NEWS RELEASE

February 2019
YAMASHIN-FILTER Corp.

Reducing CO2 emissions to help fight global warming

YAMASHIN-FILTER has established a mass production facility for manufacturing agricultural insulating materials using new resin nanofibers

New agricultural applications for materials currently used in construction machinery filters

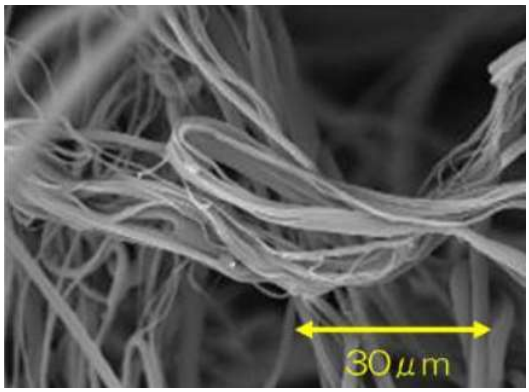
YAMASHIN-FILTER CORP., headquartered in Yokohama, Kanagawa Prefecture, Japan (hereinafter YAMASHIN-FILTER) has established a mass production facility for manufacturing agricultural thermal insulating materials using new resin nanofiber materials.
These new products are based on the results of a three-year (FY2015-2017) joint research project under the Ministry of Agriculture, Forestry and Fisheries of Japan's Science and Technology Research Promotion Program for Agriculture, Forestry, Fisheries and Food Industry (2701C: Nanofiber Solutions to Greenhouse Energy Conservation in Winter and Environmental Improvements in Summer). This project confirmed that multilayer nanofiber thermal insulating materials can help address agricultural producers' environment management challenges through energy conservation and production stabilization.

◆Multilayer thermal insulation using nanofibers helps address agricultural producers' challenges through energy conservation and additional benefits

Multilayer thermal insulation is known to deliver outstanding thermal insulation and conserve energy. Its insulation performance also reduces heating/cooling equipment loads and heating/cooling costs. In particular, using nanofibers as the insulating materials in multilayered thermal insulation not only improves the size, and weight, making it easier to handle, but also improves its thermal insulation performance further.

To address agricultural producers' challenges, YAMASHIN-FILTER has established a mass production facility for agricultural insulating materials that use, as the insulating materials in multilayer thermal insulation, high-polymer nanofiber materials originally developed as filtering materials for construction machinery filters. The product is expected to reduce carbon dioxide (CO2) emissions, promote energy conservation, and improve the environment management for agricultural producers. It is expected to see increasing use, in part due to its inclusion in the nanofiber multilayered thermal insulation in the Ministry of Agriculture, Forestry and Fisheries' Greenhouse Farming Energy-Conservation Production Manual (Rev. 2) (http://www.maff.go.jp/j/seisan/kankyo/ondanka/pdf/manyual-kaitei2.pdf).

◆ About nanofiber



An electron microscope photograph of a nanofiber

Nanofibers have drawn considerable attention in recent years. When used as insulating materials in multilayer thermal insulation, nanofibers not only improve its size and weight of the multilayer thermal insulation, making it easy to handle, but its thermal insulation performance further.
Nanofibers are defined as fibers 1-1000 nm* (or, more narrowly defined, 1-100 nm) in diameter and with lengths at least 100 times their diameters. (See photo on the right.)

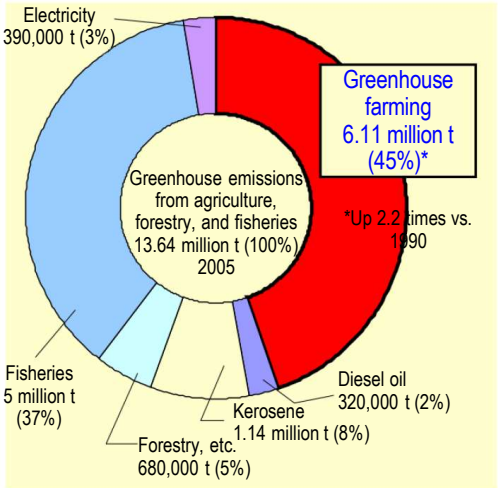
Nanofibers are extremely fine compared to traditional fibers. Even when produced from the same raw materials, they demonstrate superior performance in aspects like strength and heat resistance impossible with traditional fibers.
In addition to greenhouse insulation, nanofibers are well-suited to an extensive range of uses, such as thermal insulation and soundproofing materials in motor vehicles, buildings, and apparel.

Thermal insulation and sound and odor absorption in barns

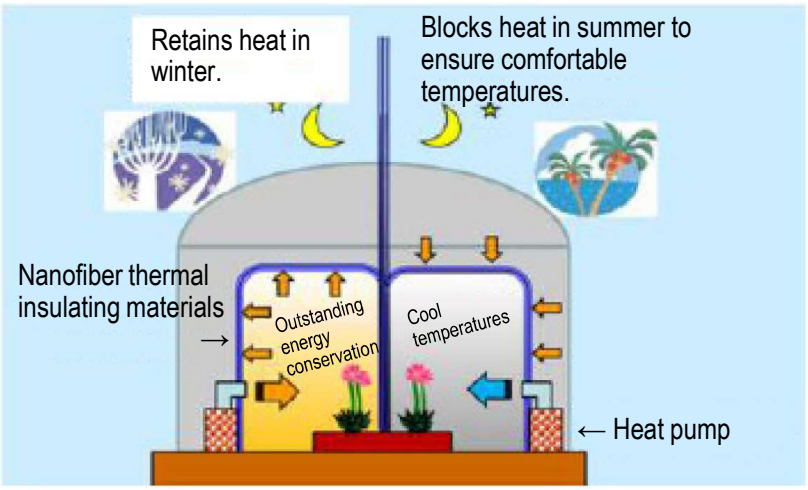
Cold-weather wear

Fruit packaging material

◆ An energy-saving multilayer thermal insulating material retains heats and cuts the use of fossil fuels, thereby helping to resolve a major challenge in agricultural management.



Greenhouse gas (CO_2) emissions from burning fossil fuels in the agriculture, forestry, and fisheries industries



Excerpt from the Greenhouse Farming Energy-Conservation Production Manual

Heating greenhouses requires significant amounts of fossil fuels, accounting for a very high percentage of the fossil fuels used in agriculture, forestry, and fisheries. This cost is a major challenge and makes energy conservation a key issue in agricultural management. Use of multilayer thermal insulation that improves the insulating properties of covering materials is an effective way not just to improve greenhouse heat retention, but to conserve energy.

Nanofiber thermal insulating materials are used as an interior covering in greenhouses. Since they also deliver high light-shielding ratio, nanofiber thermal insulating covers can be used with automatic equipment to raise them during daytime and lower them after sundown, thereby providing thermal insulation while using heating and cooling equipment at night. Since heating equipment inside the greenhouse radiates heat from the surface of the covering, using this material to cover the ceilings, sides, and end panels helps improve energy conservation.

<<Comment from project lead researcher>>

Dr. Hiroki Kawashima, Group Leader, Hillside Vegetable Production Group, Division of Hillside Horticulture Research, Western Region Agricultural Research Center, National Agriculture and Food Research Organization

Greenhouses play an important role in ensuring a stable supply of fresh, a diverse range of vegetables, flowers, and other produce, but the heating equipment essential to production during wintertime significantly relies on fossil fuels. Promoting energy conservation in these facilities is a pressing issue. Offering high thermal insulation performance—significantly higher than traditional covering materials—multilayer thermal insulation is essential to greenhouse farming. Multilayer thermal insulation made using nanofibers, which offer higher thermal insulation performance despite their thin form, should lead to further progress in energy conservation.

◆About YAMASHIN Nano Filters

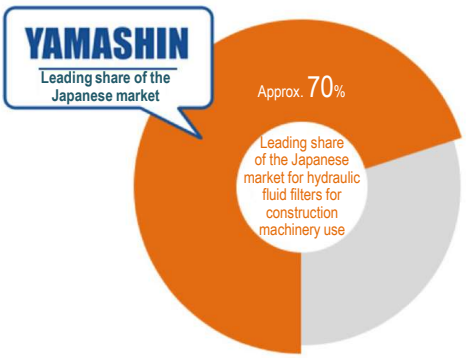
YAMASHIN-FILTER regards the compound high-polymer nanofiber materials it has succeeded in mass producing in-house (hereinafter "YAMASHIN Nano Filters") as revolutionary new materials suitable for deployment in various new fields.

YAMASHIN Nano Filters' sound absorbency, thermal insulation performance, and fireproof properties open up applications across a wide range of fields. We are also making progress in developing deodorizing and disinfection technologies that will add even more value.

In these ways, by taking advantage of the outstanding properties of these materials and their suitability to a wide range of processing methods, YAMASHIN-FILTER will deliver solutions to a wide range of issues posed by existing materials.

◆About YAMASHIN-FILTER

As a manufacturer specializing in filters for hydraulic and lubricating oil, YAMASHIN-FILTER holds a dominant 70% share of construction machinery of the Japanese market. Filters for use in construction machinery account for about 90% of its sales. YAMASHIN-FILTER's products are used in large volumes by leading manufacturers of construction machinery around the world, who recognize their high quality and YAMASHIN-FILTER's strong track record. YAMASHIN-FILTER continues to contribute to the efficient development of social infrastructures by helping to eliminate construction machinery failures that lead to delays in construction work at construction sites worldwide.



Share of sales of hydraulic filters for use in major construction machinery in Japan (FY2012)
Source: Yano Research Institute

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Established: April 5, 1956
Lines of business: Manufacture and sale of filters for construction machinery, industrial filters, process filters, and related parts
Capital: 5,435 million yen
Website: http://www.yamashin-filter.co.jp/ja/index.html

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