Design & Materials of Tire
Establish chemicals management process and evaluation system
In observance of the increasingly enhanced management regulations on chemical substances both home and abroad, Hankook Tire has undertaken a project aimed at improving in-house chemicals management system. In 2017, our R&D, procurement, and chemicals-handling teams came together to establish a unique chemicals management system. Under the system, chemical substances go through pre-management process such as MSDS (Material Safety Data Sheet) and Self-Declaration before being stocked. Any substances subject to regulations during the pre-stage are screened for use against our ‘internal regulations’ to ensure that permissions for use are obtained as necessary. Substances are admitted to storage facilities only after they clear the second and third screening to make sure that no regulations are violated. We will take further improvement measures on any irregular process identified during the preemptive project.

Expand LCA to all worksites
Following the update of products subject to LCA starting with Geumsan Plant in 2012, we conducted the process evaluation on one selected type of PCR·TBR tires representing individual plants and produced in Chongqing Plant in 2017. Tires are most affected by environment when fitted to vehicles. The environmental impact from the products subject to LCA this time averaged 84.3%. We collaborate with plants to draw strategy for eco-friendly product development for the purpose of limiting environmental impact from product use. Additionally, we strive to enhance energy efficiency by comparing the past LCA data with plant-specific energy consumption data at each manufacturing stage. Hankook Tire develops and upgrades simplified tool for eco design products with environmental impact in mind from the designing stage while integrating eco design process into product development.

Use & disuse of tire
Expand the Use of Green Carbon and Reclaimed Rubber
End-of-life tires are recycled as oil, carbon, or steel through pyrolysis system. The raw materials from old tires are used to manufacture green carbon and reclaimed rubber which are then adopted for recycled tires. Hankook Tire applies green carbon and reclaimed rubber to produce major compounds. In 2017, we carried out a wide variety of researches on high purification of carbon, desulfurization process, processability, and manufacturing quality in order to increase performance and use of recycled materials. What’s more, we completed field evaluation and temporary production of the inner liner compound applied with recycled carbon and butyl. Recycled tires manufactured with compounds of green carbon and reclaimed rubber will soon be launched on the market.

Develop Energy-saving Curing Technology
Curing process in tire manufacturing involves high temperature and pressure to put patterns onto rubber tires. Hankook Tire is committed to developing curing technology to ensure efficient consumption of the heat energy released during the process while maintaining the quality. We strive to identify and standardize the optimal conditions for productivity maximization at our plants. To do so, we study temperature, pressure, and hours when the energy efficiency is highest. In 2017, we conducted researches on the optimal pressure and temperature for steam and N₂ gas for tire curing. Based on the results, we develop technology to obtain the best possible productivity and quality with minimal resources for each segment.

Discover New Materials and Develop Applied Technologies
Hankook Tire expands researches on the use of eco-friendly raw materials as well as eco-friendliness of products. In 2017, we proceeded with researches on how to improve the performance of compounds made of eco-friendly new materials such as natural oil and to ensure mass production processability. Furthermore, we conduct studies on the eco-friendliness of diverse renewable and recycling materials, including the application of polyketone made of CO to tire cords.

Develop Lightweight Tires
Lightweight tires make it possible to reduce raw material consumption and improve fuel efficiency. This is why we have been focusing on researching the structural optimization of respective tire component with the aim of developing lighter tires. This effort allowed us to reduce the weight of our passenger car tire K125 by 3.6% from its previous version with the same specifications. This technology is being adopted to overseas plants beyond the domestic plants. Our goal is to lighten the weight by a total of 7.2% through consistent R&D efforts by 2020.

Research on Tire Wear
To understand the impact of tire wear on generating fine dust, we commissioned TIP, ChemRisk, and WBCSD to analyze air quality in 81 areas with heavy traffic in three regions (America, Europe, and Asia) in association with 10 global tire makers. The results showed that the ratio of tire wear substance among atmospheric fine particles was 0.1~2.4% and detection density was 0.002㎍/㎥~0.67㎍/㎥ based on PM₁₀, the level that does not affect human body.

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<th>Worksites Subject to LCA</th>
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Eco-friendly Worksite Management

We overhaul our environmental facilities on a regular basis and research new environmental technologies with the aim of minimizing environmental impact from our business on local communities. We also established organizations dedicated to environment, safety, and health and obtained new certifications to build a firm environmental infrastructure.

Reduce Waste Amount

Hankook Tire has promoted the R-R (Reduction & Recycling) activity to boost resource recycling and reduction of waste amount. In 2017, we achieved waste disposal intensity of 38.01 kg/production ton on the back of proactive R-R activity, overfulfilling the target of 40 kg/production ton by 2020.

Advance Environmental Management

ISO14001:2015 New Certificate Renewal. Following the overhaul of the global environment management standard ISO14001, we revised related regulations and standards of Geumsan Plant and Daejeon Plant to new version. We conduct internal audits regarding relevant standards on a regular basis and have them verified by outside organizations to meet the needs of major car makers.

New Team on Global Environment/Health/Safety

In January of 2018, the Company organized a new team in charge of Global EHS in addition to EHS team at plants. Their missions include: planning environment projects at all Hankook Tire plants including 8 overseas plants; inspect activity status at individual plants; and disseminate latest problem-solving technology. We will ensure an environment and safety management that is much more systematic and advanced while laying the groundwork for eco-friendly production.

Miniaturize air environment impacts (odor/fine dust)

Built Additional Wet-scrubber Facilities. We installed one additional 1,800 m³/min-class Wet-scrubber to prevent odor in the calendaring Process in Daejeon Plant. Expanded installation of local ventilators has improved the internal precipitating environment. The odor factor at the terminal ventilation is constantly kept below 100 multiple (odor factor required to be kept at 500 multiple or lower by law).

Replacement ventilation system type to room type for mixing line. To prevent pollution sources from being released in mixing process, local ventilation equipment was replaced from enveloping hood to full-shield room type. The replacement work in Daejeon Plant was completed while Geumsan Plant is undergoing construction. This investment contributed to raising working environment and reinforcing purification effect of atmospheric pollutants.

Overhauled Mixer local ventilators. We conduct facility overhaul on a regular basis according to yearly plan for the purpose of ensuring the best-possible efficiency of odor prevention equipment of mixing process. In 2017, we completed the overhaul of #6, #8, and #14 mixers in Daejeon Plant, and local ventilation equipment and environment facility of #3 mixer in Geumsan Plant.

Sign a Self-initiated Agreement on Fine Dust Reduction

In June 2017, Daejeon Plant signed a self-initiated agreement on fine dust reduction with Daejeon City for the cleanest air. Under the agreement, Hankook Tire will replace diesel-engine vehicles in Daejeon Plant with electric vehicles to lower the concentration of ultra-fine dust to 18 μg/m³. We will also introduce new technology for fine dust reduction by controlling the release of environmental pollutants and operating optimal prevention system.

Conduct R&D activities for a new environmental facility (Multi Wet EP System). In our utmost effort to purify atmospheric pollutants released from manufacturing process, we endeavor to develop high-performance environment facilities. In 2017, we won the ‘Atmospheric Quality Improvement and Global Environment Response Technology’ project of the ‘Advancement Technology Development for Environment Industry Project’ hosted by the Ministry of Environment. We are now developing high-performance ‘Multi Wet EP System’ which is capable of simultaneously removing fine dust and odor. Test facility has been installed in Daejeon Plant. We plan to continue feasibility study for the purpose of introducing the system by 2018.
Continuously Improve Water Treatment Efficiency

**Improve Efficiency of Sewage & Wastewater Disposal Facility.** We operate Sewage & Wastewater Disposal Facility by establishing a strict set of internal standards in observance of the waste water discharge regulations as prescribed by environmental laws. Hankook Tire ensures efficiency in water treatment based upon systemic improvement plan. In 2017, sand filter was replaced in Daejeon Plant and latest activated carbon filters and sand filters were replaced in Geumsan Plant.

**Upgraded the TMS (Tele Monitoring System) Equipment.** Our Geumsan Plant operates the tele monitoring system to monitor water treatment status of the Sewage & Wastewater Disposal Facility, its own wastewater and sewage treatment facility, in real time. In 2017, the plant replaced SS (Suspended Solids) and pH measuring devices and upgraded subsidiary facilities such as communication equipment for better monitoring and maintenance of water quality.

Promote Co-prosperity with Local Communities

**Expanded the Operation of the Donggeurami Co-prosperity Council.** At our Daejeon Plant, the “Donggeurami Co-prosperity Council” has been running since 2016 to form mutually beneficial partnerships and address odor issues in surrounding areas. The council consists of representatives of local people, city council members, provincial members, Daejeon University, and environmental organization. The scope of local people was extended to Seokbong-dong beyond Moksang-dong since 2017. The plant strives for co-prosperity with local communities by jointly addressing local issues.

**CASE STUDY**

**HANKOOK TIRE Sustainable Research: E-Circle**

**Corporate Strategy**

It is a fundamental responsibility for a company to minimize environmental impacts from businesses and prevent possible environmental impacts. To fulfill the responsibility and pursue sustainable growth, Hankook Tire complies with world-class environmental standards. We strive to efficiently use resources in the manufacturing process and increase the ratio of eco-friendly materials use, thereby improving environment by using our products and decreasing the reliance on petroleum-based resources.

**Research Activities**

Our research activities with regard to sustainability named E-Circle are carried out with four concepts – reuse of end-of-life tires, use of bio-based sustainable eco-friendly raw materials, minimization of environmental impacts within the lifecycle of tire, and recycling of waste tires. Research activities are underway in accordance with a mid- to long-term roadmap. The ultimate goal of E-Circle is to develop tires made entirely of sustainable raw materials by 2045.

**Future Plans**

Hankook Tire will spare no efforts for research activities to ensure a positive interaction between nature and human society and create sustainable values that meet requirements of current generation even without damages to future generations.