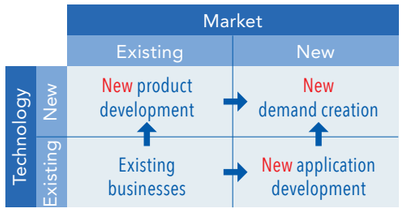
Nitto Group's Strengths

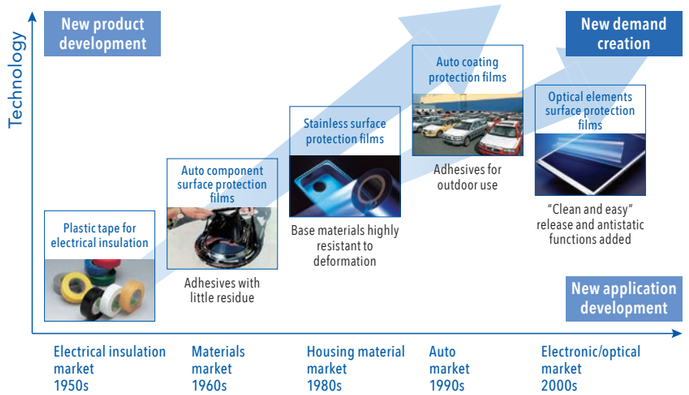
Sanshin Activities

Sanshin Activities stimulating new demand through the development of new applications and new products

Finding "new" applications for existing products and then adding new technologies to them or using new technologies to develop "new" products and then expanding their applications, thereby creating "new" demand - Literally translated as "three new activities," *Sanshin* Activities is the Nitto Group's proprietary marketing approach which we have diligently followed for more than 50 years by repeating the cycle of the three "news" for continued progress.



Example Cases of *Sanshin* Activities



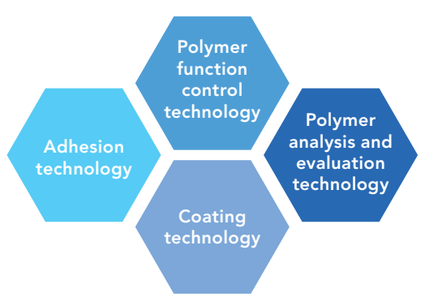
In the beginning there was plastic tape, a commonplace product whose main application was electrical insulation. Through the development of a variety of new technologies/functions and applications, we have created demand from new customers in growing industries, including electric wire manufacturers, housing developers, and auto manufacturers.

Pursuing *Sanshin* Activities with Engineering, Production, Sales, and Administration working as one while taking a customer-oriented approach has formed the "DNA" of the Nitto Group's drive for innovation and is one of its growth engines.

Core Technologies

Developing products that meet customer needs by combining the four core technologies

The Nitto Group's core technologies are: polymer synthesis/processing technologies (whose origin dates back to the founding days) and adhesion, coating, polymer function control, and polymer analysis/evaluation technologies that have been derived from the two founding technologies. Through their combination and continued development, we have broadened the scope of their applications to include automotive and transportation equipment, housing and housing equipment, social infrastructure, materials, home electronics and electronic equipment, displays, electronic devices, medical-related materials, packaging materials, and consumer products.



Niche Top Strategy

Shooting for the leading share by leveraging proprietary technologies in niche markets where we have a competitive advantage

The Niche Top Strategy is the Nitto Group's unique focus/differentiation strategy, under which we pour our management resources into niche market spaces where we can tap into our proprietary technologies and maximize our competitive advantage in the ever-growing (-changing) market.

The Global Niche Top™ strategy directs our drive for a leading share in the global market, whereas the Area Niche Top™ strategy guides us to the leading position in national and regional markets as we offer products that meet the specific needs of each area.

Example Global Niche Top™ Products

1 Polarizing films for displays (NPF™)

Offering superb optical properties, reliability, and workability, NPF™ (Nitto Polarizing Film) is available in a wide variety to meet customer needs for displays, including liquid crystal displays (LCDs) and organic electroluminescence displays (OLEDs).

2 Thermal release sheets (REVALPHA™)

"REVALPHA™" is a unique adhesive sheet that adheres tightly at room temperature but can easily be peeled off by applying heat and contributes significantly to automation/labor-saving of various electronic component manufacturing processes.

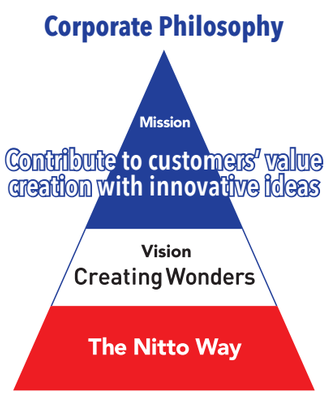
3 Thin-film metal base boards - CISFLEX™

"CISFLEX™" was developed through the combination of various technologies including the Nitto Group's photosensitive polyimide technology. Keeping the magnetic head floating above the magnetic disk with delicate spring characteristics, this component plays an important role in transmitting signals that prompt HDDs to read/write data.

Corporate Culture

Indicating our Values, Attitudes and Mindset, and Code of Conduct "The Nitto Way"

The passion, wisdom, and values of the various senior employees who have shaped the Nitto Group since its foundation have now taken the form of "DNA" that can be found in each and every member of the Group. These principles and ideologies are stipulated as "The Nitto Way," which serves as our standard for judgment and is something that we all turn to in situations of uncertainty.



History of Technology Innovation

1918 Laying the Groundwork

1946 The Second Beginning

1961 Commencing Business in the Production of Industrial Materials

1974 Diversification of Business and Globalization

1989 Introduction of the Business Division System / Implementation of Global Niche Top™ Strategy

2008 Innovation for Customers

Since 1918, our foundation year, the Nitto Group has given rise to numerous products through combinations of its proprietary technologies and expanded the scope of its business to various fields by unflinchingly adapting to the changes of the times and applying the technologies and products that it has developed.

Tapes

1918 Electrical insulating varnish cloth

1921 Linotape

1946 Friction tape

1949 Gum elastic tape, anticorrosion tape

1951 Vinyl tape

1959 Adhesive polyester tape

1962 Paper adhesive tape for wrapping

1983 COLOCOLO™ adhesive floor roller

2012 Me-del Sheet™ sweet potato sprout protection sheet

2017 Repositionable double-sided adhesive tape

1974 EPTSEALER™ sealing material

1985 NITOHARD™ reinforcing material

1992 LEGETOLEX™ vibration-damping material

Double-sided tapes

1964 Double-sided adhesive tape

1987 REVALPHA™ thermal release sheet

2002 Low-VOC double-sided adhesive tape

2004 ELEP MOUNT™ semiconductor process tape

2005 HYPERJOINT™ strong adhesive double-sided tape

Surface protection sheets/films

1961 SPV™ surface protection vinyl sheet

1992 Protection film for automobiles

1998 E-MASK™ protection film for polarizing film

Polarizing films

1975 Adhesive polarizing film

1985 Type-G high-efficiency polarizing film

1989 Retardation film for LCD

1994 EG high-efficiency polarizing film

2004 Polarizing film for large screen LCD TV

2006 Polarizing film featuring new protection film

2007 Roll to Panel™

2011 Anti-glare polarizing film for OLEDs

2013 Ultra-thin polarizing film

Medical/hygienic materials

1967 Medical adhesive sheet

1978 Antiphlogistic (steroid tape)

1981 NITREAT™ athletic tape for athletes

1983 Transdermal absorption tape formulation

1994 YU-KIBAN™ surgical tape

2005 Polymer bead for nucleic acid synthesis

2016 XTRATA™ Perme-Roll™ AIR film dressing

Fluoroplastic products

1961 NITOFLON™ fluoroplastic product

1981 Fluorine resin porous film (present TEMISH™)

1987 BREATHRON™ polyethylene porous film

1998 CAPSEAL™ pressure control part

Sputtering technology

1984 Moisture-proof conformal sheet for EL

1985 ELECRYSTA™ transparent conductive film

Membrane products

1975 Reverse-osmosis membrane

1984 Capillary ultrafiltration (UF) module

1994 Seawater desalination RO membrane module

1995 ES Series ultra-low-pressure RO membrane element

2003 High boron rejection RO membrane

2006 PROC™ 10 RO membrane element

2010 NANO-SW NF membrane

Insulation materials

1952 Glass fiber cloth

1957 Casting and molding products

1964 FRP electrical insulating products

Encapsulants

1965 E Pellet epoxy resin

1966 Semiconductor sealing epoxy resin

1983 Encapsulation resin for optical semiconductor

2003 Encapsulation resin for ball grid array (BGA)

Varnish

1924 Electrical insulating varnish

1951 Wire varnish

Polyimide

1973 NITOFLEX™ flexible printed circuit

1996 CISFLEX™ thin-film metal base board

2000 Polyimide resin belt for color copiers and printers

Nitto Group's R&D Strategy as per the Chief Technology Officer

Yosuke Miki
Director, Executive Vice President, CTO
General Manager, Corporate Technology Sector

Sorting Projects Based on the Outlook of Things that Will Grow, Recover, or not Recover

COVID-19 has completely changed the way we live and work. As new strains of the virus spread, many businesses have embarked on new initiatives to prevent infection and protect the lives and well-being of their customers and employees. Working from home and remote meetings and interviews are two prime examples. If such tools and models of online communication can produce similar results to in-person alternatives, as well as reflect major cost savings, such as time, transportation, and rent, I imagine there will be quite a few businesses that choose to continue in this way after the pandemic ends.

Once these changes (countermeasures) become irreversible, it is expected that some of the existing markets will shrink or expand and that new markets will emerge. Other areas were also forced into temporary downturns due to the spread of COVID-19 and the resultant changes in our lifestyles and society at large, but these areas should see a swift rebound once vaccines and remedies become readily available.

At the Nitto Group, the "new product ratio*" now stands at about one-third of net sales, and we will boost this number to gain competitive advantages in the constantly changing market. To make this happen, we are recategorizing both fledgling and ongoing development projects into the three categories of things that will grow, recover, or not recover, and preferentially allocating resources to the relatively attractive options.

* The ratio of sales from products released within the last 42 months to total sales

Visualizing the Commercialization Process with the "0 → 1→ 10 → 100" Formula

To create a business that seamlessly contributes to earnings, it is important to clearly show which phase of commercialization the numerous development projects are in so that we can take action accordingly. To make things easy to understand, we came up with a development flow of "0 (idea) →1 (project launch) →10 (productization) →100 (commercialization)."

The first phase from "0" to "1" is the process where we verify if an idea fresh from the laboratory can really "sell (needed in the real world)." At such opportunities as "Technology *Kuruma-za* (round-table group discussions)" and "Nitto Innovation Challenge (new business creation convention)," we lay many outstanding ideas on the table for consideration to assess their potential.

In the second phase, from "1" to "10," we start concrete action to form a product out of the chosen ideas. Here, we always start from existing businesses, and this segment involves three different approaches of development of "new" applications by bringing established applications to other markets, development of "new" products by advancing technologies, and creation of "new" demand through these approaches. We call the three business practices "*Sanshin* Activities."

Another long-standing forte of the Nitto Group is "convergence," that is, integrating technology, wisdom, and know-how across divisions. Should it be deemed necessary, we can even opt for an alliance with outside organizations. The conclusion that we have to reach at this phase is whether we can envision a scenario of us winning the way only the Nitto Group can by combining these methods.

In the final phase, from "10" to "100," because it involves a large amount of investment, having customers and partner businesses agree to the business scheme, including QCD*, is a prerequisite. By starting up mass production quickly and smoothly, we aim to establish advantageous positions in the market by delivering Area Niche Top™ and Global Niche Top™ products.

* Quality, Cost, and Delivery

Technology *Kuruma-za* Serving as an Engine for Promotion

As we move along the aforementioned development flow of "0→1→10→100," candidate projects are repeatedly screened until the strongest projects remain. Now, what determines their survivability is the quality and quantity of projects at the initial phase of "0→1."

Sometimes, free-wheeling ideas that only occur to amateurs can be very effective. At the same time, we should not underestimate the importance of commitment by technology professionals, who have a set of prior knowledge on market conditions, technologies on the background, and relevant patents and thereby can judge ideas, when it comes to developing a vision for a new business.

Here, let me explain what "Technology *Kuruma-za*" is, which is the Nitto Group's proprietary program designed to drive the shift from "0" to "1." First convened in 2017, Technology *Kuruma-za* is an avenue for cross-sectional communications where several dozens of people, including heads of R&D divisions and development managers of business execution bodies, meet once a month to hold casual discussions on how they should go about their development projects. At first, the primary subject for discussions was a departure from sectionalism, which included total optimization, inter-sectional cooperation, fusion of technologies that belong to different divisions (convergence), and stimulation of communication. From fiscal 2020, however, its operation was improved in order to enhance effectiveness as it moved on to the next phase. In more concrete terms, a team of 4-5 is given a roughly defined topic, to which they have to provide an answer after three months of intensive discussions.

In the discussion process, it is necessary to conduct surveys on markets, patents, and technological trends. Subordinates of the team members and appointed members of *Kuruma-za* offer backup support to the team's endeavors as necessary. Then, based on the results of such activities, they put together a final recommendation, which can be summed up as "This could be a scenario that you need to enter this market."

All the members of *Kuruma-za* attend both interim and final reporting sessions to engage in Q&A and discussions until they can produce an output that also reflects the wisdom contributed by non-team members. It is from here that development activities are kicked off toward productization and commercialization. It is roughly in this way that we seek to increase the quality and quantity of development projects.

Injecting Resources to Boost Development

Now, when you reach the "1→10" phase where actual product development begins, you need funds, though still in a small amount compared to what it takes to make large-scale capital expenditures at the "10→100" phase. At this early stage, however, you may be unaware or unsure of the cost-effectiveness of the money you are going to spend, or you may miss an opportunity if you follow the regular approval process of the company.

To deal with such a situation, the Nitto Group maintains a "management fund" system to provide funds flexibly. In order to expedite the development of new technologies or products within the company, this system uses a different set of criteria for making quick decisions on projects. For up to a certain amount, the CTO has the decision-making authority to distribute funds.

Within the projects receiving management funds, the number of those related to open innovation is on the increase. As technology continues to advance, companies find it difficult to afford things entirely on their own. Even if it is technologically possible, there are not a few cases where it would make better sense cost-wise or end up making greater contributions to total earnings if you cooperate or collaborate with outside organizations when necessary.

When we encounter businesses or research institutions that possess attractive technologies or intellectual properties, we can use the management fund to promote collaboration in the forms of capital alliance or provision of development funds. In order to expedite commercialization, we will encourage people to proactively use this system.

Shifting to an R&D Strategy with ESG at its Core

Fiscal 2020 saw interest in ESG rise sharply. The tendency of capital to enter ESG-minded companies accelerated, and national governments, businesses, and individuals alike experienced the bitter reality of the ramifications of being selfish under the pandemic. Some visionary businesses have already begun involving players in their supply chain to address social issues.

The Nitto Group owes part of its success to its unique marketing that entails a tremendously close connection to its customers, but we should raise our gaze to pursue business with a focus on ESG.

The Mission of our Corporate Philosophy reads, "Contribute to customers' value creation with innovative ideas," but we will modify this to say, "The global environment, humankind, and society too are our valued customers." This is not to merely say, "We also take note of/into account the public and other stakeholders," but instead means that regardless of whether we are directly supplying products, we think of everyone as our customers and strive to maximize their satisfaction and the value we deliver to them.

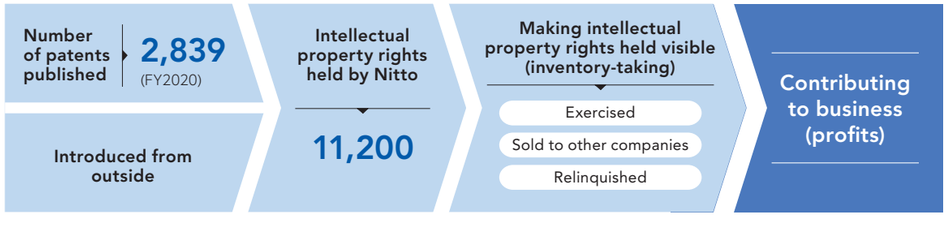
We used to start by locating "customers' everyday trouble" to initiate the development of technologies and products. Going forward, we will begin by "envisioning the shape of the future and what challenges will need to be resolved." In other words, our development activities will be triggered by challenges in our society. Rather than seeking to "pursue earnings first" and "produce results in a relatively short period," we will make it clear that we will "also pursue earnings" and "attach importance to long-term perspectives and sustainability."

I am not saying that we will make a complete shift from conventional principles to new ESG-oriented principles, but we aim to achieve each at a higher level as we strike a balance between the two. This is the R&D strategy/policy that the Nitto Group will follow from now on.

Let me give you two examples. In this world, there are people who suffer from rare diseases with no prospect for treatment. The Nitto Group's landmark product, nucleic acid medicines are pharmaceutical products produced from the components of DNA and RNA, known as nucleic acid (oligonucleotide), that inhibit the expression of genes responsible for certain diseases. One of the sources of our strength here is our expertise in the drug delivery system (DDS), which delivers drugs to target organs without affecting others. With a strong desire to offer relief to patients with intractable rare diseases, our development team taps into pertinent technologies to work on pharmaceutical products for such diseases day in and day out.

We are also taking a variety of approaches to deal with CO_2 emissions. We are not merely curbing emissions, but we are utilizing our proprietary membrane technologies to separate CO_2 from exhaust gases, condense it, and convert it to other forms of valuables. By sharing such technologies with a broad range of third-party businesses, rather than using them only at our own plants, we are working on a system that allows us to monetize the process and contribute our services to society.

Making Intellectual Property Rights Visible



Monetizing Intellectual Property

How should we monetize intellectual property, which is the single biggest constituent of our intangible resources? Roughly speaking, there are two different strategies for this: patent application and utilizing patents held by the company.

We have three approaches for the former.

First, we take the offensive to acquire patents in fields in which competitors may have an interest, in an attempt to gain a competitive advantage over them. Second, we build entry barriers by establishing rights to technologies that form the core of our main fields. The third approach is to let others use our technologies, which we have built but did not bring to market for some reason. We call these approaches "Offense," "Defense," and "Exit," respectively, and file patent applications both systematically and strategically with these approaches in mind.

To utilize patents held by the Nitto Group, there are roughly four avenues for monetization.

First, utilizing them for our operations, i.e., we establish proprietary technologies, protect them by acquiring patents, and make the most of them to maximize earnings. This is the most traditional approach.

But this is not enough. We can bundle the knowledge gained in the R&D process without being put to practical application by acquiring rights to them, hoping that some entity may show an interest in using them. When that happens, we can expect to receive gains in the forms of license revenue through the exercise of the rights to such technologies and gains on sales of the technologies. These are the second and third approaches.

We must remember, however, that there is a cost to maintaining intellectual property. In some cases, it makes better financial sense to get rid of dormant patents that are not needed by the Nitto Group or others but are being kept as a last resort.

By considering these four possibilities while making maximum use of intellectual property, we ensure that we recoup resources invested in development and boost earnings of the Nitto Group.

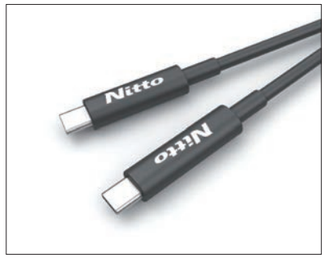
Creating Value out of Intangibles

For the last several years, we have focused on expanding earnings by utilizing intangible assets. In the past, we were keenly aware of the need to utilize patents, manufacturing know-how, and other forms of intellectual property, but that is not enough.

Here, I have touched on Technology *Kuruma-za*, a vehicle for conceiving novel ideas for better products and businesses by tapping into each person's imagination, and the management fund, a system for flexibly internalizing external wisdom. It is safe to say these systems and programs that serve as sources of competitiveness, as well as the principles of action in pursuing ESG and corporate culture, constitute an essential part of our intangible assets, and we cannot do without them to enhance our competitiveness. We will make the utmost efforts to hone and tap into these assets to create and deliver products and technologies with enhanced social value. So, please keep your eyes on the Nitto Group!

Innovation to Shape the Next Generation

Plastic Optical Fiber Cables



The advent of 5G, IoT, and other new technology platforms has given rise to the need for new technologies and products that support high-speed, large-capacity telecommunications. The Nitto Group is focusing on the development of plastic optical fiber cables (active optical cables), for which mass production and a market debut are imminent.

Optical fibers play a critical role in the communication network that supports our lives and business. Most conventional optical fibers are made of glass, with their chief applications being long-distance backbone networks, including intercontinental undersea cables, instead of cables that are wired through the walls of small rooms.

In collaboration with partner businesses and a university, the Nitto Group is working on plastic optical fiber cables. In parallel, the Nitto Group successfully developed optoelectronic hybrid boards that transmit both optical and electrical signals by forming polymer light waveguides on a printed circuit board, with possible applications for electronic and medical equipment, which require high speeds and low noise. We are currently working on launching cable products that combine plastic optical fibers and these optoelectronic hybrid boards.

At the Nitto Group, we develop new technologies and products by following the process of "0→1→10→100." Currently, plastic optical fibers are close to "10 (productization)." Through repeated dialogues with customers in the housing and communication sectors, who have high hopes for the Nitto Group's plastic optical fiber cables and are considering using them, we are making preparations for their market debut.

Voice Messages from the Development Managers

Shifting Focus to ESG-Oriented Manufacturing

Nao Murakami
General Manager
New Business Development Division

Plastic optical fiber cables, which are being materialized by the Nitto Group, offer greater freedom in wiring and placement compared to conventional glass fiber cables. Crucially, this is possible without any reduction in transmission properties.

In developing these innovative products, we took advantage of the open innovation approach to incorporate photonics polymer technology from Keio University, our joint research partner, into the Nitto Group's proven technological basis. The result is thinner, lighter, and more flexible plastic optical fibers.

Another important subject for the future is how we should modify our current production setup to take into account ESG. As we work on the initial stages of mass production, we are doing our best to figure out a production process with minimal environmental impact, such as CO_2 emissions, in addition to focusing on efficiency and cost.

Maximizing the Benefits of Wired Telecommunication

Yasuto Ishimaru
General Manager
Optical Communication Business Promotion Department
New Business Development Division

In the era of 5G and IoT, which should bring about innovation to housing, healthcare, and self-driving vehicles, relevant telecommunication must be capable of high-speed and large-capacity, multiple connections, and low latency.

Even though wireless communication has become faster with the 5G technology standard, its information transmission quantity is more than ten times slower than optical communication. One application that requires broadband telecommunication is real-time transmission of 8K videos, for which optical communication is preferred. Plastic optical fiber cables are also expected to be chosen in cases where the reliability of communication quality is critical, and in such instances, wired communication will be selected.

In the development process of "0→1→10→100," the bottleneck was the transition from "1" to "10." In the field of optical communication, the smallest imperfection can sway the product quality significantly. We have worked on such issues one by one and offered solutions to them. Every member of the team is determined to unite as one to start producing them on a commercial basis.

Segment Information

Summary of overall business

During this fiscal year, a sense of economic slowdown temporarily increased due to the impact of the further spread of COVID-19 infections. With the resumption of economic activities, however, consumption recovered. In the Nitto Group, things that will grow as new demands have arisen through changes such as the evolving electronics market and the growing life science market with the spread of new lifestyles. Meanwhile, the demands that had existed in the past were split into things that will recover and things that will not recover. To accommodate these changes, the Nitto Group acted speedily and flexibly.

In this environment, in the key markets for the Nitto Group, demands grew for assembly parts of electronic devices, process parts in the production of semiconductors, and optical films used in laptop computers and tablets, on the back of the spread of teleworking. As for optical films used for TV, we posted royalty income through licensing agreements as we enhanced collaboration with our partners as part of the intellectual property strategy the Nitto Group promotes. With respect to printed circuits that are expected to grow in the future, smartphone parts began contributing to our business results as an initiative for a new market using high precision substrates. In addition, in the nucleic acid medicine market, expectations for nucleic acid medicines grew more than ever for the development of therapeutic drugs and vaccines for COVID-19, resulting in steady demand for contract manufacturing business and related materials. Additionally, demand for porous materials also expanded as a material for medical masks.

Meanwhile, the transportation business suffered a material negative impact from COVID-19 as vehicle production plummeted in the first quarter. Although demand recovered thereafter, it did not reach the level seen in the previous fiscal year. As for optical films used in smartphones, although there was a progress in their use for high-end models, demand did not reach the level of the previous fiscal year.

In responding to COVID-19, the Nitto Group prioritized the health and safety of every person and worked on preventing the spread of infections while endeavoring to ensure the continued supply to our customers. As part of these efforts, we promoted new workstyles such as teleworking and online conferences using information communication technologies. This led to the improved productivity and smaller expenses throughout the Group.

In the fourth quarter, we posted impairment losses for structural reforms and other reasons.

As a result of the above, revenue increased by 2.7% from the previous fiscal year (changes hereafter are given in comparison with the previous fiscal term) to 761,321 million yen. Operating income rose by 34.5% to 93,809 million yen, and the net income attributable to owners of the parent company grew by 48.9% to 70,235 million yen.

FY2020 Segment Revenue / Operating Income (Yen in Millions)

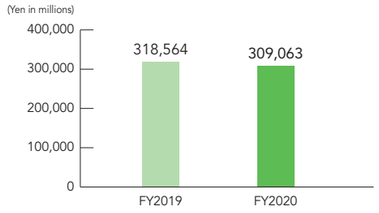
	Revenue	Operating income
Industrial Tape	309,063 (39.1%)	27,311
Optronics	428,886 (54.2%)	80,727
Life Science	29,855 (3.8%)	–3,011
Others	23,266 (2.9%)	–7,496

Industrial Tape

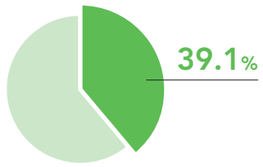
Main products

- **Functional base products** (bonding and joining products, protection products, process materials, etc.)
- **Automotive products**

Revenue



Composition of revenue



Operating results

Functional base products grew compared to the previous fiscal year. An increase in the production of high-end smartphones following the evolution of displays pushed up demand for assembly parts. Furthermore, the spread of teleworking and other factors increased demand for ceramic condensers and semiconductors used for electronic devices such as smartphones, tablets, and servers, leading to the growth of demand for related materials used in their manufacturing processes. Meanwhile, demand for materials related to general industries and housing and protective materials for metals declined significantly in the first quarter. Although demand recovered from the second quarter onward, it did not reach the level seen in the previous fiscal year.

Automotive products in the transportation business were weaker than the previous fiscal year. Demand plummeted in the first quarter especially in the United States and Europe. Although demand recovered from the second quarter onward, it did not reach the level seen in the previous fiscal year. In the fourth quarter, we posted impairment losses for structural reforms.

As a result of the above, revenue decreased by 3.0% to 309,063 million yen, while operating income rose by 33.1% to 27,311 million yen.

Issues to be addressed

In the Industrial Tape segment, the transportation business will be integrated with the functional base products business in the next fiscal year. This integration is designed to maximize synergy between the two businesses ahead of the expansion of the next-generation mobility market that is expected to accelerate in the future and the subsequent changes in the supply chain. It is also designed to enhance our efforts for innovation creation in areas such as CASE (Connected, Autonomous, Shared, and Electric). With respect to a demand outlook, vehicle production is expected to recover, albeit with uncertainties such as concerns about semiconductor supply.

Solid demand is anticipated for electronic materials and semiconductor process materials, driven by the dissemination of 5G and new lifestyles. The Industrial Tape segment will flexibly respond to these changes and endeavor to further differentiate the Group from its competitors through enhancement of technologies.

Furthermore, the entire segment will implement structural reforms to optimize its production system and create a business foundation that will stably achieve a high level of profitability.

Research and development activities

At the adhesive tape manufacturing process, we are making constant efforts to reduce organic solvents and promote the use of biomass materials. With regard to biomass materials, we have taken note of paramylon modified plastics derived from Euglena and will conduct further studies through membership in the Pararesin Japan Consortium.

In an effort to help reduce industrial waste at customers' production processes, we are working on repeelable industrial tapes, rather than those providing durable adhesion. In this way, we will continue to focus on the development of sustainable, environmentally friendly products with careful consideration given to ESG and the SDGs.

In the semiconductor field, too, the development of environmentally friendly products has been our priority. One promising offering from Nitto that has recently been launched is sintered metal sheets, which use an alternative to environmentally detrimental lead-containing solder. We are planning to expand the application of this pioneering product.

Meanwhile, we are also seeking a broader range of applications of products using fluorine functional materials. Our target markets in this regard include hygiene materials, demand for which has grown amid the COVID-19 pandemic, as well as existing priority markets of semiconductors, electronic components, and mobile devices.

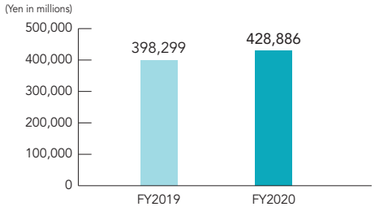
In the field of transport vehicles, including automobiles, railroad cars, and aircraft, we continue to forge ahead with the development of products that help to enhance performance of such vehicles. In anticipation of the rapid expansion of the electric vehicle market, in particular, we have expanded product lines for wire harness materials, insulating materials for motors, and vent filters for electric/electronic components. In the CASE market, on the other hand, we have developed radio wave absorbing materials for radars, which readily made its market debut.

Optronics

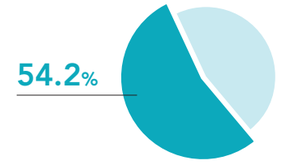
Main products

- Information fine materials
- Flexible printed circuit boards

Revenue



Composition of revenue



Operating results

Information fine materials grew compared to the previous fiscal year. The greater demand for optical films used in laptop computers and tablets on the back of the spread of teleworking made a large contribution to the segment's business results. Meanwhile, overall demand for products used in smartphones declined despite the new adoption of optical films for organic light emitting displays (OLEDs). Revenue from products used in TV also decreased. However, efforts were made to enhance collaboration with partners, and royalty income was posted in the first quarter through licensing agreements.

Printed circuits grew from the previous fiscal year. The production of hard disk drive (HDD) temporarily dropped in the first quarter but recovered thereafter. Although demand was weak for HDD used for personal computers, demand for high-capacity HDD used in data centers was strong. Furthermore, smartphone parts began contributing to the segment's business results as an initiative for a new market using high precision substrates. To respond to this change, we took actions including increasing our production capacity.

As a result of the above, revenue rose by 7.7% to 428,886 million yen and operating income increased by 40.9% to 80,727 million yen.

Issues to be addressed

For information fine materials, the Group will continue collaborating with our Chinese partner in the TV market. For smartphones, we will work on expanding the use of our optical films for OLED displays against the background of the evolution of various display technologies. Demand for optical films used in laptop computers and tablets is expected to remain at a high level, with the expansion of teleworking and other factors. We will endeavor to securely capture this demand, while working on further productivity improvement. Demand for Indium-Tin Oxide (ITO) films is anticipated to remain strong with respect to their use for laptop computers and tablets, while it is forecast to decline with respect to smartphone use. We will therefore work on creating new products using production technologies of ITO films.

The use of printed circuits in personal computers, such as HDD, is expected to decline. However, demand for high-capacity HDD used in data centers is forecast to remain solid. To meet this demand, we will work on building a stable supply system. Additionally, we will further strengthen our production capacity of high-precision substrates to increase their supply for smartphone parts.

Research and development activities

For flat panel display applications, in response to the growing demand for monitors, laptop computers, and tablets with a liquid crystal display (LCD) as people stay home, we are developing products that best meet the requirements for each device.

For mobile display applications, such requirements include higher visual quality, lower power consumption, and greater flexibility for OLEDs and other displays, while those for polarizing films include greater optical performance, thinness, and flexibility. We are thus working on thinner and bendable polarizing films that offer higher optical performance.

In the auto industry, with the progress in self-driving technology, the number and size of in-vehicle displays have begun increasing, requiring larger polarizing films with higher resistance to heat and ultraviolet (UV) radiation and lower contraction. While working on products that meet these requirements, we are also intent on developing products that offer the performance needed for polarizing film products used with curved and shaped displays, which enhance freedom in the interior design of automobiles.

For display peripheral materials other than polarizing films, we are also pushing ahead with the development of interlayer filling adhesive for displays, materials for the OLED process, and functional films, in a bid to offer value to customers manufacturing displays and equipment with a built-in display. To reduce environmental impact as part of our ESG-oriented initiatives, we are promoting the development of solventless products and products using recycled materials and bio-based materials.

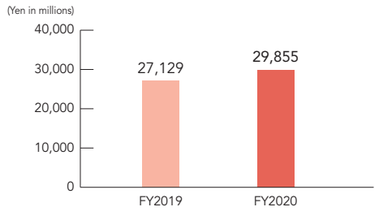
For flexible printed circuits, in addition to marketing circuits for HDDs made possible by circuit formation technology using photosensitive polyimide and the semi-additive process, we are developing products that help to further enhance recording density. We have also created "high-precision substrates" with new mechanical properties, which have been developed by applying a new base material to circuits for HDDs, and commenced mass production for smartphones. We will make continued efforts to develop new products that further enhance the performance of smartphones.

Life Science

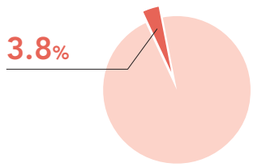
Main products

- Medical-related products

Revenue



Composition of revenue



Operating results

Life Science grew compared to the previous fiscal year. Demand for nucleic acid medicine contract manufacturing was solid due to the greater expectations placed on nucleic acid medicines as potential therapeutic drugs and vaccinations for COVID-19. Demand for NittoPhase™ also expanded for synthesizing nucleic acid drug.

Meanwhile, demand for transdermal absorption tape formulations and medical and hygiene materials shrank due to factors such as the smaller number of outpatients in hospitals. Although the demand has been recovering, it did not reach the level seen in the previous fiscal year. In the fourth quarter, impairment losses were posted for the reorganization of existing facilities and other reasons.

As for nucleic acid drug discovery, the Group is continuously working on a clinical trial of a drug for pulmonary fibrosis and intractable cancer.

As a result of the above, revenue increased by 10.0% to 29,855 million yen, while operating loss amounted to 3,011 million yen (operating loss of 2,546 million yen was reported in the previous fiscal year).

Issues to be addressed

In the nucleic acid medicine market, in addition to the already existing clinical development centered around rare diseases, development of oligonucleotide therapeutics for common diseases and cancer is progressing. The market is also shifting to the stage of commercialization and expected to grow rapidly from now on. Under this circumstance, the Group is enhancing our production capacity in the contract manufacturing business and expanding the design service function in the nucleic acid medicine production process utilizing the know-how we have accumulated so far to further increase our revenue. In drug discovery, the Group will forge ahead with R&D and clinical trials in the areas of treatment drugs for pulmonary fibrosis and intractable cancer in an attempt to develop them into core businesses. We expect to post royalty income in the next fiscal year. Meanwhile, demand for transdermal absorption tape formulations and medical and hygiene materials is expected to recover moderately.

Research and development activities

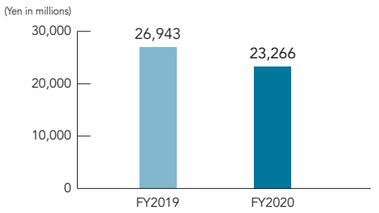
For nucleic acid process materials, demand for polymer beads, which serve as a scaffolding for polymer synthesis, increased substantially. We will remain focused on the development of products that offer new values to customers, such as higher performance beads and novel process materials with enhanced functionality. For medical materials, we are utilizing our adhesive technology that is gentle to the skin to develop new functional materials for wearable devices that are directly applied to the human body. In an attempt to branch out into new business domains, the life science business is making inroads into new markets and territories by strengthening the framework for existing partnerships with other business sectors/divisions within the Group and alliances with external organizations.

Others

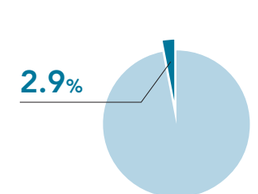
Main products

- Membrane products
- Other products

Revenue



Composition of revenue



Operating results

Membrane products (polymer separation membranes) were weaker than the previous fiscal year due to the significant impact of COVID-19. Demand for membrane products was sluggish, especially for industrial applications and in the field of energy. Please note that this segment includes new businesses that have yet to generate sufficient levels of revenue.

As a result of the above, revenue shrank by 13.6% to 23,266 million yen and operating loss amounted to 7,496 million yen (operating loss of 2,622 million yen was reported in the previous fiscal year).

Issues to be addressed

Demand for membrane products is anticipated to bounce back from the decline caused by COVID-19. The speed of its recovery, however, is expected to be moderate, given factors such as the anticipated delayed recovery in the Americas. In this situation, the Group will work on cost reduction efforts through the automation of production process. We will also work on the creation and nurturing of new products in the energy and environment areas. For new businesses, the Group will aim to bring products currently under development, including plastic optical cables, to the market as soon as possible.

Research and development activities

For polymer separation membranes, we have ensured that our products for wastewater recycling, an application we have focused on since their release in fiscal 2019, support the global trend toward Zero Liquid Discharge (ZLD), while at the same time increasing the wastewater recycling ratio to 70% at the Shiga Plant where the membranes are produced.

In fiscal 2021, the Shiga Plant will strive to increase the recycling ratio to 90% or over by introducing a new system, while simultaneously recycling liquid waste to further reduce environmental impact in an attempt to become a recycling-oriented green plant.

Their membrane technologies will be rolled out to other locations in a bid to drive the Nitto Group's initiatives for ESG and the SDGs.

For the Benefit of Society

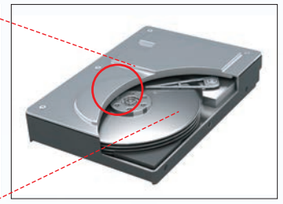
Development of Infrastructure for Intelligent Society

Circuit Boards for Hard Disk Drives

Amidst the ongoing progress in information and communication technology, virtual information technology infrastructure and data centers are facilitating the management and utilization of vast amounts of data gathered by IoT devices. To store such quantities of data at data centers and elsewhere, hard disk drives (HDDs) are mainly used.

Traditionally, the role of HDD suspensions has been to merely hold the magnetic head, and data was transferred via separate wires. Thin-film metal baseboard CISFLEX™, however, takes advantage of delicate spring characteristics to keep the head less than 10 nm above the magnetic disk, thus playing a crucial role in transmitting signals that prompt HDDs to read/write data. This innovative product also helps to reduce power consumption at data centers, as it increases HDDs' recording density, which in turn lowers power consumption per unit of memory capacity. Through the supply of materials for HDDs, the Nitto Group is underpinning the infrastructure development toward digital transformation, which is accelerating across the globe.

Thin-film metal base board - CISFLEX™



CISFLEX™ in a hard disk drive

Promotion of Cyclic Use of Plastics, Metals, Water, Carbon, and other Materials

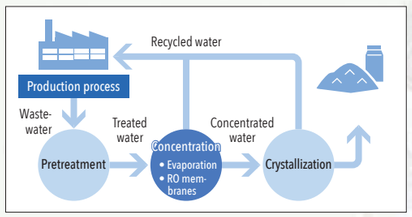
RO Membranes for ZLD

As effluents from plants and business establishments continue to soar throughout the world, some countries and regions are limiting effluents or tightening relevant laws and regulations to prevent environmental pollution and drought. Much is expected in this regard from the wastewater recycling system ZLD, which is designed to recover all liquid waste without discharge external to the system.

The key to successfully configuring this system in terms of running cost and otherwise is RO membrane modules. The Nitto Group's latest offering here is the PRO Series, developed by Hydranautics, a consolidated subsidiary in the U.S. PRO Series is a membrane technology solution optimal for the ZLD and other systems that minimize wastewater discharge.

Improving the wastewater recycling ratio not only protects the environment but also minimizes industrial waste and reduces its disposal cost. Supporting effluent treatment that is becoming increasingly difficult and diversified, Nitto Group's RO membranes play an instrumental role in facilitating the recycling of water resources.

RO membrane PRO Series for the ZLD process



Application of RO membranes in the ZLD process

Control of Infectious Diseases on a Global Scale

Fluorine Functional Materials

Fluorine resin has a number of unique properties, such as heat resistance, water repellency, chemical resistance, and releasability. The Nitto Group has made porous films out of this versatile material and is providing a variety of fluorine functional materials for semiconductors, mobile devices, and other applications.

In recent years, fluorine functional materials have found broader medical applications, a prime example being fluorine resin porous film TEMISH™, which is used in highly functional masks which effectively control the spread of COVID-19. Having long been used for the special application of such masks, TEMISH™ has increasingly been used for highly functional masks in medical settings, such as N95 masks, which require high performance and reliability.

Other applications of the fluorine functional materials include PTFE nano filter materials for air purification and functional films for pharmaceutical products.

Furthermore, Nitto has been involved in and supporting the "Prediction and Countermeasures for Infection by Virus Contaminated Droplet in Indoor Environment," a research project simulating the dispersion of droplets by supercomputer Fugaku with Dr. Tsubokura Makoto of the RIKEN Center for Computational Science and Kobe University leading the project.

The Nitto Group will remain committed to ensuring people's well-being through the supply of quality materials.

Highly functional medical masks using TEMISH™

Captures both atmospheric viruses and dust (PTFE nano filter materials used to purify air)

Support for Good Health and Longevity

Nucleic Acid Medicines

Nucleic acid medicines utilize nucleic acids (oligonucleotide), which are produced from substances in the cell such as DNA and RNA, as drugs to be released in the body. Acting directly on the expression of genes that can cause illness, these medicines are garnering more and more attention.

Nitto Denko Avecia Inc. offers a seamless contract manufacturing service for these innovative medicines, from the early development stage to the manufacturing of commercial drugs. In the synthesis process, this U.S.-based subsidiary of ours uses NittoPhase™ HL, particles for nucleic acid synthesis polymer beads born through the fusion between two of the Nitto Group's technologies, i.e., adhesive technology and polymer particle design technology. In order to expand the capacity of the manufacturing process and the development of analytical techniques, as well as ensure a sufficient supply of bulk nucleic acid medicines needed for commercial manufacturing, we have decided to invest in facilities at their headquarters in Milford, MA. We are also planning to make aggressive investments totaling nearly 25.0 billion yen to further ramp up the supply capacity of polymer beads and expand manufacturing for early clinical trials. Through active support for the highly promising nucleic acid medicine market, The Nitto Group is contributing its services to creating a society where people live a healthy life with peace of mind.

Particles for nucleic acid synthesis polymer beads - NittoPhase™ HL

Artist's rendition of Avecia's new plant in Milford