Stronger Exhaust Regulations Create Strong Growth for Core Products

Fiscal 2018 outlook

Net sales	Operating income	Net sales	Operating income
240.7 billion yen	56.7 billion yen	267.0 billion yen	60.0 billion yen

Fiscal 2017 results

In fiscal 2017, increased truck sales on the Chinese market and the impact of the more stringent exhaust regulations in the EU contributed to strong growth in NOx sensors and other automotive products. On the other hand, however, increased amortization and development expenses, combined with temporary expense increases such as new plant startup costs, contributed to an anticipated increase in revenue but decrease in profits, with net sales of 240.7 billion yen and operating income of 56.7 billion yen. Please note that, from April 2018, industrial process business has been transferred to the newly established Process Technology Business Group, and the above results represent a new segment base.

Projections for this new segment base in fiscal 2018 anticipate increased revenues and profits compared to the previous period, with net sales of 267 billion yen and operating income of 60 billion yen.

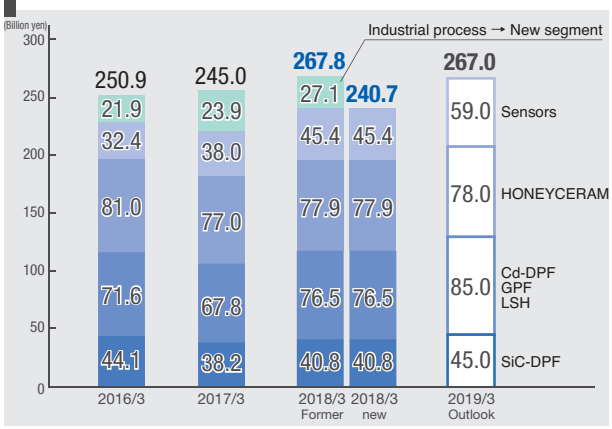
Sales of passenger vehicles in China and Asia's emerging markets and trucks in the US market are increasing, while exhaust regulations in Europe are getting more stringent. As a result of these trends, shipments of HONEYCERAM® to China and Asia's emerging markets are expected to increase, and demand for gasoline particulate filters (GPFs) for passenger vehicles in Europe is expected to ramp up significantly.

Because of further market share held by silicon carbide diesel particulate filters (SiC-DPFs), and because the number of NOx sensors per vehicle will increase, revenue is expected to increase for each.

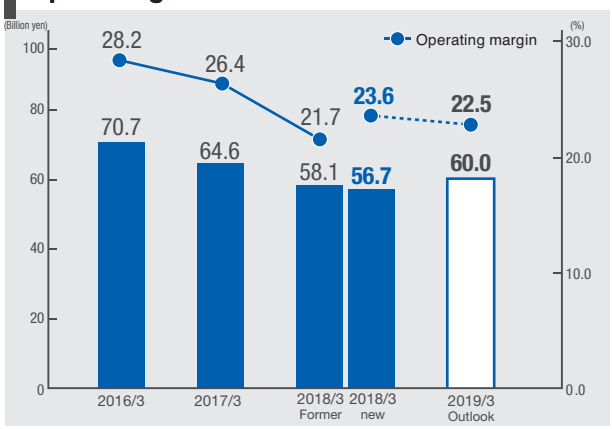
Director and Senior Vice President; Group Executive, Ceramic Products Business Group **Atushi Matsuda**

Financial results

Net sales (Billion yen)



Operating income (Billion yen/%)

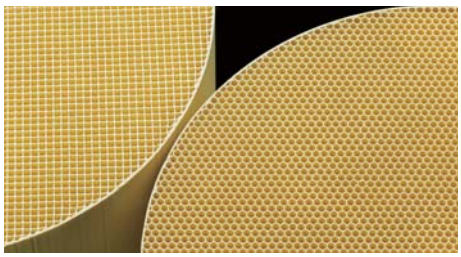


Ceramic products business

Automotive-related products

The HONEYCERAM® ceramic substrates for automotive catalytic converters are indispensable in cleaning vehicle exhaust. They have been adopted by automakers around the world and are manufactured by plants in Japan, Europe, America, Indonesia, Thailand, South Africa, and China.

NGK offers a range of other environmentally friendly and energy-efficient products, including diesel particulate filters (DPFs) and gasoline particulate filters (GPFs) which remove particulate material (PM), and NOx sensors which measure nitrogen oxide (NOx) concentration in automobile exhaust.

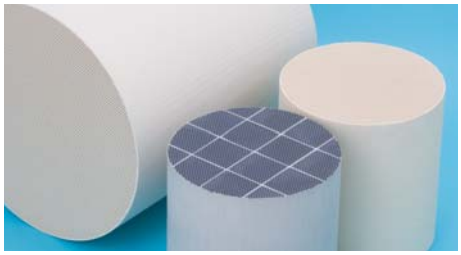


HONEYCERAM®

With a choice of square or hexagonal cell configurations (the latter being highly effective in conserving the volume of catalyst used), HONEYCERAM is used by auto manufacturers worldwide. Total production of HONEYCERAM recently exceeded 1.5 billion units.

In-vehicle high-precision NOx sensors

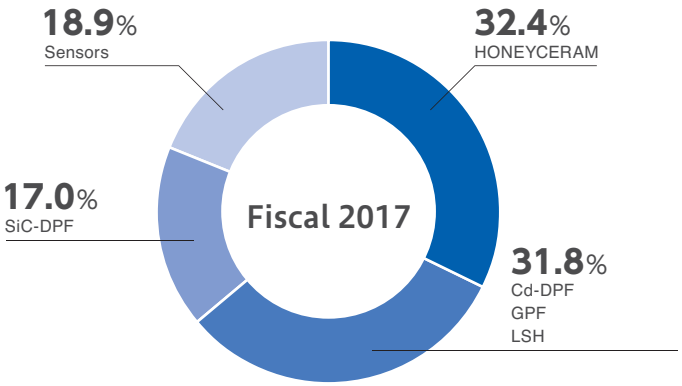
These sensors contain elements that utilize zirconia's oxygen pump function. They are now incorporated in clean diesel vehicles around the world because of their superior detection capabilities and greater durability.



Diesel particulate filters (DPFs)

These remove up to 99 % of particulate matter. Featuring superior heat resistance, silicon carbide filters (center of photo) are used in passenger cars, while lightweight cordierite filters are used mainly in heavy-duty vehicles.

Sales ratio by product



Manufacturing sites

● **Automotive-related products:** Japan, US, Mexico, Poland, China, Belgium, Indonesia, South Africa, Thailand

Steadily Investing in Production Facilities while Developing Products for a New Era

Future outlook

First, let us begin with an overview of NGK's core automotive-related products. For HONEYCERAM®, despite the fact that their total demand is generally tied with the sales volume for passenger vehicles (new automobiles) worldwide, the trend of replacing them with GPFs is causing their demand to somewhat fall below overall passenger vehicle sales.

Demand for DPFs for diesel vehicles is expected to grow as exhaust regulations for trucks and off-road vehicles become increasingly stringent in China, India, and other emerging markets and demand for trucks in China, in particular, looks to keep expanding. For large HONEYCERAM as well, the increasing sales volume for trucks in the Chinese market and stronger exhaust regulations in emerging markets are projected to increase the demand.

For GPFs, product shipments in the EU are expected to ramp up fully in fiscal 2018, while demand is expected to grow in China from next fiscal year onward.

Demand for NOx sensors is expected to increase significantly as a result of more stringent exhaust regulations in Europe, which necessitate the incorporation of more sensors per diesel passenger vehicle.

All of these are internal-combustion engine-related products; however, in recent years electric vehicles (EVs) are becoming the focus of more and more governments and automakers, and the media continues to report on the decline in diesel vehicles as a percentage of the European automotive market. Nevertheless, we project that the number of internal-combustion engine passenger vehicles will continue to increase until around 2025, and that the percentage of EVs and other non-internal-combustion engine passenger vehicles will hover between 6%–12% for the 2025–2030 period.

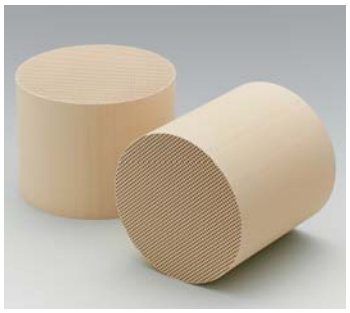
We expect diesel vehicles to be almost nonexistent among small motor vehicles by about 2025, but diesel vehicles will still be around for among large passenger vehicles and commercial vehicles that require torque.

Based on these assumptions, NGK is currently undertaking capital investment aimed at increasing SiC-DPF production at the No. 2 Plant in Poland. Our plan moving forward is to progressively decommission the aging No. 1 Plant and shift production to new lines in the highly cost-competitive No. 2 Plant in response to carefully monitored demand trends.

Observers are saying that the automotive industry is undergoing a once-in-a-century period of innovation. In such times, it is essential that we go back to basics. We will do what we are uniquely equipped to do, which is proactively pursue solutions to customer needs before they manifest themselves in the market, all while maintaining our commitment to the core aspects of our business: safety, the environment, quality, and CSR.

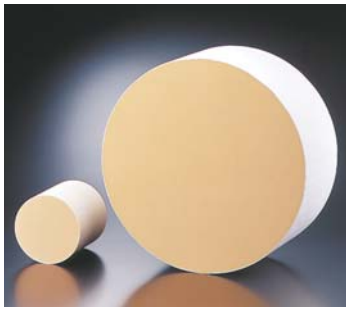
For example, the growth in hybrid automobiles on the market has seen a rise in the incidence of delayed catalyst activation due to insufficiently hot exhaust produced by engines that have been dormant for an extended period. To address this problem, we are currently developing a new product that will electrically heat catalysts to improve their purifying performance.

Such a product, however, is nowhere near ready to be added to our business group's product lineup. It will take at least five to six years, with 10 years even being possible. Instead of short-cuts and clever schemes, for our quest to discover and develop products that meet the needs of the new era, we prefer a straightforward approach that relies upon on the strengths that the NGK Group achieves through its fusion of unique material technologies and production technologies.



Gasoline particulate filters (GPFs)

These particulate filters for gasoline-powered vehicles are used in direct-injection gasoline engines that provide high horsepower and excellent fuel economy.



Large-size HONEYCERAM (LSH)

Designed for large vehicles, this model of HONEYCERAM catalyst carrier removes hydrocarbons (HC), carbon monoxide (CO), and nitrogen oxide (NOx) contained in diesel exhaust gas.

TOPICS 1

Large-scale capital investment for even greater revenue

For three years from fiscal 2017 to fiscal 2019, our business group is undertaking the largest capital investment in its history. By increasing spending on production across nearly all of our product areas, we aim to achieve even greater revenues over the following three years.

This investment is primarily aimed at the NGK Ceramic Device Ishikawa Plant, NGK Ceramics (Thailand), NGK Ceramics Polska (Poland), and NGK Ceramics Suzhou. The product areas targeted span everything from ceramic catalytic converter substrates for automobile exhaust purification to NOx sensors. All of the products our business group manufactures are connected with cleaning automobile exhaust; hence, as more and more countries adopt stronger environmental regulations, demand for our products increases.

This investment will not only allow our business group to ensure production can meet demand, it will also allow us to introduce cutting-edge production lines that will improve production efficiency to reduce costs and guarantee profitability.


Ishikawa Plant, NGK Ceramic Device


NGK Ceramics (Thailand)


NGK Ceramics Suzhou


NGK Ceramics Polska

Solidly executing the fundamentals of business; tenaciously pursuing the essence of business

The principle which our business group, as well as the President of NGK, advocates and seeks to implement is to make sure we solidly execute the fundamentals (safety, the environment, quality, and CSR) of our business while tenaciously pursuing the essence of what that business is.

As part of ensuring that we are thorough about the fundamentals of our business, we are working to cultivate workplace and organizational openness, where even bad news is reported straight away without hesitation, by reorganizing and streamlining our business meeting structure to create the business group capable of frank and earnest exchanges of opinion.

As part of tenaciously pursuing the essence of what our business is, we are working to improve the efficiency of our sales departments via systematization of the process for relaying product ordering information to our plants, moving it beyond mere information transcription to a fully standardized operation. We are also introducing system management for samples requested by customers. In addition, we are introducing automated aggregation systems into our budget formulation operations in order to reduce the number of man-hours spent on these tasks.

Moving forward, we will incorporate automation wherever we can so that we can concentrate our human resources in the communication-related and creative jobs that only humans can perform.

TOPICS 2