



The Right CHEMISTRY

NIPPON SHOKUBAI WAS FOUNDED IN JAPAN IN 1941 AS A manufacturer of phthalic anhydrides. With catalyst technology at its core, the company developed proprietary processes for synthetic resins, widely used in aircraft manufacturing and other industries, and after the war developed a line of chemicals used in plastics, synthetic fabric and detergents. ♦ In the 1950s, Japanese companies were largely importing technology, but Nippon Shokubai continued to develop its own, often creating higher quality products that helped establish it as a leader in the evolution of the chemicals sector. The '70s saw a major shift from cloth to disposable diapers to meet society's need to reduce the burden on the limited number of caregivers in homes. In response, Nippon Shokubai developed its own superabsorbent material, partnering with global disposable diaper brands. Today it still holds a quarter of that global market. ♦ Most recently, the company created an electrolytes product, IONEL, that improves the performance, durability and lifespan of the lithium-ion batteries used in electric cars, cell phones and other rechargeable devices. By contributing to the enhancement of the performance of electric vehicles, the product also aims to support the transition to a decarbonized society. An expansion of its manufacturing facilities will allow Nippon Shokubai to increase production capacity of IONEL from several hundred tons a year to a much larger scale in the spring of 2023. ♦ Brunswick's Daisuke Tsuchiya and Ayumi Ban spoke with Nippon Shokubai CEO Yujiro Goto about the current challenges the company faces. As it maintains a now-international presence, Nippon Shokubai must also address fast-changing social and regulatory challenges. In this area, as in its approach to its chemicals business, the CEO sees areas that must adapt alongside a foundational dedication to the quality, efficiency and usefulness of its products. To be truly innovative, he says, a company must be good for the community it serves.

From baby diapers to electric vehicles, Nippon Shokubai's portfolio touches all manner of sustainable products. CEO **YUJIRO GOTO** talks to Brunswick's **DAISUKE TSUCHIYA** and **AYUMI BAN** about the secret behind the chemical company's proprietary technology and partnership.

ILLUSTRATION: LINCOLN AGNEW

What was the focus 80 years ago, when your company was established?

It was before my time, of course, but there was a person named Goro Osame, who was a pioneer in Japanese chemistry. Just around the time the Second Sino-Japanese War ended and World War II was beginning, the Japanese chemical industry started producing sulfuric acid. Based on the idea of making something exclusive with his own technology, Osame established Osame Synthetic Chemical Industries and began the manufacturing business of catalysts used to produce the chemical.

Taizo Yatagai, our first true CEO, wanted to branch out a bit more, wanting to do something new with their technology—he was a very positive and ambitious person who became the central figure of the business. He had connections with people working on the South Manchurian Railway, and was able to gather a number of especially skilled engineers quickly, working very hard to start a new type of chemical industry in Japan using their own technology. From coal tar used in railroads, they developed a technology to produce a raw ingredient in synthetic resins, which were growing in demand as a result of the war for use in such things as fighter planes.

Applications for our products expanded after the war into clothing, construction materials, et cetera, including polyvinyl chloride—a hard plastic still found in piping, for instance. For it to be used more widely in plastic products the way we use them today, that hard plastic needed to be made softer and more flexible. The essential raw materials we provided made that possible.

At the time, most Japanese companies imported foreign technology. Yatagai may have been a bit stubborn; he wanted to use only domestic technology. In certain products, such as ethylene oxide, we were the first to succeed in industrialization with domestic technology, so our competitors could not keep up with us in terms of technological development.

Around 1959, at the plant in Kawasaki, Kanagawa Prefecture, which still exists today, we succeeded in producing ethylene oxide with our own domestic technology. At the time, the Nippon Oil Corporation was going to build an ethylene plant next door, but somehow, we completed our factory first. Ethylene oxide and water combined produce ethylene glycol which, with another raw material, becomes polyester—it is also used in PET bottle manufacturing. Additionally, combined with alcohols, ethylene oxide is used in detergents. A significant proportion of detergents on the market in Japan contain our ethylene oxide in some form.

Those were tough times; some accidents happened. We needed to build more plants but didn't have the money to do so. To gather the funds, we went directly to the presidents of companies that provided us with raw material—current-day Nippon Steel, and the Nippon Steel Corporation. There was a book about it you may have read: it's called *Passionate Entrepreneur* in English. In the book there

is a story about how our then-CEO found out that the president of a steel company was on a sleeper car, so he boarded the train and negotiated directly with him about an investment. Those were desperate times.

At the same time, the Japanese chemical industry was being established. It was a period of rapid growth and the favorable economic and external environments likely helped things out.

That approach to proprietary technology provided an advantage?

It still does, yes. As we manage our own original technology, we can respond to requests from our customers and control the composition of the materials for specific applications. Other Japanese companies that produce ethylene oxide, for example, use technology imported from overseas, which makes it harder to tailor the product for a customer. But in our situation, we can control operations with a certain degree of freedom. This is a major advantage—the ability to change certain aspects, including the manufacturing process, according to customized specifications. We are probably the only company that can do this.

So, you keep changing the formula according to the needs of the market?

Yes, we are able to do this because we use our own technology.

Did you stop making the raw material for plasticizing agents because the competition grew too fierce?

Yes, we did. When large companies produce it on a large scale, you can only compete on price, so we

inevitably lose to economies of scale. You can't compete no matter how good your technology is. When that happens, we stop right away and move on to the next thing.

There was a point in the 1980s when you partnered with a top manufacturer of diapers to start producing a high-performance absorbent. How did that happen?

We were already making acrylic acid, a raw material for the super-absorbent polymers. It's also used in a wide variety of areas, such as paints and adhesives. But instead of only targeting these applications, we were looking for ways to make a high value-added product.

Around the 1970s, an American research institute discovered the application of acrylic acid in super-absorbent polymers. In Japan, some companies were already working on the development and production of superabsorbent polymers.

We thought we could improve performance and make it cheaper, as well as expand the scope of applications. This led to a number of improvements in various manufacturing methods, functionality and performance and we eventually signed a deal with the top manufacturer of diapers. From there we were continuously

improving the product. As other companies in and outside of Japan began producing them, we expanded our scale.

In recent years, competition in the diaper and super absorbent polymer markets has intensified and the earnings environment has become more challenging, but technologically and economically speaking, we still have a great competitive edge. We produce the entire product, super absorbent polymer, starting from acrylic acid. Our current global market share is around 25%.

As the company decides what to tackle next, does that involve the next innovation and new ideas?

Yes. It is tough to raise profit margins simply by striving for scale. No matter how advanced our technology is, late-comer competitors will reach the technical level we were at 10 years ago and use that to try to occupy the lower-priced range. That means our gains will be minimal if we look to compete with materials that come to the market at a low price and that can withstand a fair amount of use.

That's why we are striving to enter the markets of more premium products; not just higher quality diapers, but feminine hygiene products and incontinence products such as diapers for youth and adults that are recognized as slightly higher value-added products. We believe this is a promising market.

At the same time, we are balancing that with products we produce in high volumes. Failure to add new features means that products won't be adopted by users, so we are constantly making development efforts to that end. For example, when talking about absorbing water, it's not always the case that higher absorption rate is better; rather, you need to meet the true demands of the market such as quick absorption, making sure absorbed water never leaks out, et cetera. Failing to do so means you won't attract premium market customers, so you have to stay on top of that.

But the demand for diapers continues to grow by at least 3% to 5%. And in our view, it seems that the level of take-up has become considerably well balanced in the past two to three years, and the market conditions are becoming more favorable. With a significant drop in prices of absorbent polymers, competitors are less willing to build new facilities. That is why you don't hear announcements about completely new facilities being built.

Does that mean that usage of disposable diapers has risen in developing nations?

It's often said that once a country's per capita GDP exceeds \$3,000, disposable diapers begin to be widely used. We keep an eye on population and economic changes, estimating where demand will emerge, and thinking of our next strategy. The current market situation is quite severe, so you can't simply sell at volume, you have to change your strategy.

How did you come up with the idea of developing IONEL?

We have been involved in materials used in batteries in various forms for quite some time now. It hasn't been so long since lithium-ion batteries appeared on the scene and became popular, but we've had our eye on battery material trends even before that.

In this process, Lithium FSI, a compound containing fluorine, has even greater performance than Lithium PF6, but developers around the world faced technical hurdles due to difficulty in production. One of our ambitious employees challenged himself to use our catalyst technology to see if we could succeed in its production—and somehow it worked. The yield nearly doubled, compared to the conventional production method.

So we started the Lithium FSI business, IONEL. Japanese battery manufacturers dragged their feet, but companies in China and Europe were plugging along quickly, so we turned our attention to those markets and started to develop the technology at a small scale in Japan. The next step involves the idea of local production for

local consumption in China and Europe, and we're now at the point where we need to decide on rolling out the business, whether on our own or in partnership with someone else.

Even so, we still need to think about the product lifetime of lithium-ion batteries and IONEL. In particular, we need to consider whether or not the battery industry will stabilize, how much and when the industry will change, whether or not the speed of technological innovation will pick up significantly. While considering when IONEL will bear fruit as a business, we're carefully but speedily choosing partners while building an investment strategy. This is a slightly different approach to business expansion

compared to what we have been doing in the past. We're doing the best we can.

How does Nippon Shokubai address the environmental impact of its chemicals?

Actually we feel our chemicals have a considerable positive environmental impact, rather than negative. IONEL of course allows for more efficient EV batteries, which reduces negative impacts on the environment. But we have other chemicals: for example our "Catalytic Wet Air Oxidation," which purifies factory exhaust water—a wet sulfuric acid process for instance is used to remove and recover sulfur from various streams. These processes don't rely on burning fuel, so there is no significant production of CO2.

The trend toward decarbonization is a major movement. Is your strategy linked to the growth of electric vehicles?

The global conversation around carbon neutrality has accelerated growth and innovation in this space, especially in the last year. We view our battery technology portfolio as one of our key business areas and we aim to grow it significantly.

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About five to six years ago, we refocused our priorities on launching new businesses and reinforcing a solid foundation. Carrying on as we have always done will result in poor financial performance, so we need to build a portfolio that isn't as influenced by external business and economic environments. Higher performance products are key to that, as is focusing on the technologies and areas in which we have strength and looking at how they could complement growth markets. The use of lithium-ion batteries for EVs is a good example. We had technologies under development in energy resources for 10 years. It was an area that we felt we should be investing in—where we could do something that only we can, without any immediate competition threats.

How do you deal with the threat of being copied, particularly in countries that don't honor intellectual property rights?

When you enter countries that tend to completely ignore intellectual properties, there's nothing you can do. Should you stay out of those countries at all costs and not manufacture products there? Decisionmakers have to consider such questions when expanding their business.

In fact, although our strength is developing technology to create something out of nothing, I think we could improve on actually commercializing it in a world that is changing at a much faster rate than it did even a few decades ago. We have had a successful core business, that has indeed changed and adapted well, which is how we have been able to try out various things and small endeavors in R&D with a long-term view. However, I think we could do more to try to turn a single seed of an idea into 100 products and businesses. Our researchers are always pursuing technologies so advanced, that could be profitable in the future, but the timeline is sometimes 10 years down the line. This means many ideas may be developed, but if you don't turn them into businesses, they are useless. If the new technology isn't implemented into society, you can't call it innovation. It's just complacency.

A business strategy needs to consider how the seed exits from the R&D phase, otherwise it just won't grow. When bringing a product to market, you have to accept that someone could copy it, so speed becomes key. The R&D cycle needs to be fast enough that you already have the next new thing waiting right after a product is released, and that is not easy to do.

Instead of targeting big markets from the start, we aim for rapid social implementation, starting in smaller markets. We then expand the scale, keeping an eye on the next target market. We think about when and who we should partner with and look for synergies in areas such as technology and raw material supply chains. As part of that, we sometimes don't hesitate to do M&As. All of that is part of our goal to strategize R&D for market entry according to one single company-wide plan. This is a major transformation from an operational, as well as an investment point of view.

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You've talked in terms of partnerships, co-creating with Japanese businesses, particularly in the manufacturing industry, that develop many in-house technologies.

We attempted a merger with Sanyo Kasei last year, which unfortunately didn't work out, but that was truly the strategy we were aiming for. I think of integrations and partnerships as forming a platform in a sense.

Done well, they can be more than the sum of their parts—a multiplication of assets to make an even greater company. That then gives you a different perspective in terms of risks and the next investment. The Japanese market itself has limited prospects for growth, which is an issue in itself, and our ambition is not just to survive, but to grow and thrive globally with our peers.

Does this mean that you're not limiting partners to Japanese companies?

That's correct. A so-called "all Japan" way of thinking will only result in your own satisfaction, it doesn't give you a true competitive edge. In terms of innovation, it's probably better to have a diverse range of ideas as well. In Europe, for instance, you need the appropriate market knowledge, so we need to work with local firms there.

As you move forward, how do you see Nippon Shokubai responding to social challenges?

I think we'll need to shift our management and thinking to a manner that considers the company's *raison d'être*, including its social contribution. And, partly as a result, I think the current norm of mass production and mass consumption will change drastically. I believe that the value individuals place on consumption will change to quality over quantity—this is happening dramatically due to the COVID-19 pandemic. Also, the move toward a carbon neutral society is a major factor in the changes in individual consumption trends, such as taking care of our possessions, minimizing food waste, recycling, living in a healthy environment and maintaining good personal health.

At Nippon Shokubai, we need to dig deeper into areas where we can apply our technology in this regard. We should always be aware of how new products can contribute to society. No matter how good a product is, it's pointless if the manufacturing process requires a lot of energy and produces a lot of CO₂, so I think we need to be highly aware of that in our efforts. On the other hand, if our profit falls, numerically speaking, but we see an increase in the sense of social contribution, I think that's fine.

Solely pursuing profits is sure to hurt somebody. ♦

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