

The Future of Technology at Nitto Denko



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Two years and four months have already passed since the 21st century arrived. Fiscal year 2001 was a year of ordeal for Nitto Denko and the present fiscal year 2002 has scarcely brought an upturn in the business environment. But even in these circumstances, we are watching for signs of change, considering what we can do, and creating the functions that our customer require.

Nitto Denko selects growing markets and aims at No.1 in niche areas within them. Essential in order to realize this strategy is not only marketing activity closely responsive to the customer but also technology and product development which provides speedy solutions to customer issues. With all Nitto Denko employees understanding themselves as marketing staff, the chief technical officer (CTO; currently covered by the company president) leads R&D management aimed at speedy technology and product development. (Table 1)

Table 1 R&D management

Integrated Technology Strategic Meeting:

Meeting held every month by CTO.

Supreme decision-making organ.

Whole Company R&D Project System:

Whole company projects are judged.

- All technology resources are invested with top priority.
- The best engineer for each area is drafted in from elsewhere in the company.
- The most suitably qualified staff member is appointed project leader.

As shown in Fig. 1, taking the basic technologies of synthesis, coating, membrane manufacture, molding, processing, evaluation, and analysis technology, we have realized the functions required by the customer by adding to, refining, or combining these technologies.

By introducing new materials, acquiring new technologies, and evolving existing technologies; and by combining them appropriately, we have developed new products and made them available to the customer. To the 3E (electronics, energy, and ecology) identified as required target areas we have now added an O (optronics).

The liquid-crystal display (LCD) field in which Nitto Denko products are utilized is expanding vig-

ously, and development of products with yet further advanced functions is eagerly awaited. In addition, organic electroluminescence, plasma display panels (PDP), and other non-LCD display systems are being proposed, leading to expectations of growth in the optronics field. In this field, there is pressure for conversion to high-speed, high-capacity, mobile operation and use of larger screens; the materials correspondingly required need to have properties different from those of conventionally used materials.

For instance, coating technology is now required to adapt to thin, precision, and multi-layer processes, while processing technology likewise needs to address microminiaturization and multi-layer processing. At the same time, products are being asked to meet the requirements of high reliability, high purity, and cleanness. In order to do so, development of new materials has become necessary.

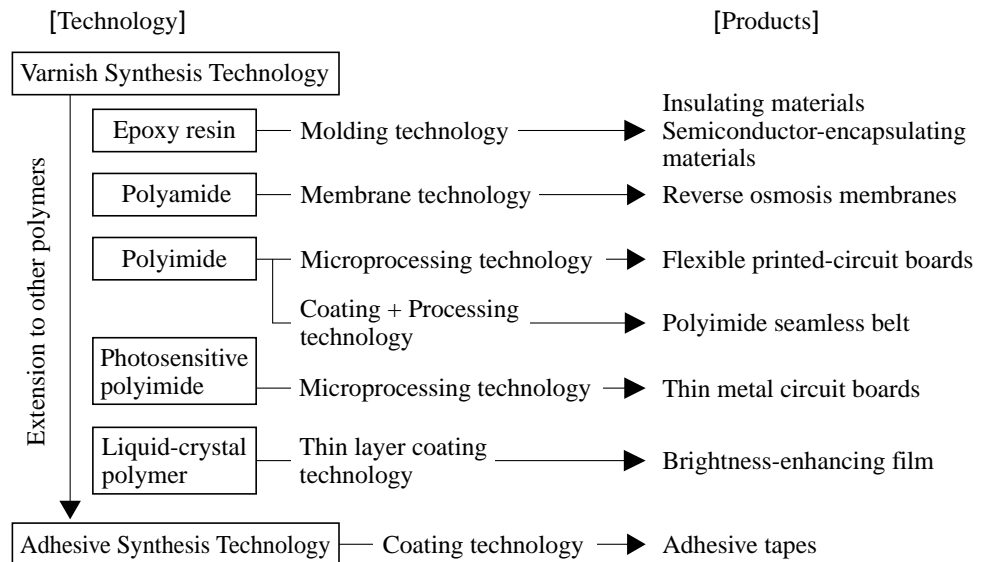


Fig. 1 Example of technology evolution and technology combination in synthesis

As well as development of self-organizing and self-associating materials, nano-structure materials, organic/non-organic materials, optical functional materials and other materials through design using molecular level simulation technology and computational chemistry, we also need to develop processing technology which will allow precision polymerization technology and new materials to display their functions to maximum effect.

Here, we present papers on the following eight examples of related technologies and products:

2. Pressure-Sensitive Adhesive Tape to Remove Paste Containing Solvents
3. Thin Wafer Backgrinding System
4. Cupil-T Anisotropic Conductive Film for Testing
5. Repairable Underfill Resin
6. Long Tail Circuit Integrated Suspension Flexures for HDDs
7. Surface Treatment Technology for High-Definition LCDs
11. Precision Polymerization Techniques for Polymer Structure Control
 - The Development of Ordered Poly (urethane-urea) -
12. Study on Current Leakage in Semiconductor Devices through Space Charge Distribution within Encapsulating Resin

In addition to creating new functions which satisfy customer needs, we are anxious to work for harmonization with the environment and with society. Accordingly we will be pressing ahead with development of environment-friendly products. These are defined as:

- products with low environmental burden at the manufacturing stage
- products which contribute to environmental conservation by the customer or by local communities
- products which contribute to reduced environmental burden during product utilization
- products readily recycled after use

We will accordingly be enhancing systems capable of creating such products.

Regarding products with low environmental burden at the manufacturing stage, we are currently engaged in the development of solvent-free adhesive manufacture.

As examples of products which contribute to environmental conservation by the customer or local communities, we have designed items which fulfill the required function without using lead or halogen, such as lead-free vinyl tape, non-halogen tape and halogen-free semiconductor encapsulating material. As for products which contribute to reduced environmental burden during product utilization, there are examples such as the brightness-enhancing film system NIPOCS, which has increased the energy efficiency of light; the polyimide belts used in photocopying machines to increase thermal efficiency; and high-polymer film and modules with advanced energy-saving properties; we are continuing with the development of systems and products toward further improved functions.

Examples of products readily recycled after use are a recyclable easy-peel double-sided adhesive tape and an easily incinerated film for protection of vehicle coatings. We will be continuing in cooperation with the customer to develop easily recyclable products.

Such environmentally adapted products require not only the development of new materials and acquisition of new technologies but also product design informed by life-cycle assessment. Product concepts will therefore need to give thought not only to functional aspects but also to the loss aspects. In this connection we present the following four examples of related products and technologies.

1. Environment-Friendly Non-Halogen Adhesive Tape
8. Development of Pest Control Methods Against *Hyphantria Cunea* Using NITOLURE "AMESHIRO"
9. A Novel Seawater Spiral-Wound Reverse Osmosis Element with High Boron Rejection
10. Toner Transfer Belt Realizing High Resolution and High Speed in Color Printers

Even in the present difficult business environment, we aspire to be an enterprise which enjoys continued growth. To do this we will need to realize our commitment to creating new value still more speedily.

Regarding our business operations, we already have group companies engaged in manufacture, sales, processing and servicing in Japan and overseas; by deepening our ties we aim to optimize operations throughout the Group. In our R&D sections, we promote communication and mutual use of information under the slogan of Group & Global so as to promote awareness of each other's strengths. By using each other's strong points, we can achieve better product development sooner. Core technologies and

issues affecting the whole Nitto Group will be discussed with domestic Group companies at Group Technology Strategic Meetings and with overseas Group companies at International R&D Meetings to reach optimal conclusions. With continued vigorous promotion of Group & Global activities, we aim to seek the overall optimization of R&D activities.

In the context of Group & Global, we have included in the present collection a contribution from our European affiliate Nitto Europe entitled 13. All in One for New Splicing Method. This tells how a new adhesive system resulted when response to European customer comments led to the design of a new adhesive tape based on a product transferred from Japan.

By creating new functions which satisfy customer needs we will advance with the creation of new value as shown in Fig. 2. This will also mean product development with consideration given to loss aspects. Meanwhile we will go on refining, adding to, and combining basic technologies to evolve existing technologies. Doing so in cooperation with domestic and overseas Group companies will be our way of seeking optimization for us as a company and for the customer.

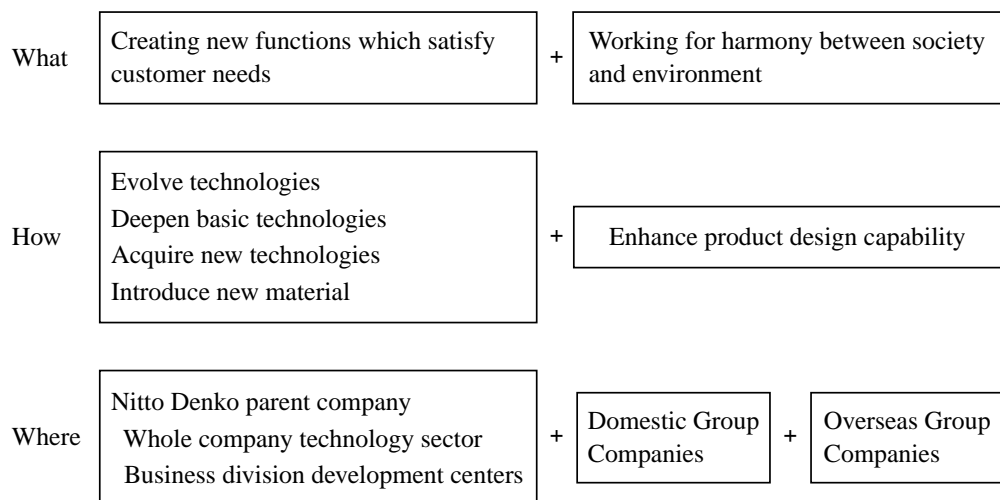


Fig. 2 Creating new value