

# POWER WITH PURPOSE

**NGK Insulators** has diversified from the power sector into auto ceramics, electronics components, and semiconductor manufacturing equipment. The common factor? Answering the world's needs.

## WHAT ARE THE BIGGEST TRENDS SHAPING THE WORLD

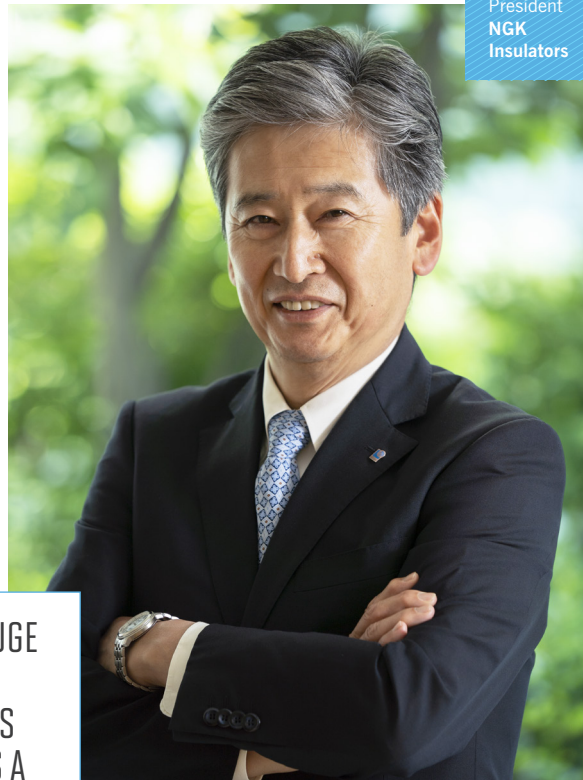
economy right now? Things like renewable energy, artificial intelligence, the Internet of Things, urban pollution, and the emergence of a new consumer class in Asia would feature prominently on any list. And it's precisely because Japan-based ceramics manufacturer NGK Insulators addresses so many of these hot-button issues that the company logged record sales of US\$4.26 billion (¥451.1 billion) in fiscal year 2017—and expects both sales and operating income to rise another 10% this year.

More than 50% of NGK's revenue comes from automotive-related ceramics that clean exhaust and cut pollution. "We make particulate filters for gasoline and diesel vehicles, ceramics for catalytic converters, and sensors that detect nitrogen oxides," explains president Taku Oshima.

Oshima has reasons to be bullish on the sector: First, annual global car sales of 90 million are poised to rise as high as 110 million or 120 million units over the next decade, as more of Asia's new middle class takes to the roads; second, Asian nations are following Europe in adopting more stringent exhaust regulations; third, hybrid vehicles (which have conventional engines) are a realistic alternative to electric vehicles, which continue to face battery-related challenges. NGK's sales are increasing in line with overall automobile demand, and the company is investing US\$1.12 billion (¥119 billion) to expand its worldwide manufacturing capacity. The company is also making strategic preparations for electrification by developing technologies like ceramic-based solid-state batteries for EVs and hybrids.

## INTERNET OF EVERYTHING

Technological trends are driving growth in NGK's semiconductor production equipment (SPE) business. Here Oshima sees two major tailwinds. "You have 3D memory chips that can store large amounts of data and increased communications speeds able to transmit it faster," he says. "In consequence, 3D memory chips are being used in more and more applications, many of which only existed as concepts before." He cites self-driving cars, which collect and analyze vast amounts of image data in real time, as an example.



**TAKU OSHIMA**  
President  
NGK  
Insulators

**THIS DELUGE OF NEW PRODUCTS REFLECTS A COMMITMENT TO INNOVATION.**

This advance in technology is spurring semiconductor demand. Like the proverbial man who made a fortune selling shovels during the Gold Rush, NGK makes susceptors—which hold silicon wafers in place during the manufacturing of semiconductors—and precision components and assemblies.

Making semiconductors is not easy. The susceptors must be perfectly flat, maintain an even temperature when heated, and be strong enough to resist corrosive plasma gases. "We're the only company with the technology to satisfy the industry's stringent requirements," says Oshima. "We can barely keep up with demand and are currently investing US\$377 million (¥40 billion) to increase our manufacturing capacity in Japan and the U.S." In fact, the SPE business is performing so well that Oshima has just combined it with NGK's industrial processes segment to create a new process

technology business. Sales are expected to increase 16% this year.

It's a similar story of progress in the company's electronics business, where NGK is releasing a raft of new products targeting mobile communications and data storage. Last year, NGK started selling bonded wafers for surface acoustic wave (SAW) filters, which select the desired frequencies in mobile devices. With buoyant demand for mobile devices, sales of the wafers are forecast to reach US\$94 million (¥10 billion) within three years. The company also began selling ultraprecise piezoceramic actuators for hard disk drives. (The actuator moves the head arm, which reads and writes on the hard disks.) While consumers are switching to solid state drives (SSDs), hard disk drives remain popular with data centers because of their cost advantage. NGK expects sales to rise 20% per year.

## ACHIEVING THE IMPOSSIBLE

This deluge of new products reflects NGK's long-standing commitment to innovation. In fiscal year 2017, the company achieved its target of generating 30% of total sales from new products—a level it intends to maintain by spending the equivalent of around 5% of sales on R&D.

NGK's original power business, which now accounts for 12% of total sales, is still going strong after 99 years. Ranked No. 1 globally, it produces high-spec insulators which it supplies to more than 100 countries worldwide. In this sector too the company continues to push the innovation envelope, with large-capacity sodium-sulfur (NaS) batteries—sold under the NAS® trademark—used to store and stabilize energy output from renewable sources.



NGK's semiconductor production equipment is in great demand.

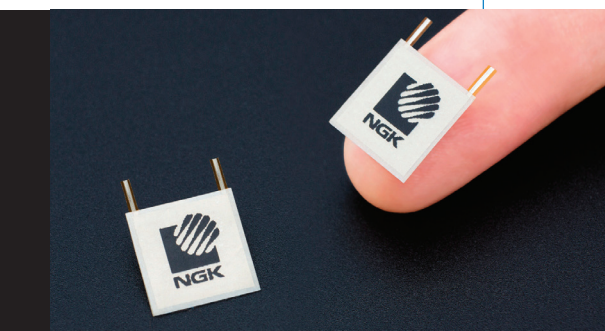
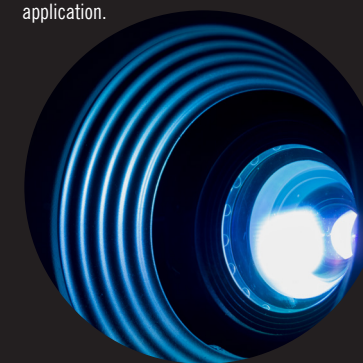
NAS batteries are already in use in some 200 locations worldwide; now Oshima sees the Middle East as a key market. Financially and environmentally, it makes sense for Middle Eastern nations to generate their electricity from the sun rather than oil. But since solar power can be generated only in the daytime, it has to be stored for night-time use. NGK's NAS batteries offer the perfect solution—as proven by the success of a 108MW installation in the searing heat of Abu Dhabi. The company is in talks with several countries for business to launch in the 2020s.

"People told us that it would be impossible to develop large-capacity batteries, but we pressed on—and we succeeded. That's what we do," Oshima says. "We look at the world, see what products are needed and develop solutions, even if it takes time to do so. We use ceramics technology to turn the impossible into the possible." ●

**NGK INTENDS TO GENERATE 30% OF SALES FROM NEW PRODUCTS. HERE'S A SNAPSHOT OF TWO CLOSE-TO-MARKET INNOVATIONS. >**

### ▼ MERCURY-FREE LIGHT

The United Nations' Minamata Convention on Mercury aims to reduce mercury pollution. To this end, business projectors with mercury lamps are being phased out. NGK is developing a substitute technology based on ultrahigh luminance lasers using gallium nitride (GaN) wafers. Automobile headlights are another application.



### ▲ FINGERPRINT VERIFICATION

Of the various batteries NGK has in development, a chip-type rechargeable battery is first in line for commercialization. Merits include thickness of just 0.4 millimeters, resistance to heat and to bending, high energy density and direct solderability. It will be used to power fingerprint authentication in credit cards and Internet of Things wireless modules for connected devices.