

Special Feature

Helping transform the mobility industry by strengthening our presence in the OHT business

The off-highway tire (OHT) market is expected to grow in the future amid increased food production and the growth of logistics driven by economic development in global markets. In May 2023, the Yokohama Rubber Group acquired all shares of Trelleborg Wheel Systems Holding AB (TWS), turning it into a wholly owned subsidiary, with the aim of expanding earnings in the OHT business, which is expected to generate consistently high profits. Yokohama will make full use of TWS's advanced technological capabilities in the OHT market to tap into greater growth.

Current market situation for commercial tires and our challenges

Considering the global tire market, the ratio of consumer tires to commercial tires is around 1:1, within a market scale of around ¥20 trillion. As CASE, MaaS, and DX become more widespread in the future, the number of privately owned cars is expected to decrease, while the number of infrastructure vehicles that support the movement of people and goods is expected to increase. The Yokohama Rubber Group has positioned the OHT business, which offers consistently high profits among commercial tires, as a growth driver and is focusing on business expansion.

The global OHT market was valued at \$30 billion in 2022 and is expected to grow at a compound annual growth rate (CAGR) of 6% from 2023 to 2027, reaching \$40 billion by 2027. This is due to continuous and stable growth in North America, the largest market, as

well as the growing need for residential construction due to the rapid population growth and migration to large cities in the Asia-Pacific region, as well as the expected growth of agricultural and mining industries worldwide.

With the acquisition of Trelleborg Wheel Systems Holding AB (TWS), the Yokohama Rubber Group aims to achieve sustainable growth by seizing growth opportunities and solving social issues, while optimizing its sales ratio of consumer tires and commercial tires from 2:1 currently to 1:1, in line with the global market.

TWS: Leading manufacturer of tires for agricultural machinery and industrial vehicles

TWS, headquartered in Tivoli, Italy, is a leading manufacturer of tires

After TWS joins: OHT product portfolio

										
		Agriculture	Construction	Earthmover and Mining	Forestry	Lawn Garden & Turf	Material Handling	Truck (off highway)	Two wheelers	Rims
Tier 1			✓	✓			✓	✓		
										
		✓	✓	✓	✓	✓	✓	✓		
Tier 3										
After TWS joins: OHT product portfolio										
Tier 1		✓	✓	✓	✓	✓	✓	✓		✓
										
Tier 2		✓	✓	✓	✓	✓	✓		✓	
										
Tier 3		✓	✓	✓	✓	✓	✓	✓		
										



for agricultural and industrial machinery with a history spanning more than 110 years, as it began producing tires in 1909. Approximately 60% of its products are for agricultural machinery, about 20% for industrial vehicles, and the rest for construction vehicles and motorcycles. TWS boasts world-class product strengths, brand power, technical prowess, and service capabilities in agricultural machinery and industrial vehicles. In fiscal 2022, the company's net sales totaled 13,277 million Swedish kronor (approximately ¥172.5 billion), and over the past decade, its net sales and EBIT have more than tripled.

Strengthening the Yokohama Rubber Group's ability to help transform the mobility industry through the acquisition of TWS

Expanding product portfolio

The acquisition of TWS renders the brand lineup of tires for agricultural machinery and construction vehicles complete in all categories, from basic to standard and premium. This enables the Yokohama Rubber Group to better respond to sales channels and increase its resilience to economic fluctuations.

Global network covering major markets

TWS has 14 production bases in nine countries: in Europe in Italy, the Czech Republic (3 bases), Latvia, Serbia, Slovenia; in North America in the United States (2 bases); in South America (Brazil); in Asia (China (2 bases), and Sri Lanka (2 bases)), with Europe accounting for about 60% of the company's sales. By adding TWS's strengths in Europe to the Group's strengths in Japan, North America and Asia, the Yokohama Rubber Group will be able to build a global network that covers major markets, and anticipates greater growth.

In terms of services, Yokohama Rubber will expand TWS's proprietary tire maintenance services for industrial vehicle tires currently offered at 83 bases in 21 countries around the world to include tires for agricultural machinery and construction vehicles.

Use of DX

TWS is developing remote monitoring systems for air pressure and tire temperature, similarly to Yokohama Rubber. Its Adaptive Tire Management System (ATMS) improves agricultural productivity by detecting working conditions such as load, pressure, and temperature in real time and constantly suggesting the optimal tractor vehicle settings. Its Tire Pressure Management System (TPMS) developed for construction and port vehicles constantly monitors air pressure and temperature to improve operational efficiency and ensure operator safety. The combination of TWS's and Yokohama Rubber's DX knowledge will promote the provision of more convenient and efficient services.



ATMS: Real-time tire data for ultimate tractor performance



TPMS: Digital tool for construction/port vehicles

Future issues and responses

Going forward, the Yokohama Rubber Group will need to maximize synergies from the TWS acquisition, and it is now implementing a PMI program toward this end. Specifically, utilizing the bases of both companies, the Group will work to further grow the OHT business by combining its strengths with TWS's in all areas, such as building optimal production, sales, service, and quality assurance systems that meet the needs of each region, combining our R&D knowledge to create new tire products and services, and strengthening sustainability initiatives such as utilizing sustainable materials.

Research & Development

Yokohama Rubber is working to develop high-quality tires using innovative technologies based on changing needs. While pursuing performance improvements such as durability, safety, and fuel efficiency, we test and evaluate the behavior and performance of tires under various conditions in Japan and overseas. We are also focusing on research into the use of sustainable materials, weight reduction, and recycling technologies, and are promoting the manufacture of environmentally friendly products. The results of our R&D lead to improved tire performance and reduced environmental impact, contributing to the safety and sustainability of the automotive industry as a whole.

Relevant material issues	Initiatives
 Products	<ul style="list-style-type: none"> • Manufacturing and selling tires and industrial materials with advanced safety, quality and environmental performance • Manufacturing and selling carbon neutral products • Developing products and services utilizing AI and IoT (wear detection, road surface detection, tire management and damage prediction) • Manufacturing and selling tires for industrial and construction vehicles supporting social infrastructure and tires for agricultural and forestry machinery supporting natural capital
 The Earth	<ul style="list-style-type: none"> • Achieve carbon neutrality of our own activities by 2050 • Achieve 100% usage of sustainable raw materials by 2050

Basic Policy on Research & Development

The Yokohama Rubber Group's research and development involves taking on challenges on the forefront of global technology and providing pioneering, world-first products to the market. On our frontline of research and development, we engage in multi-faceted and comprehensive research and development activities from material development to product design, testing and evaluation along the themes of

ingenuity, application and greater sophistication of technologies, and pursue the possibilities of various technologies and products, including rubber polymer technologies. In addition, outside the field of tires, we use innovative ideas unconstrained by conventional thinking and cutting-edge technologies to pursue the development of new materials and the design of products with a view toward the next generation.

Research & Development Promotion System

Under the idea of "local production for local consumption," Yokohama Rubber is strengthening tire research and development activities in regions close to major markets in Japan and overseas. Utilizing our global R&D system close to consumer areas, such as the Tire Test Center of Asia in Thailand, the Yokohama China Technical Center in China, and the Yokohama Development Center America in North Carolina, United States, we are able to quickly launch new products suitable for each market.



Evaluating Tires Around the World to Guarantee Performance

In order to verify tire performance, we have set up test courses in consumer areas in Japan and overseas to utilize information on the actual local climate and environment in our products, and are earnestly working on research from all angles such as safety, drivability, and comfort. The enormous amount of data obtained from driving tests at Yokohama Rubber's comprehensive tire test courses at the Daigo Proving-ground and Research Center (D-PARC, Ibaraki) and the Tire Test Center of Asia (Thailand), the Nürburgring Test Center (Germany) and winter tire test courses at the Hokkaido Tire Test Center and Yokohama Test Center of Sweden is sent instantly to the

Research and Development Integrated Center (RADIC) at the Hiratsuka Factory in Hiratsuka City, Kanagawa Prefecture, where it is used to improve tire performance and develop next-generation tires.



Comprehensive tire test course at D-PARC (Ibaraki Prefecture)



Winter tire test course at Yokohama Test Center of Sweden

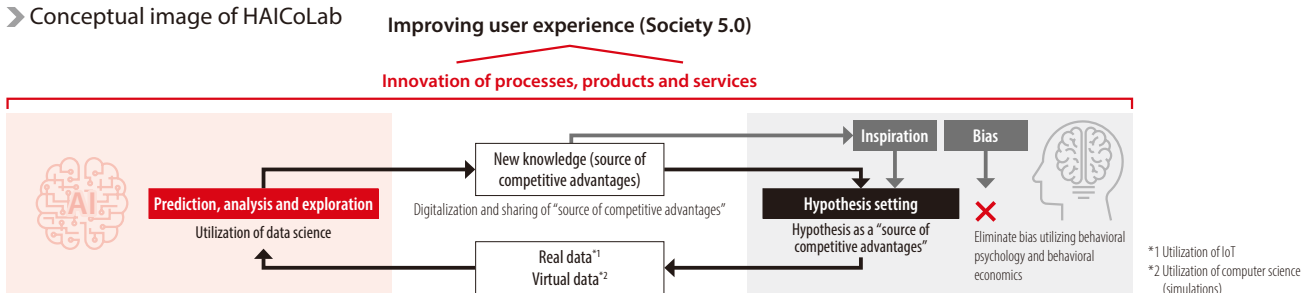
HAICoLab* AI-powered data utilization framework

For more than a decade, Yokohama Rubber has been developing technologies to apply computer science and machine learning to the development of materials. The HAICoLab, which came on line in 2020, is our proprietary AI-powered data utilization framework that combines simulation technologies and AI technologies and also focuses on human characteristics. We aim to promote new discoveries through “human-specific inspiration” and “creativity” and

“collaboration between the enormous data processing capabilities that AI excels at” aimed at non-continuous and radical innovation. The new knowledge gained by generating and collecting virtual data from real data and simulations, and predicting, analyzing, and searching with AI is being utilized for innovation in tire technology development.

*A coined term based on “Humans and AI collaborate for digital innovation.”

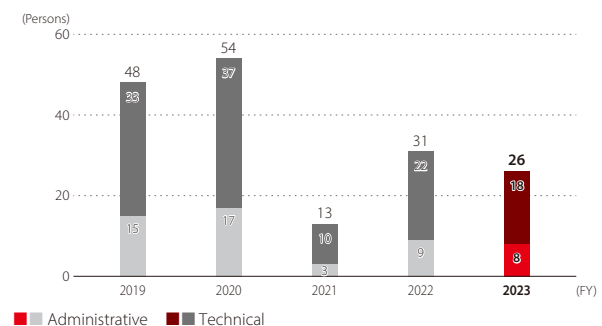
Conceptual image of HAICoLab



Securing and Developing Talent in Development

Yokohama Rubber strives to secure human resources stably in technology development as core human resources to maintain our strengths of high technology and innovation. In the recruitment of new graduates, we maintain strong cooperation with universities to ensure stable recruitment every year. We also hire a wide range of mid-career employees. Of the number of new graduates hired in fiscal 2023, 18 were technical personnel, while six of the mid-career hires during the year were also technical personnel. In addition, the Yokohama Techno Forum (YTF), which is held as an opportunity to share knowledge and raise awareness of internal technology research, was held 38 times in 2022.

New graduate recruitment



Intellectual Property

Intellectual property activities are an important investment in the protection and development of our business. We are conducting intellectual property activities to strengthen high value-added products, carbon neutrality, and circular economy, among others, which are covered under the policy of YX2023. In addition, we promptly reflect the status and direction of our business in activities such as the acquisition and utilization of rights such as patents, designs, and



trademarks, and efficiently and proactively carry out activities such as the acquisition of rights in cooperation with business departments. As a result, the number of domestic and overseas patent rights held during the previous management plan (GD2020) increased by more than 10%. At least once a year, we report on the status of intellectual property strategies and activities at meetings attended by members of executive management with technical expertise.

Future Issues and Measures

At Yokohama Rubber, one of our challenges is to make more effective use of the vast amount of research and development data (actual product and lab sample test results, simulation results, manufacturing and processing conditions, etc.) that we have accumulated

to date. This is an area that we are now working to address. In the future, we will develop a foundation that makes it easier for engineers to use this data, leading to the improvement of individual skills, new awareness, and quantification of tacit knowledge (skill transfer).

Production & Quality

Related material issues	Initiatives
 Products	<ul style="list-style-type: none"> • Manufacture and sell tires and industrial materials with advanced safety, quality and environmental performance • Manufacture and sell carbon neutral products • Develop products and services utilizing AI and IoT (wear detection, road surface detection, tire management and damage prediction) • Manufacture and sell tires for industrial and construction vehicles supporting social infrastructure and tires for agricultural and forestry machinery supporting natural capital
 The Earth	<ul style="list-style-type: none"> • Achieve carbon neutrality of our own activities by 2050 • Achieve 100% usage of sustainable materials by 2050

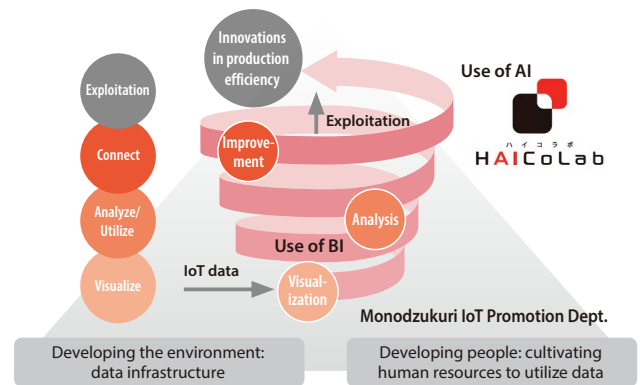
Production Initiatives

Building a production and logistics structure that is resilient to environmental changes and fluctuating orders

In order to supply good quality products at a low price in a timely manner to customers around the world, Yokohama Rubber conducts manufacturing at its global production bases with the latest technology and thorough quality management. As it is a fundamental policy in YX2023 to raise the high-value-added tire sales ratio, we strive to push forward with our strengths in high-mix low-volume production systems, and enhance production efficiency through the utilization of digital technology, such as IoT and AI, and Jidouka (autonomation).

Yokohama Rubber also puts efforts into creating an environmentally friendly production system. In fiscal 2022, efforts were implemented to achieve carbon neutrality at the Shinshiro-Minami Plant, which serves as a model plant. All production bases in Japan have achieved complete zero emissions by reducing the amount of landfill disposal of industrial waste to zero. Going forward, we plan to implement IT-based initiatives in overseas locations as well as strive to achieve a circular economy.

Developing Infrastructure for the Utilization of Manufacturing Data and Fostering a Data-Driven Culture



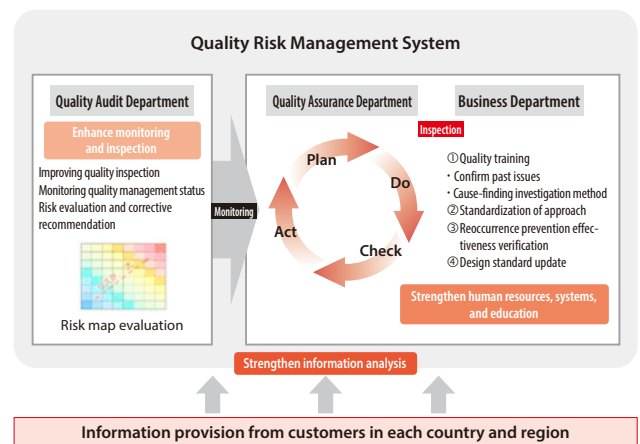
Quality Initiatives

Quality management system

Yokohama Rubber places the safety of customers as a top priority. We have developed our own risk map to ensure prompt, legal, and appropriate internal processes are carried out in business, quality assurance, and service departments, which are overseen and monitored by the Quality Audit Department.

We conduct quantitative categorization of potential risks following the quality management system (QMS) and embrace proactive safety design approach based on FMEA* to establish a structure that prevents the reoccurrence of similar quality issues. Moreover, we conduct internal quality training as well as encourage managers and supervisors to acquire the certification of internal quality auditor. In fiscal 2022, three employees obtained their certification (total 147 certified to date).



We appoint experienced engineers at sales subsidiaries and sales locations in the domestic and overseas markets to systematically host internal training on product knowledge and handling.



* Failure Mode and Effect Analysis (FMEA): A method of systematically analyzing potential failures for the purpose of failure/defect prevention.

Motorsports Activities

For 60 years, since the Company began supplying tires to motorsports in Japan in 1963, Yokohama Rubber has participated in a wide range of motorsports in Japan and abroad, including races and rallies. By utilizing the advanced technical capabilities and knowledge cultivated in the field of motorsports, where extreme driving is required, in the development of tires for passenger cars, we are creating high-performance tires with excellent safety and quietness levels, and reduced environmental impacts while offering an exhilarating driving experience.

Relevant material issues	Initiatives
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 The Earth	<ul style="list-style-type: none"> • Achieve carbon neutrality of our own activities by 2050 • Achieve 100% utilization rate of sustainable raw materials by 2050

Yokohama Rubber’s Commitment to Motorsports

Yokohama Rubber supplies tires to a wide range of motorsports in Japan and abroad, from the top category to the grassroots category. Motorsports is a grand testing ground for tire development, and the technology cultivated through competition is fed back to our development of high-performance, high-quality new passenger car and

aftermarket tires. In addition to reducing the rolling resistance and improving the quietness and safety of tires, which results in the reduction of CO₂ emissions from passenger cars, we will fulfill our responsibilities as a tire manufacturer by pursuing “exhilarating driving experiences” as a form of added value.



Results in FY2022

GT300 Class Series Champion

A car using Yokohama Rubber’s global flagship tire brand ADVAN won the series championship for the first time in two years in the GT300 class of the 2022 SUPER GT, Japan’s highest level touring race. The ADVAN racing tires provided by Yokohama Rubber were a powerful ally in helping the car recapture the title thanks to excellent grip and handling stability.



this traditional hill climb race that has been held since 1916, our tires demonstrated our high level of technical ability to achieve stable driving even in harsh conditions.



Pikes Peak International Hill Climb Overall Champion

At the 100th Pikes Peak International Hill Climb, a car with ADVAN tires won the overall championship for the first time in two years. In

Asia Cross Country Rally Overall Champion

In the Asia Cross Country Rally 2022, a car with GEOLANDAR tires won the overall championship (4 of the 5 winning cars used GEOLANDAR). The tire’s high off-road performance has been proven in many races.



Future Issues and Measures

In response to growing environmental awareness in the motorsports industry, Yokohama Rubber is developing racing tires using renewable and recycled raw materials. In the All Japan Super Formula Championship, we began supplying dry tires that use approximately 33% of sustainable materials from 2023, and we are developing them to further increase the ratio of sustainable materials. In addition, in 2022, we participated in a harsh hill climb race in the United States

with tires made of sustainable materials, and are promoting the development of technologies to reduce the environmental impact through actual races. We will continue to develop racing tires using sustainable materials to further improve the environmental performance of tires for production vehicles and contribute to the development of sustainable motorsports.