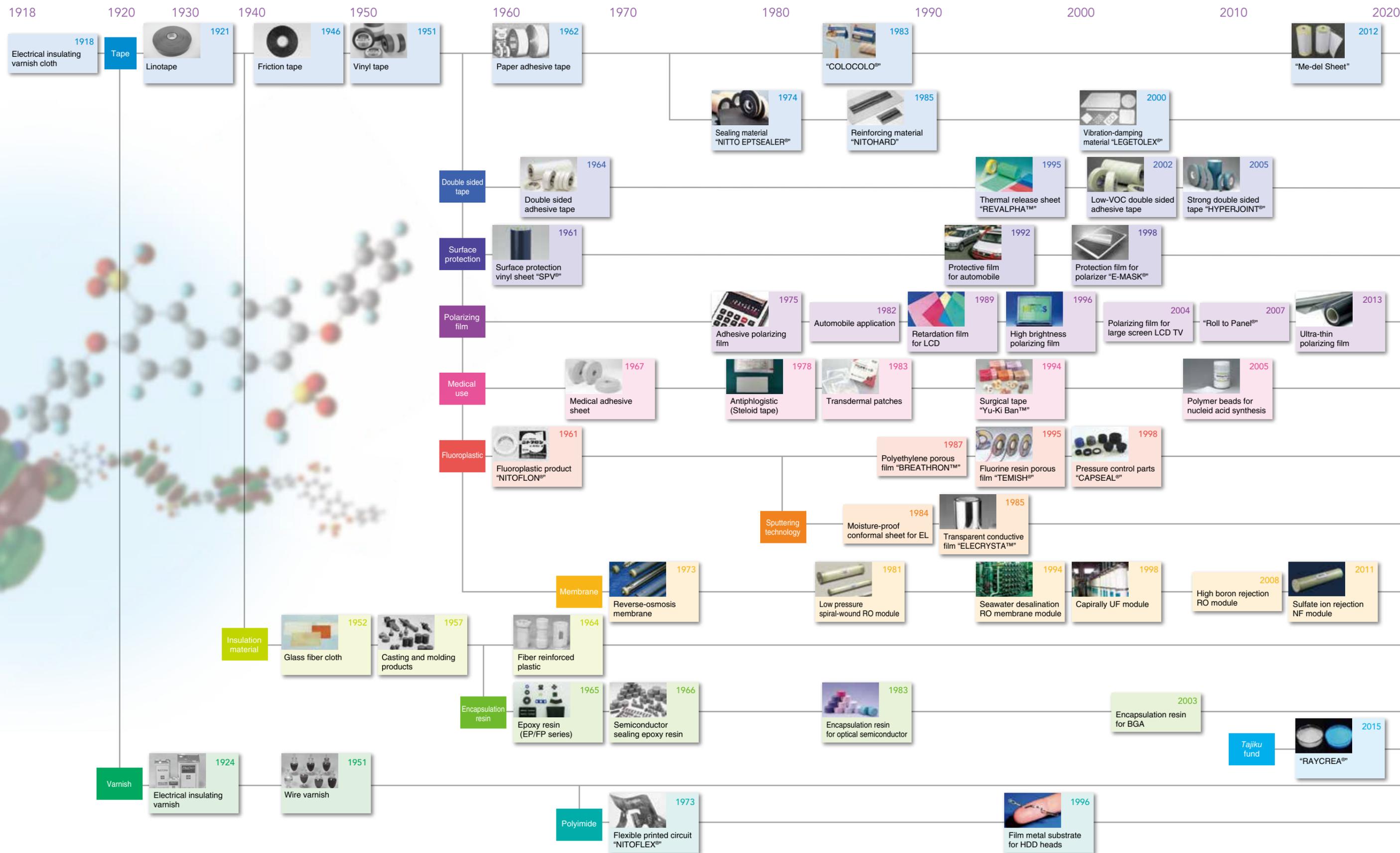


# New Value for Society

## History of Technological Innovation

The Nitto Group has produced countless new technologies based on our four core technologies and has created various products by combining these technologies since 1918, our foundation year. Furthermore, we have developed our business by applying the products and technologies which we have developed to various fields.



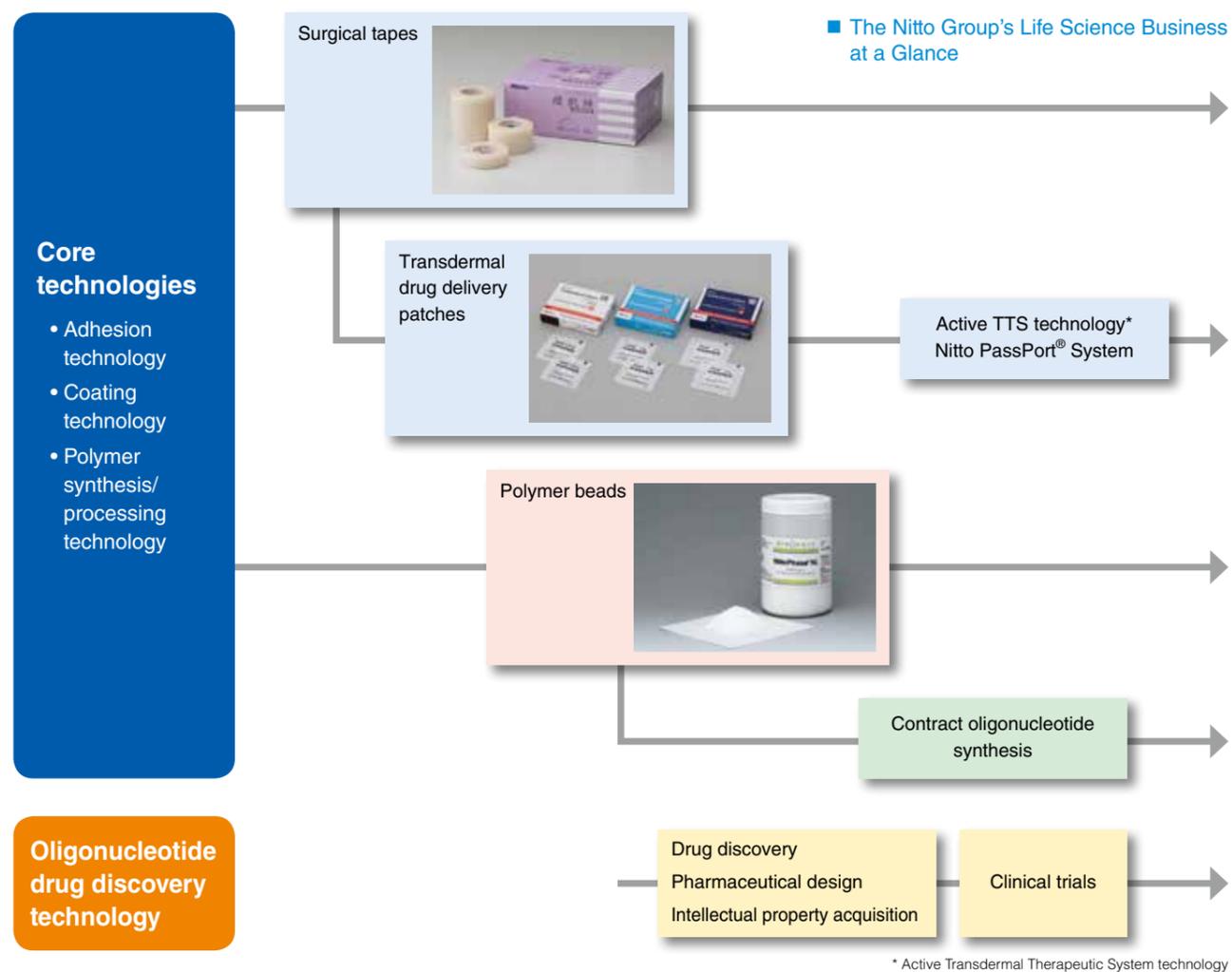
## Technologies and Products that Benefit Society

Globalization and rapid development have brought along with them various social challenges. Nitto, which was founded in 1918 to produce the electrical insulating materials that would go on to underpin Japan's development, has long offered solutions to such challenges while achieving dramatic growth through global expansion. With its focus spreading to cover the new Green (environment), Clean (new energy), and Fine (life science) domains, the Nitto Group continues to provide new value to the global community.

### For Example For People's Good Health

The Nitto Group's life science business dates back to the late 1960s, when Nitto first produced medical adhesive sheets by combining its adhesion, coating, and polymer synthesis/processing technologies. Since then, the Group has opened up a new path for administration and development of drugs.

As medical needs continue to rise amid the rapidly aging populations in developed countries and the population explosions in emerging countries, shortages of medical professionals and poor access to healthcare are posing ever more difficult problems. Meanwhile, there have been increasing calls for the development of drugs for hard-to-treat diseases. The Nitto Group will improve and expand its products and services that address these issues, thereby enhancing people's quality of life (QOL).



In this chapter, we introduce our new products and services, and those we aim to commercialize, as well as our existing products and services.



Products and services in new domains that Nitto is putting emphasis on



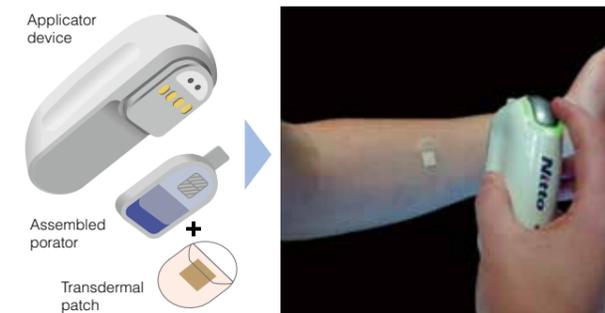
Products and services which we aim to commercialize.

### Fine Nitto PassPort® System

Proposals for the Future!

The Nitto PassPort® System is a novel drug delivery system that combines technology for painless and safe creation of micropores on the skin surface with advanced drug patch technology. Capable of efficiently delivering substances that cannot be absorbed into the skin as they are, such as polymer bio-pharmaceuticals, which include peptides, oligonucleotides, and proteins, and hydrophilic drugs, this innovative transdermal drug delivery platform allows patients to receive drugs that are currently available only via injection or infusion, and is able to control the duration and quantity of the delivered drugs by optimizing the number and size of micropores, as well as the formulation.

At present, Nitto is working on this platform with multiple pharmaceutical manufacturers to accelerate its commercialization.



Creating micropores on the skin to apply a transdermal patch

### Fine Agreement with Bristol-Myers Squibb to Develop Therapies for NASH and Cirrhosis

Proposals for the Future!

Nitto has been working to develop fibrosis therapy through the use of small interfering RNA (siRNA) since 2008. One of Nitto's leading investigational products thus developed has been granted fast track designation by the U.S. Food and Drug Administration for indications of liver fibrosis and cirrhosis secondary to advanced non-alcoholic steatohepatitis (NASH) and to the hepatitis C virus (HCV).

In November 2016, Nitto and Bristol-Myers Squibb (BMS) of the U.S. entered into an agreement granting BMS exclusive worldwide rights for the development, manufacture, and commercialization of Nitto's leading investigational product for NASH and liver cirrhosis. The agreement is expected to accelerate development of this investigational product, thereby delivering the therapy to patients as early as possible.

### Fine Expanding Contract Manufacturing of Oligonucleotides

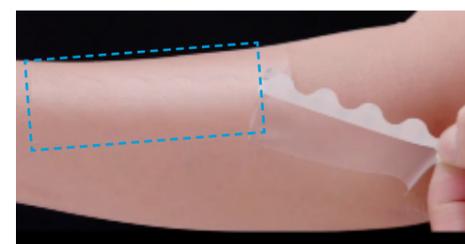
The Nitto Group boasts the leading share of the market for contract manufacturing of oligonucleotide medicines, which are expected to be effective for cancer and other difficult-to-cure diseases.

In October 2016, Nitto acquired the assets of Irvine Pharmaceutical Services and Avrio Biopharmaceuticals of the U.S. via Nitto Denko Avecia Inc. to establish Nitto Avecia Pharma Services Inc. This acquisition allows the Nitto Group to broaden its pharmaceutical analytical capabilities and provide aseptic fill & finish services.

We will remain committed to providing services that help to accelerate the development of oligonucleotide medicines in its bid to deliver new drugs into the hands of patients as soon as possible.

### XTRATA® Perme-Roll AIR™

A thinner model of the XTRATA® Perme-Roll™ transparent film roll has made its debut. Only one-fourth the thickness of the previous model, XTRATA® Perme-Roll AIR™ covers injured skin surfaces to make the wound dressings impermeable to bacteria and liquids. Stretching easily to gently fit the contours of the body, it feels as if nothing is on the skin at all. The unique STRATAGEL® soft gel adhesive fits so perfectly to the skin surface that wound dressings can be gently removed with minimum damage to the stratum cornea.

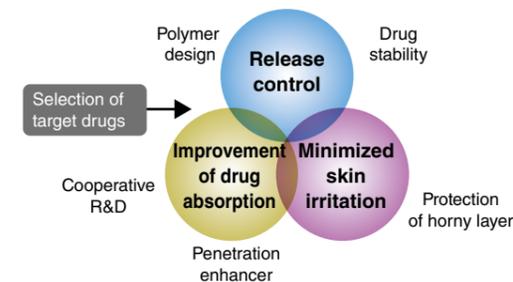


XTRATA® Perme-Roll AIR™ is applied to the area within the dotted line.

### Transdermal drug delivery patches

Transdermal drug delivery patches are medicated adhesive patches placed on the skin to deliver drugs. Unlike internal medicine, they neither irritate the digestive tract nor the liver, and do not cause pain like injections using needles. They also help to alleviate adverse drug reactions due to rapid drug absorption by controlling dosages.

Nitto's technologies have produced medicated adhesive patches for local anesthesia and a broad range of indications, including ischemic heart disease, asthma, and hypertension, thereby helping patients to ease their concerns and burdens.

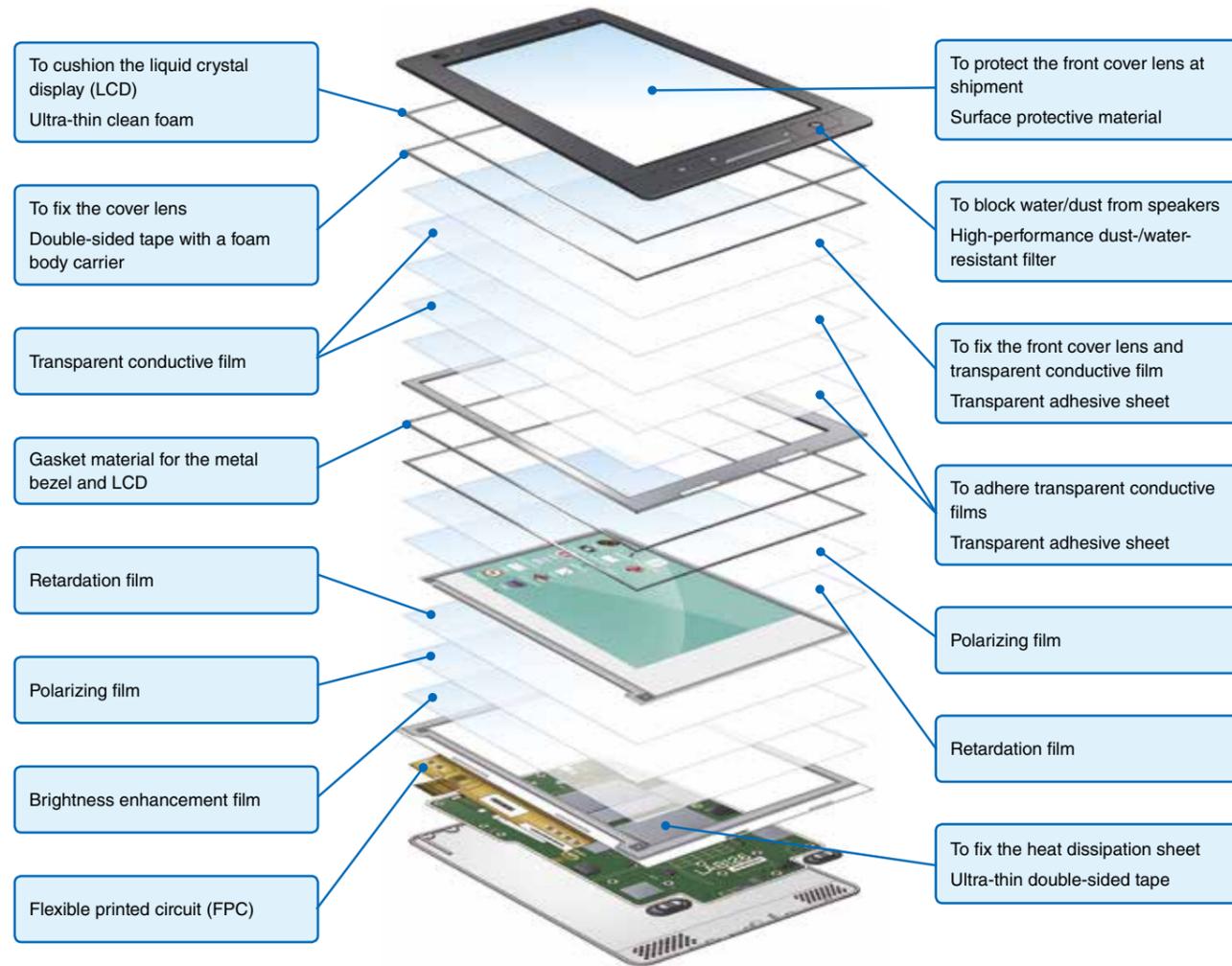


For Example

**Underpinning Our Information Society**

Amid the constant exchange of all kinds of information today, smartphones, tablet PCs, and other information terminals have become an integral part of our contemporary lifestyle. Accordingly, greater compactness and lighter weight are required from the displays of these ubiquitous information devices, and the demands for flexible displays, which may be applied to wearable devices as well, are rising.

A variety of our products at the Nitto Group, including optical films, play a key role in such displays, thereby underpinning our rapidly evolving information society.



**Ultra-Thin Polarizing Film**

Nitto's Ultra-Thin Polarizing Film has been selected for the Prime Minister's Prize at the 2017 National Commendation for Invention. By preventing panel warping when stretching films and achieving greater thinness with stable quality, this innovative manufacturing method has made it possible to make displays thinner and more flexible. A review of conventional processes and materials together with the new manufacturing approaches showed a thickness reduction of approximately 80% and a reduction of shrinkage, which is the cause of panel warping, by approximately 60% compared with standard polarizing films. Nitto has already received the Display Component of the Year Award at the Display Industry Awards 2016 in recognition of this innovative development.

The Ultra-Thin Polarizing Film has already been used for flat panel displays, smartphones, and other devices, and its application to flexible displays is expected going forward.

**Different levels of shrinkage**

Standard polarizing film



Ultra-Thin Polarizing Film



For Example

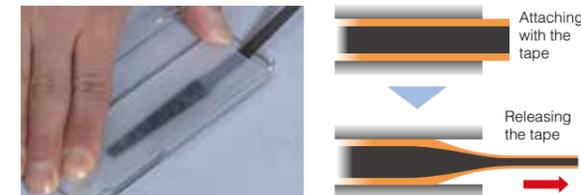
**Reducing Environmental Impact**

Environmental problems, such as climate change and resource depletion, have become so serious that they threaten our present-day lifestyle, demanding that we take them on both rapidly and proactively. The Nitto Group not only reduces the environmental impact caused directly by our business activities, but also develops products that help our customers to reduce environmental impact at their production process.

Proposals for the Future!

**Stretch Tape for Easy Release**

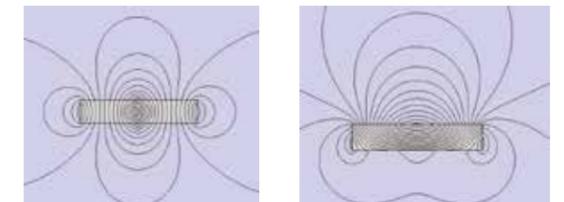
Stretch release double-coated adhesive tapes (No. 58110B and No. 58115B) achieve both excellent adhesion and easy release simply by stretching the tape. Its easy release without damaging the regions that it adheres to makes it ideal for recycling and reuse of batteries and built-in cameras of mobile devices.



By stretching the tape, the special flexible backing material deforms to achieve clean peeling.

**Clean Neodymium One-Sided Attraction Magnet**

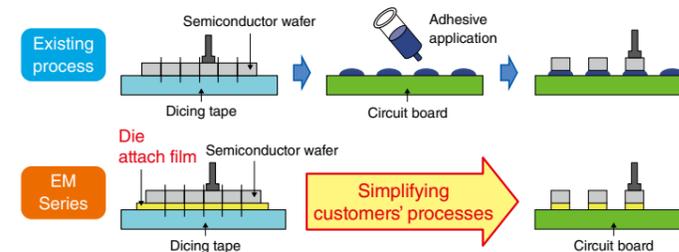
By concentrating the magnetic flux on only one side, Nitto's neodymium magnet achieves strength beyond anything that could be achieved by conventional technology. This innovative magnet enhances motors' performance while reducing size and weight, and also shortens tact time for semiconductor and LCD fabrication. This unique product is also ideal for linear motors.



Standard magnet Nitto's one-sided attraction magnet

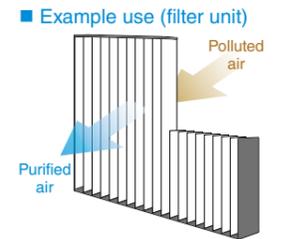
**Die Attach Film with Pressure Sensitive Dicing Tape ELEMOUNT® (EM Series)**

This adhesive film eliminates the need for the existing process of fixing chips with silver paste or other materials during semiconductor fabrication, thereby simplifying customers' processes and reducing their environmental impact.



**Green Clean TEMISH® Air Filter NTF9300 Series**

This high-performance air filter lets clean air pass through while collecting fine particles of dust, and is perfect for cleanrooms and vacuum cleaners. Its low permeation resistance is expected to reduce energy consumption. The filter releases dust easily, thereby increasing the efficiency of maintenance work.



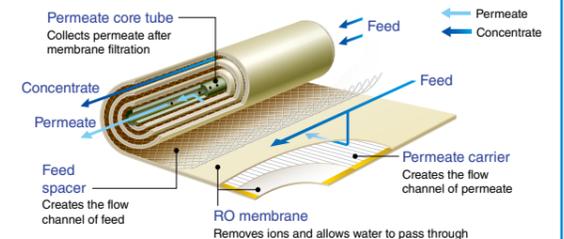
**Green Ultra-Low Pressure RO Membrane Element ESPA®2-LD MAX**

Reverse osmosis (RO) membranes are used to eliminate impurities from river water and wastewater. They are widely used in various applications such as sewage/wastewater reclamation, seawater desalination, and ultrapure water production.

Our new offering, ESPA®2-LD MAX, uses a thinner RO membrane and a thicker feed spacer. The thinner membrane allows ESPA®2-LD MAX to have a larger membrane area, thereby increasing water treatment production output. Meanwhile, the thicker feed spacer widens the membrane's flow channel, which then reduces energy consumption thanks to its lower water resistance. It also reduces the frequency of chemical cleaning with its anti-fouling feature.

As a result, ESPA®2-LD MAX's energy saving features and reduced need for chemical consumption provide it not only with environmental friendliness, but also a longer expected service life.

**RO membrane element structure**



For Example **Safeguarding Transportation**

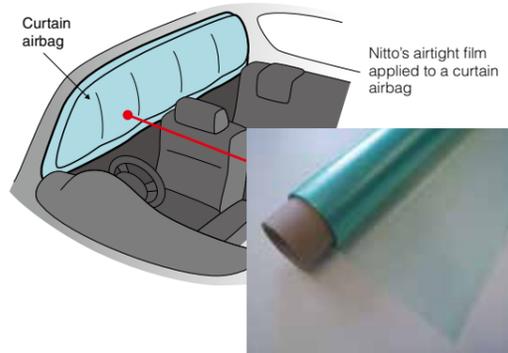
Along with globalization has come the necessity for speedy transportation of large numbers of both people and goods. In addition, automation and electronization of transportation equipment are making rapid progress in order to assure safety. Through the development of new technologies and materials, the Nitto Group is pursuing greater safety and comfort in a bid to fulfill these social needs.

**Airtight Films for Curtain Airbags**

Proposals for the Future!

In July 2016, Nitto acquired the functional film business for curtain airbags from Swiss company nolax Holding AG.

In the event of a side impact crash, curtain airbags are activated and deployed to cover the side windows and protect the driver and passengers. In order to prevent the driver and passengers from being thrown out of a car when it rolls or is overturned immediately after a collision, curtain airbags are required to have an airtightness that will allow them to remain deployed for several seconds. Nitto's thin adhesive films offer airtightness equivalent to that achieved by the traditional method of applying varnish, and simplifies processes to reduce their environmental impact.



**Reinforcing Material of Steel/Aluminum Panels NITOHARD**

As a result of the pursuit of greater safety and comfort, vehicles nowadays come with a greater amount of equipment, and this additional weight then lowers fuel efficiency. Meanwhile, in order to improve fuel efficiency and reduce gas emissions to meet ever-tightening environmental regulations, panels with a thinner skin are often chosen to make automobiles lighter. However, this then increases the risk of their rigidity being compromised.

By simply being attached to skin panels and heated, NITOHARD generates foam and hardens to provide reinforcement to portions of the panels, and also offers excellent vibration-damping, soundproofing, and thermal insulation properties. Its flexibility allows it to adhere tightly even to complex shapes and curved surfaces.

Developed specifically for aluminum materials, NITOHARD AS2000 controls skin panel distortions that often occur during heating processes and is used widely in the U.S., where demands for aluminum panels are growing in the quest for lighter weight.



Proposals for the Future!

**Green Visible Light-Blocking Material for HUDs**

Head-up displays (HUDs), which project information necessary for safe driving directly into the driver's line of sight, are expected to grow in demand. They support drivers by projecting not only meter information, but also data related to oncoming vehicles and pedestrians.

Due to the fact that HUD units are usually installed close to the windshield, sunlight can easily penetrate the device and cause trouble with the display.

Nitto's visible light-blocking material is able to reduce sunlight penetration by 50% while allowing the unit to project images clearly. It also helps to lengthen the HUD unit's service life.



For Example **For Enhanced Neighborhood Safety/Security**

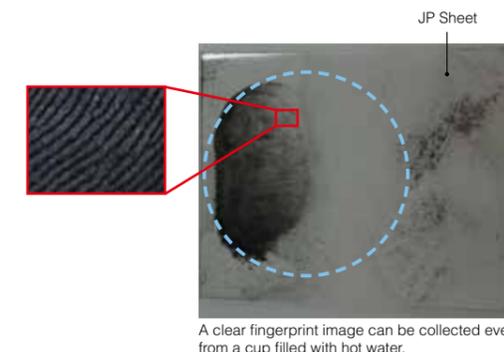
Rapid development of communities can sometimes result in the deterioration of public order. At the request of those tasked with maintaining order, the Nitto Group applies its technologies to products and services that enhance the safety and security of neighborhoods.

**Latent Print Lifting Sheet for Crime Scene Investigations – JP Sheet**

In the past, collecting fingerprints required developing them by sprinkling powder where they were likely to exist and then lifting them onto the adhesive face of a gelatin sheet. Due to the heat sensitivity of such sheets, however, they cannot be used in such a way to collect fingerprints on the hood of a car during the summer.

Nitto's JP Sheet exhibits excellent heat and water resistance and offers clearer images, allowing even more fingerprints to be presented as evidence. Because it does not use powder and instead lifts fingerprints directly onto the adhesive sheet, staining or accidents involving office automation equipment and other items can be avoided.

Developed in response to requests from the field, the JP Sheet is currently used by police throughout Japan to help to increase efficiency of scientific criminal investigations.



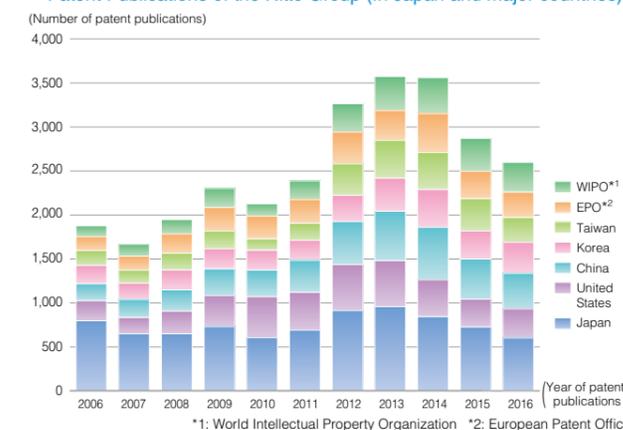
**Protecting Businesses with Intellectual Property**



The Nitto Group is engaged in optimal intellectual property activities that are suited to each market in an effort to commercialize its technologies, services, and products in the new domains of Green (environment), Clean (new energy), and Fine (life science), as well as in existing domains, and to gain a greater share of such markets. By "protecting businesses with intellectual property," we are expanding potential of our business strategies.

The Group's global patent application rate now stands high at 60%, and our intellectual property activities have become globalized in tandem with our business expansion. In recognition of such activities, the Nitto Group was selected by Clarivate Analytics (formerly Thomson Reuters IP & Science) as one of its "2016 Top 100 Global Innovators" for the sixth consecutive year.

■ Patent Publications of the Nitto Group (In Japan and major countries)



Mr. Hino of Clarivate Analytics (right) presents a trophy to President Takasaki.