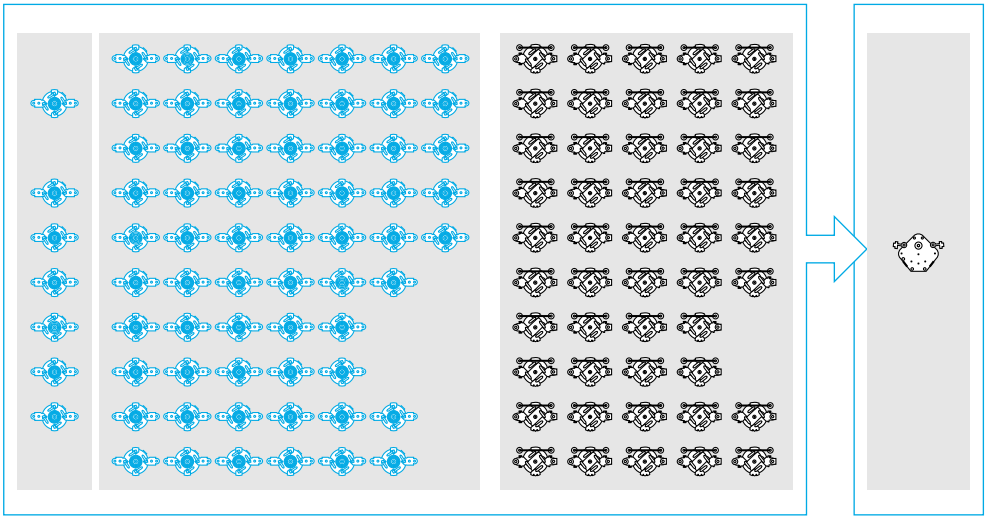
As global automobile manufacturers embark on a new round of corporate reengineering, they are demanding ever-lower prices from component suppliers. Suppliers, in turn, must battle to stay alive in a cut-throat market dictated by cost. At DENSO, we are confident we can rise to this challenge and use it as an opportunity to grow. We are taking a number of approaches to reducing costs—standardization of parts and processes, smaller, lighter components with greater functionality, modularization, shorter development times, and streamlined manufacturing processes. These methods are part of an integrated approach to generate significant cost-saving synergies.

... COST REDUCTION

›› Supply pump for the 1,800-bar common rail system

VARIATIONS OF INSTRUMENT CLUSTER MOVEMENTS PARED DOWN FROM 118 TO 1



ALL ROADS LEAD TO STANDARDIZATION

Reducing the number of different product variations we manufacture—the heart of the standardization concept—helps to streamline manufacturing processes. This creates benefits for DENSO in the form of lower capital investment in machinery and facilities, improved quality, and enhanced productivity. For our customers, it creates advantages such as smaller, lighter, and more functional components, and the opportunity to modularize parts and save costs.

DENSO is also developing individual components that simultaneously meet the needs of multiple customers—creating interchangeability across a wide range of car platforms. This is achieved by carrying out extensive consultations at the planning stages. Meanwhile, as long as cars in the aftermarket continue to use DENSO components, no matter how few, we have a duty to continue to supply these components. Standardizing existing components for this aftermarket will generate significant cost savings. Based on these ideas, we are broadening the scope of standardization throughout the manufacturing process, from R&D to production; and already seeing the benefits.

One example is the standardization of instrument cluster movements, devices that convert speed and other data into readable form on the dashboard. By moving to a stepper motor with a drive torque 200 times greater than conventional motors, we have succeeded in reducing the types of movements we produce from 118 to just 1. Cost per unit has been cut, while component weight has been reduced by half and accuracy boosted fivefold. This standardized instrument cluster movement entered mass production in November 2001. Another example is our high-pressure supply pump for the 1,800-bar diesel common rail system. The supply pump has an outer cam structure, which allows us to manufacture two types to cover a wide range of engine displacements in both two-cylinder and three-cylinder configurations. This range of pumps also uses an electromagnetic suction valve, as opposed to two valves in the past, for inlet-metering, further reducing the cost per unit. Using aluminum for pump housing sections not under high pressure has generated weight savings.

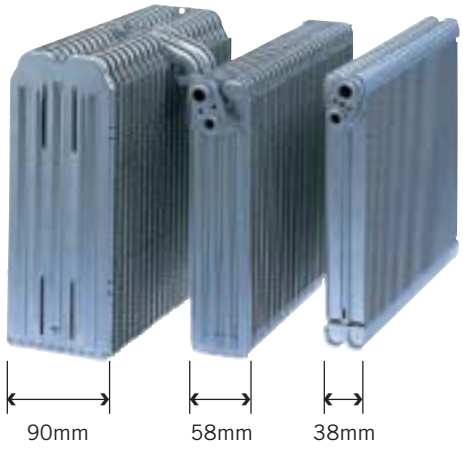
SMALLER, LIGHTER, MORE FUNCTIONAL

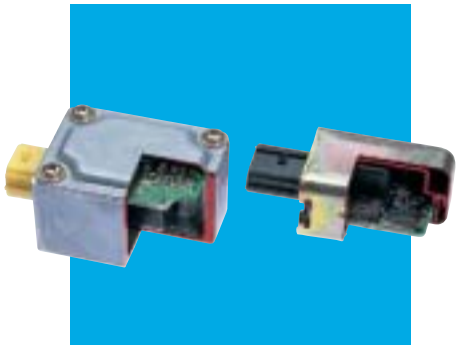
These watchwords are at the heart of our drive to add more value to DENSO products. Making compact, lightweight components incorporating cutting-edge technologies is not new to us. But with ever-tougher demands from automobile manufacturers and increasing component standardization, further progress in this area is vital.

Evaporators used in air conditioners is one product category where we are making headway: We have progressively reduced the core width of our evaporators, from 90mm a decade ago to 58mm today, by redesigning refrigerant pathways and adopting inner fins in evaporator tubes. Our latest product, slated to go into full-scale production in the summer of 2002, is even slimmer, at 38mm, thanks to finer fins and tubes that generate improvements in heat transfer efficiency.

THINNER EVAPORATORS

We have progressively reduced the core width of our evaporators by almost two thirds.





SMALLER SIDE IMPACT SENSORS (SIS)

Our latest side impact sensors (right) are over 50% smaller than previous models (left).

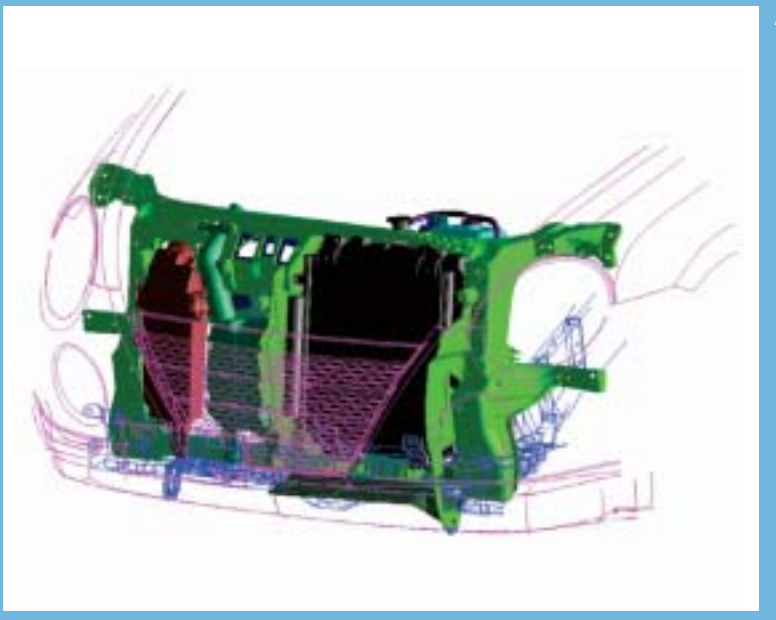
This yields reductions in manufacturing costs and on-board volume. In other product categories, our latest side impact sensors (SIS) for airbag sensing systems, which went into production in June 2001, are less expensive and over 50% smaller than previous components.

Meanwhile, our most recent electronic throttle body, which controls engine intake air in accordance with travel in the accelerator pedal, is another example of our drive to make components smaller, lighter, and more functional. This latest component is the first in the industry to adopt a built-in non-contact sensor using a Hall IC to detect valve steps. This increases the functional life of the throttle body twofold. The integrated design also means it is 20% smaller and lighter than previous models, while internal parts have been reduced to a minimum. The electronic throttle body went into production in July 2001.

ENHANCING COMPONENT VALUE: MODULARIZATION

At DENSO, we approach modularization from two angles: as a way of combining the functions of two or more components into a single module, and as an integral part of our efforts to make components smaller, lighter, and more functional. With DENSO's all-round strengths across a wide range of automobile components, it is an area where we can excel. Modularization is also a boon to automobile manufacturers, who can realize enormous efficiency savings on assembly lines and enhance competitiveness.

In 2001, we developed an integrated air/fuel module, launching it in overseas markets in September 2001 and in Japan in June 2002. The configuration for the Japanese market integrates eleven components in one compact unit including an air cleaner, variable intake control system, air flow meter, electronic throttle body, intake manifold, injectors, and an engine ECU. Combining these components in one unit allowed us to design an integrated air intake system covering the entire



A DENSO FRONT-END MODULE

process—from the air inlets to the cylinder head ports. This leads to lower air intake noise levels, and improved engine performance. Integrating the engine ECU also removed the need for a separate ECU case and reduced the volume of wiring.

In May 2002, we launched an advanced front-end module. This integrates a radiator, condenser, electric fan, engine inter-cooler, and front-frame carrier into one unit for installation in the front of the vehicle. Using new materials for the carrier and redesigning the separate components as one unit, produced weight-savings of around 30% and improved thermal efficiency in the condenser, radiator, and inter-cooler components.

DECCS: FOR A BETTER DESIGN PROCESS

Changing the way automobile components are designed can play a major role in reducing manufacturing costs, by significantly shortening development cycle times. To this end, we have been introducing the DENSO Engineering Core Computing System (DECCS) at design divisions, since 1997. This system allows us to take advantage of 3D design and virtual prototyping capabilities such as model analysis and testing in a virtual environment. In October 2001, we started introducing the DECCS mass production drawing issuance system at manufacturing divisions, completing its rollout in June of this year. The issuance system enables the rapid distribution of accurate design information, including 3D data, thereby saving time in the manufacturing process. Using DECCS in the early development stages will allow production engineers to step into the design engineer's shoes and make suggestions for changes to component design. We have great hopes for DECCS, not only as a way of reducing development cycle times, but also as a means of improving quality.