

JCFA's approach to achieving carbon neutrality

Japan Chemical Fibers Association (hereinafter, JCFA) developed and published the industry's policy for a sustainable society, in July 2021. We will take action on our defense and attack strategies for achieving carbon neutrality, in order to contribute to the policies of the Paris Agreement and Japan's 2050 Carbon Neutrality Declaration.

I. Environmental impact and efforts of the chemical fiber industry

- In Japan in 2023, the chemical fiber industry consumed energy of 459 thousand kiloliters of crude oil equivalent (COE), resulting in CO₂ emissions of 1.2 million tons. The energy consumption and the CO₂ emissions accounted for about 2% of the chemical industry, and about 0.4% of the entire industry (excluding the energy conversion sector).
- The energy consumption fell by 31% compared with 2013 (base year in Keidanren Carbon Neutrality Action Plan).

	Production of chemical fibers (t)	Energy consumption of chemical fibers (kL COE)	Basic unit for energy (kL/t)	CO ₂ emission (t CO ₂)	Scope 1 (Direct emissions)	Scope 2 (Indirect emissions)
1990	1,811,772	1,660,728	0.92	4,351,971	91%	9%
2005	1,249,344	1,041,904	0.83	2,730,330	89%	11%
2013	979,679	663,652	0.68	1,739,113	82%	18%
2014	975,714	642,736	0.66	1,684,303	83%	17%
2015	959,684	649,690	0.68	1,702,526	83%	17%
2016	911,884	608,589	0.67	1,594,820	83%	17%
2017	902,024	602,032	0.67	1,577,637	83%	17%
2018	879,611	592,368	0.67	1,552,312	83%	17%
2019	818,080	559,580	0.68	1,466,391	83%	17%
2020	705,363	498,506	0.71	1,306,345	83%	17%
2021	750,764	535,311	0.71	1,402,793	83%	17%
2022	736,698	530,936	0.72	1,391,328	84%	16%
2023	675,088	459,437	0.68	1,203,964	82%	18%

Source: JCFA quoting (i) *Yearbook of current production statistics (textiles and consumer goods)*, and (ii) *Yearbook of the current survey of energy consumption (chemical fiber industry/chemical fiber products)*, Ministry of Economy, Trade and Industry

Note: The above table shows the energy consumption and the CO₂ emissions in manufacturing of chemical fiber products. It excludes energy used for any processes after providing fireproofing properties in PAN-based carbon fiber manufacturing, and also energy used in pitch-based carbon fiber manufacturing. Regarding PAN-based carbon fiber, only acrylic fiber production is targeted.

- According to the CO₂ emissions by emission source in 2023, scope 1 and 2 emissions accounted for 82% and 18%, respectively. For reducing scope 1 emissions, the fuel shift will be key to lower carbon emissions, promote carbon circularity, and use carbon-free technologies, because scope 1 emissions are mostly associated with fuel combustion used for generating electricity and heat through off-grid facilities (private power generation). Also, smart manufacturing systems will be necessary to increase energy saving and productivity. For reducing scope 2 emissions, it will be necessary to ensure net zero CO₂ emissions from purchased electricity, because scope 2 emissions are associated with consumption of electricity from grid suppliers.
- The above table does not include scope 3 emissions (emissions from upstream and downstream in supply chains). For a future carbon-neutral society, we will enhance our efforts in recycling and shifting to plant-based raw materials to promote carbon circularity of raw materials, and also will develop and expand products that contribute to energy saving and new energy as end products.

II. Our committees and working group

JCFA members participate in its activities of carbon neutrality, through the following committees and working group.

	Activities	Committee/ Working Group
1. Carbon circularity of raw materials	<u>Development of eco-friendly fibers</u> - Research latest fiber technologies in the world - Develop eco-friendly fibers, e.g. recycled chemical fibers, and bio-based chemical fibers	Technical Committee
	<u>Expansion and promotion of eco-friendly fibers</u> - Expand and promote eco-friendly fibers, e.g. recycled chemical fibers, and bio-based chemical fibers - Expand green products (Action in accordance with the Act on Promoting	Sustainability Promotion Committee

	Green Procurement)	
	<u>Standardization of eco-friendly fibers</u> <ul style="list-style-type: none"> - Standardize eco-friendly fibers, e.g. recycled chemical fibers, and bio-based chemical fibers - Design environment-friendly textile products (work with the government and relevant organizations) 	Standardization Committee
2. Reduction and structural shift in production	<u>Strategies of the chemical fiber industry</u> <ul style="list-style-type: none"> - Work in accordance with the Carbon Neutrality Action Plan (for the chemical industry), with relevant organizations - Take action for climate change, e.g. energy saving, and CO₂ emission reduction 	Environment and Safety Committee
	<u>Strategies of energy sector</u> <ul style="list-style-type: none"> - Energy saving strategies, e.g. cogeneration, energy recovery, and innovative technologies - CO₂ emission reduction strategies, e.g. fuel shift 	Power Expert Committee
	<u>Strategies of manufacturing sector</u> <ul style="list-style-type: none"> - Improve manufacturing processes of chemical fibers - Use smart manufacturing/digital transformation - Develop low carbon processing technologies for chemical fibers 	Technical Committee/ Information and Communication System Expert Committee
	<u>Strategies of logistics sector</u> <ul style="list-style-type: none"> - Rationalize logistics operations, e.g. cooperative transportation - Modal shift 	Logistics Expert Committee
3. Emission reduction at the stage of product usage	<u>Expansion and promotion of products that contribute to environmental issues</u> <ul style="list-style-type: none"> - Provide added values, e.g. lightweight, longer life, higher efficiency - Contribute to renewable energy and new energy 	Sustainability Promotion Committee
	<u>Eco-label</u> <ul style="list-style-type: none"> - Guideline on checking labelling information of eco-friendly fibers 	Intellectual Property Expert Committee
	<u>Information dissemination</u> <ul style="list-style-type: none"> - Disseminate information about eco-friendly fibers on our website/at events 	Information Dissemination Working Group

III. Our approach to carbon neutrality

1. Carbon circularity of raw materials

(1) Development of eco-friendly fibers

- While the market is awash with recycled chemical fibers that are produced using materials such as collected PET bottles, we are aiming for more development and use of recycling-based fibers that are produced using textile wastes.
- We are addressing the shift from fossil fuel-based raw materials to plant-based raw materials for lower carbon emissions, and also developments of new chemical fibers (bio-based chemical fibers).

(2) Expansion and promotion of eco-friendly fibers

- For expansion and promotion of eco-friendly fibers such as recycled chemical fibers and bio-based chemical fibers, we are addressing the challenges of establishing collection and recycling systems, and also of expanding green products, for example, taking action in accordance with the Act on Promoting Green Procurement, and the Eco Mark Program.

(3) Standardization of eco-friendly fibers

- We are addressing visualization of environmental performance of eco-friendly fibers, such as labels of recycled raw material composition ratio of recycled chemical fibers, and of biocomponent mixing ratio of bio-based chemical fibers. We are also addressing building systems by which products with higher environmental performance can gain more value on markets.
- We believe that, composition of clothes, and dyes/additives are key to make sorting and subsequent processing efficient. We are addressing standardizing of systems of giving the above information to people who sort collected clothes for efficient recycling solutions.

2. Reduction and structural shift in production

(1) Energy saving and CO₂ emission reduction

- The Japanese chemical fiber industry has developed high-functional/high-performance chemical fibers, and the world's top energy-saving system, maintaining its global competitiveness and taking action for environment.
- We will maintain our focus on becoming carbon neutral, by taking any actionable strategies, such as (i) promoting the fuel shift, (ii) applying

renewable energy, (iii) applying innovative technologies of energy saving/ CO₂ emission reduction (highly efficient cogeneration, carbon recycling technologies, CO₂ separation and collection for its beneficial use).

- The chemical fiber industry usually generates heat (steam) and electricity by off-grid facilities, due to large amount of heat required. The off-grid facilities rely on fuels such as coal, heavy oil, and gas. According to the consumption of coal and gas between 2013 and 2023, the coal consumption fell from 27% to 18%, whilst the gas consumption increased from 16% to 33%. The data indicates a progress in shift to low carbon fuels. We are expecting further shifts of low carbon fuels in the foreseeable future, before carbon-free electricity generation technologies will be developed using fuels such as hydrogen and ammonia in the further future. Given that electricity generation technologies and carbon-free fuels are not distributed enough across the industry, electrification will be key to use heat and electricity in the best balance (minimize fuel use).

(2) Work in accordance with the Carbon Neutrality Action Plan (Chemical industry)

- Leading chemical fiber companies are involved in the Carbon Neutrality Action Plan (Chemical industry) established by Keidanren.

Chemical industry's goal of becoming carbon neutral by FY 2030

Base year	Absolute amount
FY 2013	32% reduction

Source: Japan Chemical Industry Association

(https://www.nikkakyo.org/work/global_warming)

- Some chemical fiber companies are working in accordance with Japan Chemical Industry Association's policy, as a part of the chemical industry.

(3) Smart manufacturing (Digital transformation)

- We are focusing on smart manufacturing systems using digital transformation technologies, for increasing energy saving and productivity, and reducing waste. We will seek any possibilities of using the smart manufacturing systems in chemical fiber manufacturing facilities, and aim for lower carbon emissions in the entire supply chain.

(4) Sustainable logistics

- We are addressing lowering carbon emissions in logistics, such as modal shift to vessels and railways, use of pallets, and cooperative transportation.

3. Emission reduction at the stage of product usage

(1) Expansion and promotion of products that contribute to environmental issues

- We are promoting products provided with added values such as lightweight, longer life, and higher efficiency, for environmental impact reduction. We are also promoting products that contribute to renewable energy and new energy, such as wind power parts, hydrogen tanks, and battery parts.

(2) Eco-label and information dissemination

- We established a guideline on checking labelling information of eco-friendly fibers, in the fight against greenwashing. We check back regularly for updates.
- We are actively disseminating information about eco-friendly fibers on our website/at events, aiming for better understanding on our efforts and our member companies' eco-friendly fibers.

IV. Our requests to the government

We believe the following policies are necessary for a future carbon neutral society.

A. Frameworks to drive lower carbon emission solutions

- Collaborative work between government, industry, and academia for "fiber-to-fiber recycling" systems, and payment responsibilities such as customs duty
- Awareness-raising campaigns for consumers in order to expand markets of eco-friendly fibers (e.g. recycled chemical fibers and bio-based chemical fibers), and labelling systems/certification systems to help user industries/consumers understand environmental performance of the eco-friendly fibers and make right choices
- Globally consistent systems of society-wide responsibilities to pay expenditure for facility investments and the fuel shift to lower carbon emissions

B. Supports to develop and install technologies for lower carbon emission

- Supports for technology developments and facility installations of recycled chemical fibers and bio-based chemical fibers
- Supports for installation of facilities that contribute to lower carbon emissions and carbon-free emissions (e.g. off-grid facilities, energy saving/CO₂ emission reduction facilities, and renewable energy facilities)
- Supports for early developments and establishments of carbon-free electricity generation technologies (e.g. use of hydrogen and ammonia)
- Supports for developments and social implementations of innovative technologies that contribute to carbon-free emissions (e.g. carbon recycling, CO₂ separation and collection for its beneficial use, large capacity batteries, and fuel storage)

C. Steady and reasonable supplies of carbon-free energy

- Achieve zero emission of electricity from grid suppliers
- Steady and reasonable supplies of carbon-free fuels such as hydrogen and ammonia

V. Stance of the chemical fiber industry

- We will take action on our defense and attack strategies in accordance with Japan's 2050 Carbon Neutrality Declaration. As the defense strategies, we will accelerate (i) promotion of the fuel shift, (ii) application of renewable energy and technologies of innovative energy saving/CO₂ emission reduction, and (iii) improvement of processes such as smart manufacturing systems. As the attack strategies, we will contribute by (i) development and expansion of recycled chemical fibers and bio-based chemical fibers, (ii) supply of products provided with added values such as lightweight, longer life, and higher efficiency, and (iii) supply of products that contribute to renewable energy and new energy.
- We will concentrate our efforts on the above strategies, for contributing to achieving carbon neutrality.

*This document was developed in October 2021, and updated in October 2024.