Focusing on the Current Topic

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Features:

TNSC's Innovation Strategy

- TNSC undertook organizational restructuring to more swiftly materialize its Innovation efforts.
- TNSC's Innovation Products are expected to grow in a wide range of market segments.
- TNSC believes establishing a new business model with enhanced marketing efforts is critical to profitable sales growth and business expansion.

Taiyo Nippon Sanso Corporation (TNSC)

Innovation Division /
Research & Development Division

Creating new Core Business through Collaboration between Marketing and Development

(From right)

Tadaharu Watanabe (PhD (Engineering)),
Sr. General Manager, Business Development,
Research & Development Division

Takayuki Arai,
Director, Sales and Marketing, Innovation Division

Restructuring the Organization to Sell "Non-Gas Products"

Various innovative technologies arising from TNSC open innovation efforts are finally about to see the light of day. TNSC in 2018 undertook a major reorganization aimed at commercializing these technologies. The "Innovation Unit," which used to be housed in the Global Operations Division, was made into a new standalone division—the Innovation Division. While the former unit focused mainly on manufacturing equipment for compound semiconductors used in such products as LEDs based on a technology called MOCVD*, the new Innovation Division will also address the profitable global sales of uniquely differentiated Innovation Products. In addition, the Business Development Department, which also used to be a part of the Global Operations Division, was split off to be integrated into the basic research function of the Research & Development Division. TNSC thus strengthened the collaboration between business development and research activities.

Dr. Watanabe in the Research & Development Division commented on the reason for the reorganization: "In the Innovation Division, it is essential that perspectives and approaches are adopted that are different from that of supplying industrial-gas products based on air-separation units and the idea of local production for local consumption." TNSC over the past decade has promoted open innovation and globalization, actively partnering with venture companies grobally and expanding its new product portfolio. While these new products are related to TNSC's gas technologies, they are for the most part products other than gases ("non-gas products"). Mr. Arai in the Innovation Division said "We have sales experience in non-gas products, namely MOCVD; this should prove to be a much-needed asset as we look to expand our sales channels globally by pushing forward with marketing and development simultaneously."

New Business Areas Where TNSC Is Expected to Find Success

The areas in which "non-gas products" play key roles are wide-ranging, from electronics to additive manufacturing (metal 3D printing). In the field of electronics, sharp increases in demand are expected in compound semiconductors made by MOCVD equipment for use in facial-recognition sensors, optical devices for next-generation displays, high-frequency devices for 5th-generation mobile communication technologies (5G), etc. Meanwhile, in additive manufacturing, which is gaining widespread recognition especially in Europe and the United States, the know-how developed by TNSC in welding gases will be put to good use. A joint research effort is already underway with a US-based company that develops 3D printers. Mr. Arai and Dr. Watanabe are excited: "As additive manufacturing business becomes more widespread, we can expect increased sales of industrial gases. However, there is still only weak demand in Asia. We need to build a new and different business model that not only involves drawing on the know-how generated in the US and pitching the utility of metal 3D printers in Asia but also includes offering consulting on effective ways to utilize them—so we are really addressing innovation."

Synergies between Global Expansion and the Industrial Gas Business

As TNSC accelerates to expand globally, effective cooperation with its business locations all over the world will be essential. While the Research & Development Division gathers information from partner companies, the Innovation Division will need to gather market intelligence from around the world, cooperate with subsidiaries, and sell TNSC's Innovation Products globally. "The key to a successful innovation strategy will be to integrate the information we have, determine the right timing to enter the market, determine the directions and priorities concerning our Innovation Products, coordinate with our subsidiaries, and effectively utilize our finite store of human and financial resources," comments Mr. Arai. Positive effects are on the horizon for other business segments, too, according to Dr. Watanabe: "Whatever success is found by our new Innovation Products should have synergistic effects on our industrial-gases business." This wave of innovation will undoubtedly have significant impact across all of TNSC.

*** What is MOCVD?**
MOCVD stands for metal-organic chemical vapor deposition. MOCVD is a growth technology of semiconductor thin films in which raw materials containing an organometal, together with a carrier gas, are subjected to a high temperature and undergo decomposition and chemical reactions on top of a wafer made of silicon, sapphire, etc. MOCVD is frequently employed for the manufacture of compound semiconductors to be used in Laser Diodes, LEDs etc.

TNSC's Innovation Products

MOCVD equipment

MOCVD equipment is a specialized reactor that creates semiconductor devices, and must meet a wide range of requirements, which include not only performance but also production cost and ease of handling. My goal is to keep working in development to meet such requirements by utilizing the techniques we have developed.

Yuji Tomita
Technology / R&D
Innovation Division

MOCVD is equipment used to create semiconductor crysral thin layers on a substrate surface by feeding a metal-organic gas and another special material gas on a substrate surface that has been heated to a high temperature. Various types of semiconductor layers can be created depending on the type of organic metal and material gas used. The layer thickness can be controlled to within a range of several nanometers. MOCVD equipment is used to produce semiconductor devices such as LEDs, sensors, and power semiconductor devices.

NeoKelvin-Turbo

This is the world's first refrigerator for cooling superconducting power equipment, and it was developed by applying our know-how in rotating machines and cryogenics—the cornerstone of our company's technical expertise. We look forward to keep working on development so that we can contribute to the development of a "superconductivity-based society."

Shinsuke Ozaki (left) and Masaki Ishii (right)
Superconductivity Project
Department of Project Promotion and Control
Research & Development Division

High-temperature-superconducting power equipment featuring superconducting cables etc. are cooled by circulating refrigerants such as liquid nitrogen. *NeoKelvin-Turbo* is a neon-based refrigerator developed by TNSC, which is capable of maintaining a temperature of about -200 degrees Celsius enabling stable operation of high-temperature-superconducting power equipment. TNSC has commercialized two models with cooling capacities of 2 kW and 10 kW, tailored to meet different types and scales of cooling.

Metal 3D Printing

I am fascinated by the various shapes created through metal 3D printing. These are the result of a wide range of phenomena. I want to better understand these complex mechanisms and engage in the development of gases best-suited to creating novel shapes through metal 3D printing.

Hiroki Amano
Engineering Group,
Processing Technologies Department
Yamanashi Research Center,
Research and Development Division

Metal 3D printing enables objects of arbitrary shape to be created with accuracy and has been applied to such advanced technical fields as aerospace and medicine. The printing quality in 3D printing is greatly affected by the gas atmosphere, so this is where the application of TNSC's gas-control technology is expected to play an important role. TNSC is also working to optimize the post-printing heat treatment process and to develope related products such as metal powders which serve as the raw materials.

Innova-Jet Swing

Self-induced oscillation is a phenomenon that has long been known, but there are very few cases in which this phenomenon has been applied to burners. TNSC is currently trying to apply this technology to supersonic flow as well as to various other applications, and will develop the oxy-enriched burners that apply the phenomenon of self-induced oscillation as a TNSC's unique technology.

Masashi Yamaguchi
Engineering Group,
Combustion Technologies Department
Yamanashi Research Center,
Research & Development Division

Innova-Jet Swing is a burner that applies a phenomenon in fluids called self-induced oscillation. This burner is capable of making the flame oscillate with no device to drive the oscillating motion. In conjunction with the burner's high-temperature flame enabled by TNSC's oxygen-enriched combustion technology, an extensive area can be heated effectively with this one burner. We have commercialized *Innova-Jet Swing* for applications in steel and glass, and promoted to distribute over a wider area.

Message from the Frontline

My name is Rick Kowey, and I am Executive Vice President of MATHESON's Advanced Technology Group (ATG). As part of TNSC's Total Innovation initiative, the mission of ATG is to advance TNSC Group's position in high-technology markets around the world, but first starting in North America. Our group began work in 2014 with intense focus on TNSC's metal organic chemical vapor deposition technology for advanced LED lighting, laser, and power electronics for consumer and industrial applications, resulting in several successful U.S. installations. Within the last year, we expanded our pursuits to include the high-growth area of metal additive manufacturing and also vibrant biomedical sectors. The ATG team includes Mayank Bulsara for compound semiconductors, Paul Taylor for additive manufacturing, Dave Zunzanyika for biomedical, and Junko Lindberg for overall marketing and administration. We work alongside TNSC's R&D and corporate business development groups to make profitable businesses from their developmental efforts, and we look forward to very profitable sales growth!

Mayank (left) and Junko (right),
ATG, Matheson Tri-gas, Inc.

Rick Kowey
Advanced Technology Group
Matheson Tri-Gas, Inc.

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