

Thoughts on Publication of Electronics-Related Technology Feature

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▶ Introduction

The Mongol Empire, which once ruled the world, operated a communication network consisting of beacons which apparently reached a transmission speed of 140 to 150 kilometers per hour. In the modern age, we can access the world's information resources instantaneously and in real time through personal computers and mobile telephones. We have certainly been blessed by the advances in electronics technology and if Genghis Khan could glimpse the world of today, he would most certainly be amazed.

But however fast the transmission speed, if the sensitivity at the receiving end is low, there will be a deficiency in realizing customer value.¹⁾ As explained in the foreword to the present publication, Nitto Denko has a tradition of what we call *Sanshin Activities* (meaning 'three new activities') which consists of expanding our existing business domains to take in new applications, drive new product development, and create new demand. In these *Sanshin Activities*, the important factors are rapid acquisition of information combined with a staff of technology specialists who have an individual antenna-type sensitivity which they can translate into concrete technologies.

As witnessed for instance in the 1997 Asian currency crisis, globalization of the economy has been taking place on an unparalleled scale in goods and services and also in finance. In this creation of a global market, it was envisaged in terms of technology that simply combining technologies in existing specific fields would be inadequate, and that the mission of the business enterprise in the advanced knowledge-based society was to prepare in advance products and services with an appeal that exceeded the expectations of the market. The vehicle for the delivery of this value is none other than the scientific knowledge of individual highly literate members of the technological staff and their collective creativity

and emergent properties. To realize this scenario, existing core technologies need to be strengthened and new core technology axes laid down.

In the temple of *Horyuji*, which has withstood 1400 years of wind and weather to become the world's oldest wooden building, and in many other historic temple buildings which survive in all parts of Japan, it is reported that the supporting beams used were selected in advance through meticulous inspection of tree rings and peculiarities of the timber before being used as structural members.²⁾ Core technologies are likewise the supporting beams in the structure of our current set of technologies and increasing their number is one of the missions of technology staff.

The results of the routine coalface work of the technology staff engaged in research and development are to be seen in the creation of new products and intellectual property rights. In this Electronics-Related Technology Feature, we want to focus on these new products.

▶ Outline of Featured Articles

In putting together the present Electronics-Related Technology Feature, we concentrated on presenting the new product development which constitutes the results of the routine activities of our technical staff, who are engaged day to day in new product development. In new product development, it goes without saying that, together with a set of core technologies for a particular business area, the construction of a range of component technologies with outstanding competitiveness is essential.

The article entitled ECU Vent Filter Components for use in Automotive Electronics (p.56) presents concrete examples of parts design based on optimization of welding techniques and stress analysis technology,

while the article Flexible Printed Circuit Boards for High Frequency Use (p.21) reports an example of the accumulation of design technologies for the high-frequency flexible printed circuit boards which use high-frequency signal transmission analysis technology and electromagnetic field analysis technology to help realize high-resolution images and high-precision operation in digital appliances. These were both selected as examples where simulation technology contributed to the creation of new products.

Together with simulation technology, the deployment of a varied range of analytical technologies is also essential to the creation of new products. The articles No.585 Heat-Resistant Double-Coated Tape for Micro-processing on FPCs (p.40) and Dicing Tape Suitable for Use with Inline Systems (Active Surface) (p.44) show examples of the identification of problem points using equipment analysis technology in order to establish guidelines for material design. In the former case, as well as using for the first time a woven cloth of unprecedented ultrathin dimension, the use of electron spin resonance (ESR) revealed that the cause of the breakage of polymer main chains in high-temperature reflow processes was the radicals produced during the process, a discovery that allowed countermeasures to be taken. In the latter case, the use of X-ray photoelectron spectroscopy (XPS) showed that the reverse surface of a wafer immediately after grinding was characterized by high activity, and the best solution to this was selected from among Nitto Denko's unique accumulation of polymer design technology.

Among Nitto Denko's electronics materials, circuit-forming technology has not remained limited to making flexible printed circuit boards but has now been developed to include a business in the manufacture of ultra-high precision cutting-edge circuit boards. The articles Latest Trends in CISFLEX[®] (Suspensions with Circuits) Technology (p.16) and Reliability Requirements for 20 μ m Pitch CARRIERFLEX[®] (p.26) report on examples of the application of cutting-edge circuit-forming technology to mass-produced items. Although the customers supplied are different in each case, narrow-pitch wiring technology, which applies semi-additive engineering at mass production level, is the core element and meets customer needs with a range of wiring design technologies which lead the way in responding to the market requirement for improved functions.

The advanced development of material design technology and material utilization technology also contribute to realizing customer requirements in the business of Nitto Denko. In the article E-MASK[®] TP200 Surface Protection Film for Touch Panel Displays (p.53), by changing the surface-protective film material for the touch panels of liquid crystal display elements from the conventional polyolefin-based substrate material to

a special film substrate material with greatly superior heat resistance, we contributed to significantly improving customer productivity and at the same time realized an improvement in performance.

The article Development of Epoxy Resin Sheets for Encapsulation of Electronic Devices (p.36) explains how we are delivering new customer value in the form of sheet molding to the world of semiconductor plastic encapsulation, in which transfer molding has previously been the mainstream. In the article Present State and Future Prospects of Epoxy Resin for Optical Semiconductor Encapsulation (p.30), we trace modifications and improvements in the fields of nanodispersion technology, resin modification technology, physical property control technology, and other material utilizations specific to optical semiconductor encapsulation, also touching on the future improvement of material functions.

Meanwhile, in the article NEL System[®] for Ultra-Thin Wafers (p.48), we present an example of business development to improve the customer utility of Nitto Denko wafer-processing tape, which included support to the customer in creating manufacturing equipment with a range of built-in mechanisms unique to Nitto Denko. By not merely providing materials and parts, but supplying a wide range of production resources including manufacturing equipment, we hope to contribute to seamless delivery of value.

Conclusion

The present Electronics-Related Technology Feature consists of articles which focus on new product creation activity and the technologies which underlie it. I will be more than satisfied if, by looking through the different articles, readers gain some insight into Nitto Denko's research and development activity aimed at delivery of customer value.

In order to be able to respond to the market demand for ever more advanced and higher functions adeptly and in a way that exceeds expectations, all technology staff are committed, going forward, to joining together to continuously meet customer requirements at a still higher level.

[References]

- 1) M. Aizawa, The Role of Nitto Denko R&D in a Borderless Society, Nitto Denko Technical Report, 77, p.16-18 (1998).
- 2) T. Nishioka, The Life of a Tree and the Soul of a Tree, Shincho OH! Bunko (2001).