

NGK Insulators: Ceramic experts combat climate change

 **NGK INSULATORS, LTD.**

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The 2016 G7 summit is being held today near Aichi prefecture, Japan's industrial heartland and home to numerous world-class companies, such as Toyota. Less well known than the carmaker are global ceramics-technology manufacturers with roots in the traditional porcelain kilns of the region. NGK Insulators is one of them. The company was established in 1919 as a spin-off of the forerunner of Noritake, renowned for fine tableware, to produce high-voltage insulators for Japan's electrification.

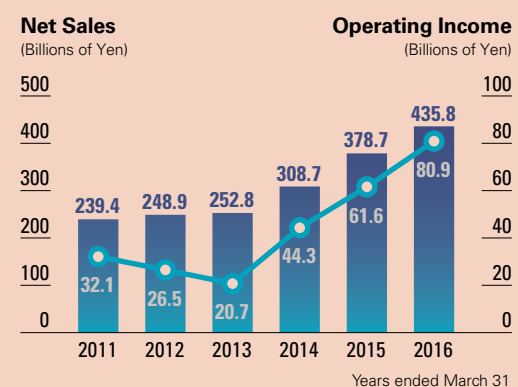
Nearly a hundred years later, the company has become a leading global supplier of ceramic electrical insulators and ceramic substrates for automotive exhaust gas purification worldwide. It has also pioneered numerous ceramic technologies for semiconductor manufacturing equipment and mobile devices. More recently, NGK has attracted attention as the world's only commercial supplier of large-scale electricity storage systems using sodium sulfur (NaS) batteries.

"Since early in its company history, NGK has possessed unrivalled expertise in ceramics production," says President Taku Oshima. "Through innovations of this core technology, we've continued to expand our business successfully."

Diverse Portfolio of Ceramic Technologies

Indeed, the company's global reach in all its business segments is considerable. The company boasts the world's largest production capacity for insulators, including the world's strongest insulators for power transmission, which are used in at least 100 countries. It is also the leading supplier of ceramic substrates for automotive catalytic converters and diesel particulate filters (DPFs) to major automakers worldwide.

Robust growth for NGK Insulators



Taku Oshima
President
NGK Insulators, Ltd.

NGK's honeycomb-shaped "Honeyceram" and DPFs help purify harmful substances from the exhaust of hundreds of millions of gasoline and diesel vehicles.

In the past two decades, the company has commercialised its unique NAS[®] system (see box) worldwide. The versatile NAS is used to store and stabilise intermittent power generated from such renewables as wind and solar. Oshima, who was in charge of developing and commercialising NAS for over 20 years, takes a long view. "It is not just about short-term profits when you are developing a product that could contribute to dealing with the greatest environmental challenge for humanity."

As governments commit to reducing emissions and encourage the use of renewable energy, the surge of electricity produced from solar and wind is putting a strain on electricity grids. Utilities are turning increasingly to batteries for storage. NGK has supplied major Japanese utilities with large-scale battery storage systems for stabilising renewables. Outside Japan, it has provided NAS battery arrays to customers in Italy and the United Arab Emirates in what represent some of the largest grid-scale storage battery deals in the world.

Robust Fundamentals

NGK's diverse business portfolio allows it to deliver on its corporate philosophy of generating value and protecting the natural environment through ceramic technologies. And it has done so with robust profits.

Last month, NGK announced record sales of 435.8bn JPY (US\$3.9bn) and operating income of 80.9bn JPY for the fiscal year ended March 2016. This is an 82 per cent increase in net sales and a 152 per cent increase in operating income compared with five years ago (year ended March 2011). The company also demonstrates a strong ROE of 13.3 per cent and robust earnings per share of 163 JPY for fiscal 2016.

Propelling NGK's sales are strong automotive demand in Europe, the United States, and China; tightening regulations for exhaust gas; expanding demand for mobile devices and semiconductor manufacturing equipment; and large orders for NAS batteries. The majority of NGK's business is outside Japan. Fully 70 per cent of the company's sales and 60 per cent of its workforce of around 20,000 employees are abroad.

Not resting on its laurels, NGK is committed to streamlining its costs and to further reducing the environmental impact of its operations. It also continues to expand beyond its core insulator, automotive, and electronic businesses. Oshima has challenged his research divisions to raise the ratio of total sales from new products to 30 per cent in fiscal 2017.

New technologies being developed and commercialised include solid oxide fuel cells, chip-type ceramic secondary batteries, and high-performance wafer products. "The high-density chip-type batteries under development are particularly promising, with their wide range of uses in the

growing markets of the Internet of Things and of wearable devices," says Oshima. And the company appears to be on target, with sales from new products accounting for 25 per cent of total sales in fiscal 2016.

Contributing to the Environment

Climate change and energy security are global issues that will be discussed at the

G7 Summit and elsewhere. The world is in search of solutions, particularly for ways to harness renewables, curb emissions, and lower energy costs. With its unparalleled track record in large-scale battery systems and other environmental technologies, NGK is well positioned to contribute toward resolving these global challenges.

NAS Batteries: Compact, containerised, and cost-effective

With climate change a pressing concern, governments in Europe, North America, and Asia have been rushing to back the expansion of renewable energies, particularly solar and wind. These power sources, however, are notoriously unstable. Unlike thermal power, solar and wind—depending on weather conditions and time of day—are intermittent producers of electricity. This means that renewable producers risk wasteful over-generation and shortages of output that can destabilise the grid.

The key is to develop reliable, low-cost electricity storage systems that can store large volumes of surplus electricity and release that power into the grid as needed.

NGK's NAS system is a promising contender among energy storage technologies. The company developed this large-scale battery system in the mid-1980s and put it into commercial use in 2002. Since then,

NAS systems have been set up worldwide in over 190 locations. Combined, they provide total power of 530 megawatts (MW) and storage capacity of 3,700 megawatt-hours of energy.

NAS batteries feature a number of compelling advantages: long duration of up to six hours of high-output discharging, scalability, and long life. They are also compact and come pre-installed in 20-foot containers, allowing for rapid and cost-effective deployment. Their total cost per kilowatt-hour is considerably lower than that of other storage battery technologies, and NGK is working to further drive down that cost to rival pumped hydro storage by

2020. Finally, as a mature technology, NAS batteries have had their reliability and safety features tested in the field for nearly 20 years.

NAS systems serve diverse needs around the world. Major installations include a 108 MW facility in Abu Dhabi for load leveling of its thermal generation; a 35 MW facility in Italy to store renewables generated in the south of the country for transmission across the grid to the north; and various wind and solar stabilisation sites inside and outside Japan. As a compact, cost-effective, and rapidly deployable choice for grid-scale electricity storage, NAS batteries appear to be leading the pack.

An image of the containerised NAS battery system being deployed around the globe

