

Riding The Currents

NGK INSULATORS HAS EXPANDED FROM ITS ORIGINAL BUSINESS OF MAKING INSULATORS TO HIGH-GROWTH DOMAINS LIKE CERAMIC COMPONENTS FOR THE AUTOMOBILE AND SEMICONDUCTOR INDUSTRIES.

ARE YOU FUTURE PROOF? For Japanese ceramics maker NGK Insulators, the answer to that existential question is a resounding yes. Founded in 1919 to manufacture high-voltage ceramic insulators for the country's emergent power-generation industry and now global No. 1 in that field, the company has evolved to the point that the power business accounted for a modest 13% share

of overall revenues of US\$3.58 billion (¥401.3 billion) in fiscal 2016.

So where do the rest of NGK's sales come from? At around 61%, ceramics products for the automotive industry—things like particulate filters for gasoline and diesel vehicles and ceramics for catalytic converters—account for the lion's share. The remaining 26%, meanwhile, comes from electronics-related ceramics, ranging from semiconductor production equipment to electronic components.

The market environment for automotive ceramics is highly favorable. Globally, around 90 million cars are sold every year, and the figure is rising at a brisk 3% to 4% annually. With emission regulations becoming ever more stringent in both the developed world and in emerging economies like India and China, the number of models requiring to be fitted with exhaust-purification devices is rising rapidly. "We have a global share of 50% for automotive ceramics," says president Taku Oshima. "We plan

to invest ¥170 billion—roughly US\$1.5 billion—in new manufacturing capacity over the coming three years and are working hard to meet ever-increasing demand."

But could this market vanish if electric vehicles (EVs) swoop in and replace internal combustion engine vehicles overnight? Not according to Oshima. He expects EV sales to rise from an annual level of several hundred thousand now to somewhere below 10 million by the mid-2030s. As total global auto sales will also increase to the 130 million range, the market for conventional vehicles will remain far bigger, particularly the large vehicle segment, the buses, trucks, and construction equipment that have a particular need for exhaust purification.

SERVING THE DIGITAL ECONOMY

It's a similar story of future-proofing in the electronics-related ceramics business, where global megatrends are again providing a powerful tailwind. Almost half of NGK's sales in this segment come from semiconductor production equipment (SPE). "These days, you hear a lot about the Internet of Things, artificial intelligence, and autonomous vehicles," says Oshima. "What do all those technologies have in common? They all need semiconductors."

Ceramic materials have twin merits: While offering precision, they're also tough enough to withstand the brutal atmosphere of the vacuum chambers full of hot, corrosive gas in which semiconductors are made. NGK



TAKU OSHIMA, President of NGK Insulators

manufactures key components like electrostatic chucks (which hold silicon wafers still during etching) and ceramic heaters (which keep silicon wafers at a uniform temperature during membrane formation).

"We're one of a handful of companies that can make equipment precise and durable enough for these tasks," says Oshima. "Our SPE business doubled in size the last five years and is growing at a double-digit rate." In a sign of confidence in the future, NGK will break ground on a third SPE ceramics plant in Japan in April 2018, and is currently expanding the capacity of its metal SPE component factory in California.

This relentless focus on discovering new avenues for growth is also on show in NGK's power business. The original insulator business might be mature, but the global switchover to renewable energy is creating demand for entirely new kinds of infrastructure. Case in point: NGK's large-capacity sodium-sulfur (NaS) batteries—sold under the NAS® trademark—which are mainly used for stabilizing the energy output from renewable sources like wind and solar. Already in use in 200 locations worldwide, NAS batteries are currently part of a multiyear demonstration project in Lower Saxony, Germany. Potential needs are high, and such demonstration projects will stimulate demand.

INNOVATE, COMMERCIALIZE, REPEAT

This ability to continuously innovate, however, is something that NGK has to work at. With the company on track to achieve its goal of generating 30% of revenues from



NGK MANUFACTURES KEY COMPONENTS FOR SEMICONDUCTOR PRODUCTION EQUIPMENT.

new products in FY2017, Oshima's target now is maintaining that challenging ratio. He attributes the firm's success in innovation to two things: spending 4% to 6% of sales on R&D and investing aggressively in pilot plants to turn out new products at scale fast. "Our ¥300 billion capital investment over the next three years is triple what's normal for a firm our size," he points out.

New products coming on stream soon include micro-lenses for ultraviolet LED for medical sterilization and gallium nitride wafers that serve as substrates for high-brightness light sources like laser diodes in automotive headlights and business projectors. "With our materials technology expertise, we can modify materials to bring out their inherent qualities and create products that other companies simply cannot copy," Oshima concludes emphatically. ●

RECHARGING GROWTH

President Taku Oshima explains how NGK is leveraging its expertise in ceramic materials to develop innovative batteries and fuel cells.

Where do you see opportunity in batteries?

Trends like wearable devices and the Internet of Things [IoT] are driving demand for smaller, safer and more durable batteries. We've developed high-energy-density rechargeable lithium-ion chip-type ceramic batteries just 0.2 millimeters thick. They're small and heat-resistant enough to be mounted directly on circuit boards

beside semiconductors.

Where will these tiny batteries be used?

Smartwatches and fitness trackers are an obvious market, as are smartcards with security features like built-in fingerprint recognition. They can also serve as the power source for IoT modules that will enable different devices to

communicate with one another. That's where our expectations are highest.

What else is under development?

Zinc rechargeable batteries with unique ceramic separators of solid electrolyte and an aqueous electrolyte. They're safe and inexpensive, so perfect for indoor use in homes

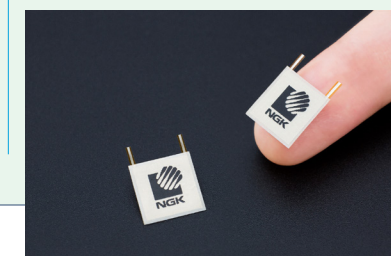
and small buildings.

What about fuel cells?

Home-use fuel cell systems are getting popular in Japan because they cut energy bills by generating both heat and electricity from gas fuel. We've created a solid oxide fuel cell module design that's durable, more efficient, and very compact.

When will these new products come out?

Field tests and certification are underway. Production in pilot plants will start in stages from FY2017.



CHIP-TYPE CERAMIC BATTERIES AS SMALL AS A POSTAGE STAMP.