

# Product and Service Reliability and Innovation

## Ideal Status in 2020

Providing eco-friendly products and services founded on high quality and safety

## Priorities

- Ensuring product quality based on thorough customer orientation
- Efforts to alleviate and adapt to climate change
- Development of human resources with technical expertise

## Reasons for being Priority Issues

In order to enrich society by creating excitement and surprise with our products that exceed customer expectations, the Toyo Tires Group has positioned as priority issues both resolving environmental and social issues through our products and services and training human resources who can continue to respond to changes in the business environment and the customer needs.

## Policies

The Toyo Tires Group states as its manufacturing principle that we will “strive for the highest level of quality, safety, and societal benefits in our products and services” and we will ascertain changes in market trends and customer needs in an accurate and timely manner, and promote product development through unique ideas and a drive to take on new challenges not influenced by conventional wisdom. At the research and development stage, we will support a precautionary approach towards environmental issues, and continue to develop products and services that reduce, prevent, and minimize the negative impact on the environment.

As for product quality and safety, we operate a quality management system based on ISO9001 and ISO/TS16949 and have established risk countermeasures through foreseeing and predicting. Furthermore, our fundamental philosophy and action guidelines regarding product safety is clearly defined in the “Toyo Product Safety Charter.”

## Management Approach

### Goals

As a quality improvement Goal, we perform quality risk analysis (quality planning and quality design) for each value chain and are sure to reflect that in each project. And we work to ascertain the state of their quality with a constant awareness of customer satisfaction by referring customer opinions of our products and services.

Through the collaboration between the Production, Sales, Engineering, and other departments, we will work to make improvements to provide even higher quality products. We also push forward with efforts to improve current issues from various perspectives through personnel exchanges with all Group companies.

We will improve fuel efficiency, wear resistance, and safety in all product development activities, which are our goals in solving environmental and social issues through our products and services. We will also promote human resource training and personnel exchanges (research and technology), which support these technological innovations.

### Responsibilities

**R&D:** Corporate Officer of R&D Headquarters  
**Production Engineering:** Corporate Officer of Fundamental Production Engineering Headquarters  
**Provision of products and services:** Corporate Officer of Sales Headquarters  
**Quality Assurance:** Corporate Officer of Quality Assurance, Environment & Safety Headquarters

### Activity Promotion System



### Quality Assurance



## Quality Assurance Efforts

### Improving the Quality of the Development Process

While considering it important to achieve greater quality in the upstream business processes for manufacturing, we aim to raise the quality not only of products and services that we introduce to the market but also the development process itself.

For new products that we develop, our Quality Assurance Department checks the design reviews that are performed at every stage, from product planning stage to production planning stage. This is to ensure that quality is designed into our products and production processes.

### Responding to the Quality Standards of Each Country

Against the background of, for example, climate change and expanding demand for mobility resulting from population increase in emerging countries and economic expansion, more and more countries and regions are introducing new laws and systems relating to performance and quality for improving fuel efficiency of automobiles and reducing of CO<sub>2</sub> emissions from automobiles.

#### Examples of efforts to respond to quality standards

- ◎ Collecting information locally
- ◎ Making recommendations by participating in industry organizations
- ◎ Exchanging opinions with regulatory institutions
- ◎ Distribute information on the latest legal and regulatory trends
- ◎ Giving presentations related on legal and regulatory matters

## Maintaining and Improving Quality and Customer Satisfaction

We understand that we are linked to customers and society through our products and services, and we will strive every day to maintain and improve product quality at our production sites. We are also conscious of efforts to improve our “quality as a company” at all workplaces and we are working to provide the “customer first” products and services. We continually conduct product satisfaction surveys in markets and feedback customer requests to the design and production sites.

Every time our customers contact us with an inquiry or a complaint, we consider this as an opportunity to gain an understanding of the expectations of the Group and to improve our products and services.

The total number of inquiries received by the Customer Relations Department in Japan in fiscal 2017 was 2,448. For inquiries and requests received by phone or on our website, the Customer Relations Department staff provide a “clear and accurate” explanation so that customers can gain a full understanding of the issue.

When receiving an inquiry about a tire, the staff first ask the customer to provide as much information as possible and explain about how to “properly use our products”, for example, the optimum air pressure for the tires when to change tires and the storage method of the tires. Our staff also suggest the best tires for customers’ vehicles or the desired performance.

We want our customers to shop for our products with ease, confidence, and satisfaction. So, we are working hard to improve the level of service provided by sales associates and receptionists at our tire sales subsidiaries.

For example, Toyo Tire Japan Co., Ltd. and independent distributors in Japan, conduct work-specific training to train human resources so that they possess the required level of service quality for their respective work types (sales, reception, engineering).

## TOPICS

### QC Circle Activities, the Source of Sustainable Growth

For more than 50 years, the Group has undertaken QC circle activities to take the initiative to raise the level of quality management using what we have learned from a front-line perspective. In fiscal 2017, there are now around 300 circles across all facilities. A “company-wide QC Circle Conference” is held every year so that employees can share their experiences and achievements and to learn from one another. More than 70 people from 10 facilities throughout Japan participated in the conference in fiscal 2017, and 12 circles gave presentations on their quality improvement activities.



Fiscal 2017 company-wide QC Circle Conference



# Improving the Environment and the Society through our Products

## Tire Technology

The Toyo Tires Group conduct research and development on structural design, material design, and analytic & production technologies in order to develop new generation of tire technologies.

We are working closely with universities and public research institutes on reducing environmental impact, improving performance, and developing new systems.

### Proprietary Technology

#### ◎Nano Balance Technology

Platform technology for material design. We will work to optimize operations so that we can achieve the required level by conducting R&D activities through the integration of the four nano-level systems of "research, analysis, material design, and processing."

#### ◎T-mode

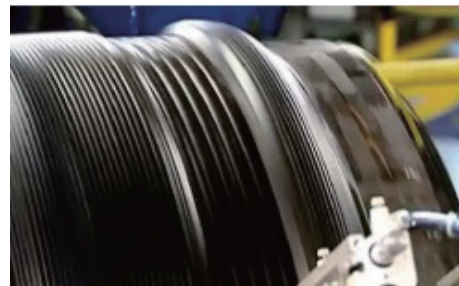
Integrating general tire simulations that analyze tire movement and structure with driving simulations, which analyzes car movements, makes it possible to design tires to match the car type and use.

#### ◎e-balance

This is platform technology for truck and bus tires that enable an increase in important basic tire performance related to wear resistance, uneven wear resistance, fuel efficiency, and durability.

#### ◎A.T.O.M. (Advanced Tire Operation Module)

This makes it possible for us to produce tires with superior precision, quality, and unique design needed for large tires. As of 2017, the technology has been introduced at the Sendai Plant in Japan and overseas at Toyo Tire North America Manufacturing Inc. (TNA), Toyo Tyre Malaysia Sdn Bhd (TTM) in Malaysia, and Toyo Tyre Zhangjiagang Co., Ltd. (TTZ) in China.



A.T.O.M.'s molding drum



Sidewall design produced with A.T.O.M.

## TOPICS

### Published "noair" Airless Tires

The paradigm shift in the mobility society, such as greater use of electric vehicles (EV), autonomous driving technology, and car sharing, is expected to reduce opportunities for automotive tire maintenance.

In September 2017, we became the first company in the industry to hold a technological announcement regarding the new tires "noair", non-pneumatic tires that can actually be mounted on passenger cars and driven at high speeds.

With "noair", there is no need to worry about flat tires and there is no need to carry a spare tire. This leads to reducing the weight of cars and increasing fuel efficiency. In addition, through proprietary technology such as the X-shaped spokes

made from a special resin and adopting fuel efficient rubber tread developed using Nano Balance Technology, these tires have lower rolling resistance compared to conventional tires.

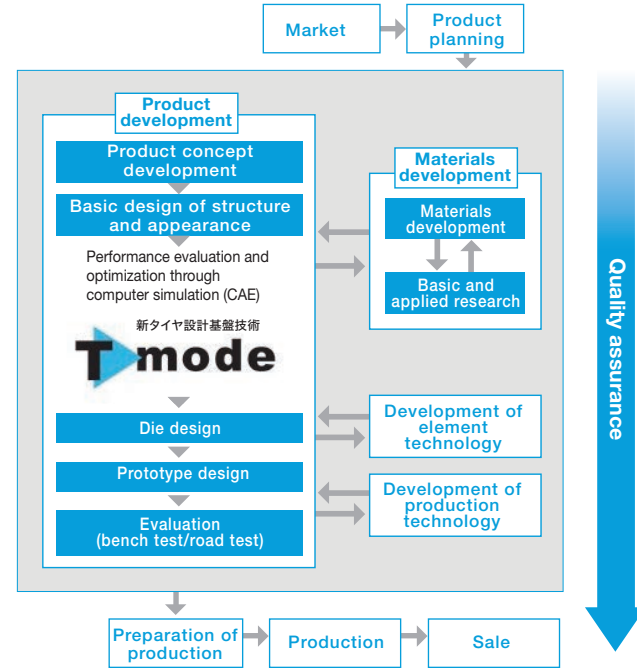


"noair"



"noair" mounted on a vehicle  
\* The vehicle is the FOMM1.0, an EV by FOMM Corporation

### Tire development process flow chart



### Improving Tire Performance

With increased the risk of climate change and abnormal weather, there are demands for better tire performance, such as greater fuel efficiency, wear resistance, and wet braking performance, to reduce or adapt to those risks. We are continuing to research and develop products that meet the needs of society, centered on our proprietary Nano Balance Technology.

As a result, tires launched in fiscal 2017 provide greater performance, including fuel efficiency, wear resistance, and wet performance than previous tires.

## TOPICS

### Three Tire Products Win 2017 Good Design Award

Three of our new tire product types launched in fiscal 2017 were won the Good Design Award. This makes it the seventh consecutive year that our tires have received the award.

The award-winning products were the new OPENCOUNTRY A/T plus sport utility vehicle (SUV) tires launched in March 2017, the Winter TRANSPATH TX studless tires for high-roof SUV and minivans launched in August 2017 (both TOYO TIRES brand), and the NT421Q SUV tires (NITTO brand) with superior fuel efficiency launched in February 2017. This is also the first time that a NITTO brand tire was presented with the award.



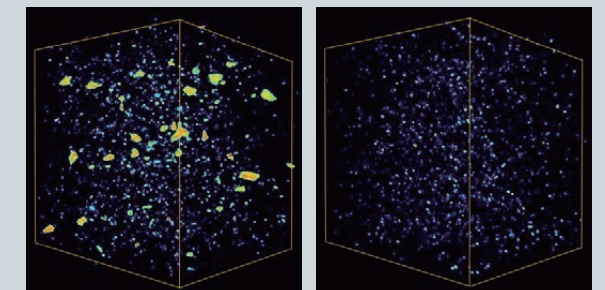
\*OPEN COUNTRY A/T plus suits ECE R117-2 international standards, and NT421Q suits a grade of "A" for rolling resistance and "b" for wet grip under the Japanese tire labeling system.

### Creating a Development Process that Dramatically Reduces Fuel Consumption for Truck and Bus Tires

Transportation, a part of the social infrastructure, is currently faced with the need to tackle issues such as compliance with environmental regulations and improving transport efficiency. Under such circumstances, improving the wear performance and fuel efficiency of tires for trucks and buses used on transport vehicles is expected to be one way of solving these problems.

With the goal of developing "high performance truck and bus tires" that meet these demands of society, we leveraged our Nano Balance Technology to establish a new development process that dramatically reduces fuel consumption while maintaining high wear performance.

We plan to commercialize these technologies through development and production of new tires for trucks and buses in 2018.



Particle dispersion state of filler  
(left: conventional process/right: new process)



### Automotive Parts Technology

In order to respond to diversification of where cars are sold throughout the world, we are moving forward with efforts to develop automobile anti-vibration rubber parts that also possess cold resistance and high durability in addition to conventional products that focus on heat resistance.

For leading technology development, we are moving forward with development based on increasing performance while reducing weight and aiming to apply these to next-generation vehicles. As for analysis technology, we are working to create the most optimal designs in terms of low weight and reduced costs by increasing the sophistication of our analysis system, including seeking a correlation between actual car performance and equipment evaluations.



Our air suspension for commercial vehicles

### Training Human Resources with Technical Expertise

With an eye toward a future in which the market environment is projected to be dramatically different due to the mobility revolution, the Toyo Tires Group is focusing its efforts on training professionals who can transform difficulties and crises into opportunities for sustainable growth. Human resource training supports technological innovation, the backbone of our Group, and we will engage in education and training that focuses on basic knowledge education, exchanges with parties outside the company, and passing on technology.

For example, Toyo Tire & Rubber Co., Ltd. aims to train human resources with “problem-solving skills and innovative capabilities” based on thinking oriented toward customer needs as well as “logical thinking and facilitation capabilities,” which are important abilities.

In fiscal 2017, the technology headquarters responsible for our tire development conducted about 115 hours of education and training for tire technicians who joined the company less than five years previous in order to advance the skills of young employees. As for the results of these education and training activities, a check is made using post-class tests to ensure that the target level is achieved.

## TOPICS

### Joint Development of Suspension Module for EVs Launched with GLM

The development of EVs has accelerated, with many different automobile manufacturers mapping out their own mass production plans in quick succession. In order to meet the demand of a future mobility society, the Toyo Tires Group has concluded an agreement with EV manufacturer GLM Co., Ltd. to jointly develop suspension modules for EVs.

The primary parts being promoted for development by the companies are “active air suspension<sup>\*1</sup> to ensure a smooth flat ride<sup>\*2</sup>.” We are aiming for commercialization before the end of 2020.

We aim to become a supplier that can propose greatly added value.

<sup>\*1</sup> Suspension that electronically dampens vibrations in vehicles  
<sup>\*2</sup> Ensures a comfortable ride by damping juddering or vibrations with automatic control of the vehicle’s shock absorbers to best suit the road conditions

## TOPICS

### Holding of the 7th Company-wide Technology Development Presentation

We hold a company-wide technology development presentation as a venue to present the Company’s cutting-edge technology-related efforts and their results to management.

For fiscal 2017, there were six entries. Three awards, including the Outstanding Technological Development Award, were presented after evaluating the entries based on five perspectives (originality, logicity, future prospects, development speed, and presentation content).

#### The 2017 awards

■ **Outstanding Technological Development Award:** Leading Development of Automotive Parts for EVs

■ **Unique Award:** Development of New Tire Production Methods

■ **Surprise Award:** Development of Polymers That Adapt to Changes in the Mobility Environment



The 7th Company-wide Technology Development Presentation

## Priority Theme 2

# Contribution to the Global Environment

### Ideal Status in 2020

Promoting environmental management on a Group-wide basis

### Priorities

- Efforts to alleviate and adapt to climate change
- Efforts to reduce water risk
- Resource recycling efforts

### Reasons for being Priority Issues

The Toyo Tires Group is actively engaged in efforts to reduce, prevent, and minimize its negative impact on society, which is growing as the scale of the Group’s business increases. In particular, environmental issues such as alleviating and adapting to climate change, reducing water risk, and resource recycling are considered likely to arise and have a major impact on society as our Group continues to conduct business into the future. So, these issues are positioned as priority issues to achieve our sustainability.

### Policies

In the Toyo Global Environmental Charter, we clearly indicate our fundamental philosophy and action guidelines for promoting environmentally conscious behaviors and activities.

Furthermore, we support international norms such as the United Nations Rio Declaration on Environment and Development and Agenda 21 and have quickly established countermeasures for environmental issues based on a precautionary approach, including risk assessments, in order to fulfill our environmental responsibilities.

We respond to organization issues by operating ISO14001-based environmental management system, and disclose the environmental performance of our corporate activities in our CSR report.

## Management Approach

### Goals

For our activities within Japan, we have also formulated the Toyo Global Environmental Action Plan, the target year of which is 2020. We create annual activity plans, set objectives, and manage efforts to achieve this plan. Furthermore, we translate the activity plan and objectives into English each year and share it with each overseas business site.

As for global warming countermeasures, since the adoption of the Paris Agreement in 2015, countries throughout the world have set greenhouse gas reduction targets and compiled measures that each entity should undertake as global warming countermeasure plans. We are also moving forward with a review of our medium- and long-term targets taking into consideration laws, ordinances, regulatory standards, and plan targets for countries and regions in which the Group conducts business.

### The FY2018 Policy (Excerpt) <sup>\*Domestic</sup>

#### Response to Climate Change

##### ● Energy Conservation

**Targets** Reduce energy consumption per unit of production by an average of at least 1% per year on a medium- to long-term basis.

##### ● Preventing Global Warming

**Targets** Reduce CO<sub>2</sub> emissions intensity per unit of production by 15% compared to fiscal 2005 by the end of fiscal 2020.

#### Efforts to Reduce Water Risk

**Targets** Set voluntary targets at each site

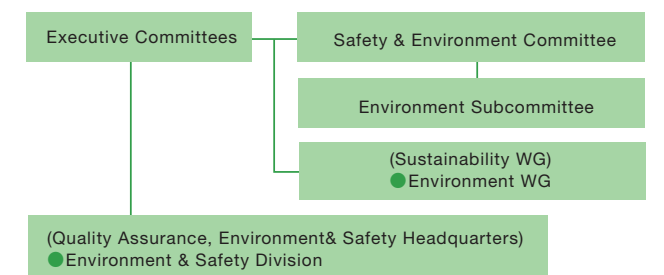
#### Resource Recycling Efforts

**Targets** Achieve a 100% recycling rate by the end of fiscal 2020 and maintain it thereafter.

### Responsibilities

Corporate Officer of Quality Assurance, Environment & Safety Headquarters

### Activity Promotion System <sup>\*Domestic</sup>



<sup>\*Overseas (at affiliated companies), the environmental manager of each company promotes activities based on the group policy examined and established by the Sustainability Promotion WG.</sup>