

Building on World-Class Productivity and Efficiency

MANUFACTURING

TADAO TAKAHASHI Executive Vice President

"By following the Nissan Production Way and the principle of *doukiseisan*—meaning synchronization with the customer—manufacturing at Nissan remains flexible and integrated, and keeps lead times short. The Nissan Production Way incorporates integration at the supplier, global and logistic levels. That is why we remain the most productive manufacturer in the world.

We've also become much more efficient, as our utilization rates show. In Japan, we were operating at 54 percent of capacity in 1999. In fiscal 2004 that figure increased to 86 percent, which is just about the maximum possible. During NISSAN Value-Up, we will increase our global utilization rate from approximately 74 percent to over 80 percent. We will not achieve that target by closing facilities, either. In fact, we've opened new plants in the U.S. and China, and increased capacity at our other facilities.

Manufacturing achieved a series of milestones during NISSAN 180. One of the biggest was opening the Canton plant in the U.S., which got up to speed quickly, launching five new vehicles in a period of just eight months. We built two plants in China, and restarted operations in Egypt. We dramatically expanded the Decherd, Tennessee engine plant in the U.S., and all engines for North America are now built at Decherd or at our plant in Mexico.

We also commenced cross-production with Renault: Nissan began building Renault's Platina in Mexico and its Traffic in Spain, while Renault began building our Pickup and Xterra at its factory in Brazil. We also started production of common engines with Renault, with our subsidiary Aichi Kikai and the Yokohama plant producing the four-cylinder engines used in our new Tiida, Note and Lafesta models. In Japan, we launched six new models in just six months—the Murano, Fuga, Lafesta, Tiida, Tiida Latio and Note. We also launched three vehicles—the Tiida, Teana and Tiida Latio—in China.

While we were successful in Japan and China, we did have quality issues at the Canton facility. This was

unfortunate, since it affected our ratings in the J. D. Power and Associates Initial Quality Study. We've since taken effective measures to resolve these problems. More importantly, we learned from them. We created new systems and new approaches to quality, which we then applied in Japan and to the new factories in China. Incidentally, the factories in China opened with no significant quality issues. This highlights one of our 'neverending' quests at Nissan, which is to identify problems and rapidly get solutions for them in place.

We do not rely solely on external quality evaluations. In cooperation with Renault, we created AVES, the Alliance Vehicle Evaluation System. AVES is a sophisticated process involving two people taking four to five hours to evaluate a vehicle. Because it is time-intensive, we also devised a short version of AVES that only takes an hour and can be done at the factory.

The second major area of focus is logistics, which is becoming more complicated. We send engine parts to the U.S., and soon we will be shipping more parts from leading competitive countries, or LCCs. During 2004, we encountered cargo-handling problems on the U.S. West Coast, which highlighted the need for a more sophisticated tracking system. If we had had such a system in place, we could have anticipated those problems and made the necessary adjustments.

While Nissan's productivity leads the world, we have not stopped working to improve the process. One system we have implemented is the Design Standard Time Ratio, which allows us to calculate the ideal standard time for every operation. By applying this globally, we have brought all our branches around the world to nearly the same level. This in turn illustrated that we can produce vehicles more cheaply and with good productivity in the LCCs. Another opportunity discovered for the LCCs was in low-cost jig and die making. As a result, we have doubled the capacity of our die-making plant in Thailand and are looking into doing the same in China.



The most important measurement in manufacturing is the global cost per unit. During NISSAN 180, we achieved a cost reduction of 14 percent per unit, including indirect costs, or 8.3 percent in direct costs. We also evaluate our performance in time to delivery using three different measures. One measure is from customer to customer, and the time from order to delivery—an especially important calculation for our build-to-order system. We've reduced this interval to 24 or 25 days, and have set a target of about 18 days.

The second measure is from the "model freeze" stage until the start of production, which is an important factor for both manufacturing and R&D. With the recent launch of the Note in Japan, we brought this down to 10.5 months for the first time. The third measure is the time from the start of production to full production. The standard is about two months. Our target is two weeks, which we achieved with both the Tiida and the Note. While a faster rate could present quality issues, we produced these two cars with speed and high quality.

The second of our 'never-ending' quests at Nissan is greater synchronization, or douki. With the Nissan Production Way, we are aiming to shorten production pipelines. The process begins with the customer's order, which includes items such as colors and specifications. Based on this, we make the production plan, establish the sequence and determine the shipping time. We broadcast this information to all players at the same time, within Nissan and our suppliers, and not just in the order of need. If there is any problem, everyone immediately recognizes it. This makes quick action possible. The same can be said of what we call the "fishbone system." Instead of a strictly linear production line, this system features a constant, parallel introduction of supplies to the operation similar in construction to skeleton of a fish. We also utilize the 'strike zone,' where supplies must be delivered within the reach of the factory workers, which improves quality and productivity. This is related to logistics, so we involve our production partners from the early stages of planning.

MANUFACTURING IN NORTH AMERICA



DAN GAUDETTE Senior Vice President Nissan North America

"I am proud to say that Nissan's U.S. plants have long been among the most efficient in the country. We've topped *the Harbour Report* automotive assembly rankings for the past 12 years. We are now operating at close to full capacity. The Smyrna and Canton plants, which can produce 550,000 and 400,000 vehicles a year, respectively, are running at approximately 85 percent of total capacity.

"In North America, our manufacturing flexibility gives us a competitive advantage. Both Smyrna and Canton are set up to produce five models each, and we can react to market changes quickly. We also recognize that we may need to boost capacity in the future due to expected growth and increases in exports to various countries. "To us, the Canton plant embodied the principles of NISSAN 180. We had to be prepared to launch and immediately produce five all-new vehicles. At the same time, we were taking the Decherd plant from an annual capacity of 250,000 engines up to 950,000, including two brand-new engines. That was a challenging and exciting time.

"Today, we are pleased that our results in the recent J. D. Power and Associates Initial Quality Study show significant improvement over the prior year, and we're determined to move beyond that level. We will continue to rely heavily on the Nissan Production Way as our guide, focusing on being quality-driven and waste-free."



The above are all part of the Nissan Integrated Manufacturing System, known as NIMS, which provides more flexibility in manufacturing. Using NIMS, for example, we can produce eight models on a single line. During NISSAN 180, we introduced 16 NIMS lines worldwide into our 18 total major lines. For NISSAN Value-Up, we will increase this to 22 NIMS lines.

We will need that flexibility during NISSAN Value-Up, because twice a month we will be launching new cars somewhere—a total of 70 production starts. We cannot do this with our old system. The launch stage can be a difficult period, and too often problems arise that can cause panic on the line. To cope with these problems, we've devised what we call the Global Launching Expert system. The launch expert can stand back and analyze the situation and come up with solutions. We are now identifying, educating and dispatching launch experts from around the world. In 2006, we will further refine our launch procedures by opening the Global Production Engineering Center. Currently, if we produce the same car in several markets, the launches are separate activities. In the future, we will 'bundle' all launches by developing the launch process and creating the dies in Japan. This bundle will then be reproduced and forwarded to the various factories producing the car.

We have established four key factors for success during NISSAN Value-Up: quality, timely delivery, cost, and the environment. Regarding the environment, we have identified three environmental issues, which are CO₂, recycling, and emissions such as chemical emissions and volatile organic compounds. This is our newest challenge, since we do not yet have concrete targets on a global scale as we do for Japan.

Our goal is to maintain Nissan's status as the world leader in manufacturing by aggressively implementing new technologies and expertise. Our processes are designed to require low investment costs and generate fast product launches, which would result in a faster return on investment in addition to a top-quality product."

MANUFACTURING IN EUROPE



COLIN DODGE Senior Vice President Nissan Europe

"In the last four years the Nissan Production Way has become the international standard for manufacturing in the world. This system makes sense everywhere, including Japan, the UK, Spain, and the U.S. It's a system that everyone embraces and feels is theirs, not one that was imposed on them. The Sunderland plant is the most productive automotive plant in the Western world, and while we have great people working for us, the Nissan Production Way is what made this success possible.

Europe is an incredibly competitive market, with 15 companies trying to gain market share.

We decided not to compete directly in fundamental segments. Instead, we chose to build unique, profitable vehicles, like the new crossover vehicle, based on the Qashqai concept car, which will be released in early 2007. This is one of the three launches for the upcoming year from the Sunderland plant, along with the Tone and the Micra C+C coupe and cabriolet. NISSAN 180 was a great success for us. Today, our Spanish factory is in full production and our Sunderland plant is preparing to turn out the three new models."