personal situations and thinking, while respecting their individual values. **JS**

Naoyuki Haraoka is editor-in-chief of *Japan SPOTLIGHT* & executive managing director of the Japan Economic Foundation (JEF).