Feature story

Earth-friendly and human-friendly product development

INOAC's environmentally conscious products that meet the people's needs

The issues of marine pollution caused by microplastics and the treatment of non-recyclable plastic wastes are now social issues of a global scale. As such, strong expectations are being placed on the plastic industry and each manufacturing company to confront these problems. Our company is dealing with the environmental problems by promoting a shift to the use of plant-based resins. Demand for plant-based products is rising rapidly due to the minimal stress they put on the environment, and this demand is expected to accelerate even more in the future. In addition, as part of our efforts to reduce waste, we are reusing thermoplastic resins by pulverizing and modifying process waste, which could not previously be recycled. We are also carrying out product developments that make a shift to using carbon neutral materials in the place of plant-based resins to reduce carbon dioxide emissions.

We are also a member of the Nano Cellulose Vehicle (NCV) project, which is carried out by various industrial, academic and government institutions, including Kyoto University and 21 other universities, research institutes and companies. The aim of the project is to research the possibilities of cellulose nanofiber (CNF) from various different angles. Not only is CNF a natural material, it is also highly effective as a reinforcement filler for resins, and we anticipate that it will be of significant value in the future. CNF is ideal for creating light but very rigid products and has contributed to making cars lighter and more fuel-efficient. Indirectly, it can also contribute to reducing energy consumption.

In order to continue meeting the diverse needs of the global market going forward, we will actively promote the use of plant-based resins, research recycling methods and develop foam products that are lightweight and have heat insulating properties, which contribute to saving energy.

Kentaro Iwanaga
Division Director
Global Technology Development Division

World-leading R&D and human resource development

In order to propose and provide new solutions to society, each of our departments and affiliated companies are engaged in developing environmentally friendly products, with our company's R&D efforts centered at the INOAC Technical Center and the Global Technical Division. Outside of Japan, such as in North America and China, we are likewise developing environmentally friendly products that meet the needs of each region. We share information among the entire group and are committed to further advancing and enhancing our technological capabilities. We are also actively engaged in human resource development by working together with raw material manufacturers and our customers both in Japan and overseas, while also collaborating with educational institutes and gathering information at exhibitions. In addition, we organize research opportunities abroad to always keep up with the latest information as we move forward with our R&D.

Continuing to be a manufacturer of earth-friendly and human-friendly materials

The social structure as we know it, with mass production, mass waste and mass energy consumption, will no longer be possible. To realize a recycling-oriented society, the role of materials is extremely significant and their needs will likely rise even more. Developing technologies that lead to decreasing environmental burdens and saving energy is a field that Japan has been leading in over the years. Going forward, as a material manufacturer that supports various industries, we will strive to develop and provide products that are considerate of the earth and its people's lives.

Case.1 Product development using plant-based raw materials 1

The polyolefin sheet that reuses sugarcane pomace

At I-Sheet Industry Co., Ltd. of the INOAC Group, we are doing R&D of polyolefin sheets that use sugarcane pomace as part of its raw materials.

The sheet has the same physical properties and quality as the existing petroleum-based one, and can be similarly vacuum formed and used.

In addition, the sheet does not emit extra CO_2 when combusted due to partially consist raw material (=plant) that absorbed CO_2 in the atmosphere.

The sheet is compatible with the CO_2 life cycle (“plant absorption” → “manufacturing bioplastic” → “combustion and atmospheric emission”),

and can be said to be a product that contributes to a recycling-oriented society.

Sugarcane cultivation does not cause deforestation and environmental destruction due to it being grown in areas that are converted from pastures.

The material has another advantage point compared to materials derived from corn: manufacturing energy costs are lower and has no competition with food or feed.

We are expanding the sheet sales as an alternative to petroleum-derived food and industrial trays.

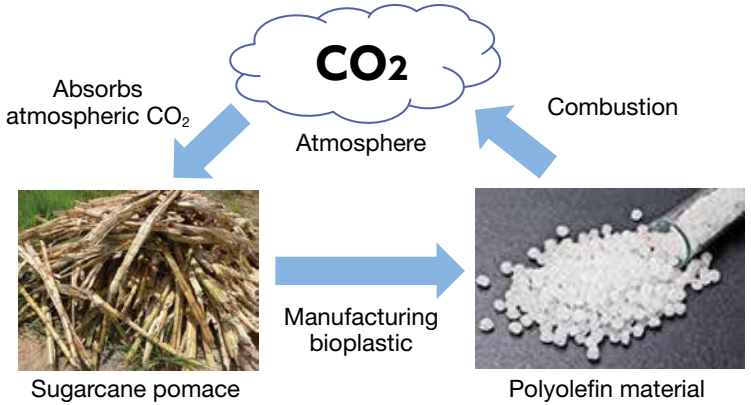
Junichiro Kasada
Development Technology Section
I-SHEET Industry Co., Ltd.

Characteristics of materials using sugarcane pomace

- **Can be used in the same way as existing petroleum-based products**
  Same physical properties, quality, formability.
- **The material that can contribute to a recycling-oriented society**
  CO_2 lifecycle
- **No negative effects on environmental protection or food problems**
  No deforestation required for manufacturing.
  Sugarcane pomace is not used for food and feed.

【CO_2 lifecycle diagram】

*This product is not biodegradable



Product examples

- **Trays for food and industrial components**
  (Alternative to petroleum-based products)

Case.2 Product development using plant-based raw materials 2

Development of urethane foam using plant-based raw materials

We believe that in order to contribute to a sustainable society, one of the important activities for companies is to effectively utilize limited resources.

Although most of our company's main material, urethane foam, is petroleum-based, we are also engaged in developing plant-based raw materials to prevent the depletion of limited fossil fuel resources and to be more environmentally friendly.

We are currently working to develop products with a high percentage of plant-based raw materials by using polyols derived from plants (e.g.: castor oil, palm oil, soybean oil).

By continuing to carry out product developments that increase the percentage of plant-based raw materials, we hope to contribute to the reduction of CO_2 emissions with carbon neutral materials and prevent global warming.

Yasumasa Goto
Urethane Technology Section
Foam Products Department
High Functional Material Division

■ Maintaining the same properties as existing (petroleum-based) products

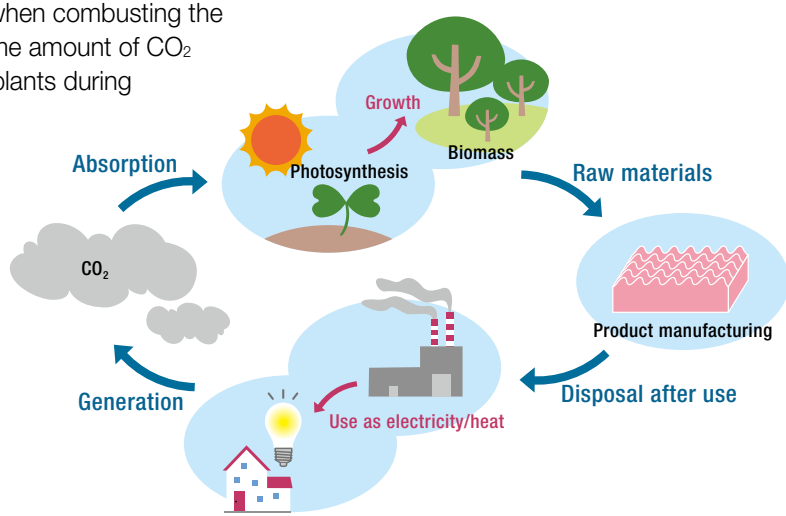
Products made from plant-based raw materials are generally hard and tend to weaken easily, so it is difficult to develop products that can maintain the same properties as those made from petroleum-based raw materials. However, with the product we are currently developing we have achieved a level of maintaining the same properties as existing products.

■ Advantages of using plant-based raw materials

- Reduction of CO_2 concentration with carbon neutrality
  →Prevents global warming
- Reduction of dependence on fossil resources
  →Prevents the depletion of limited resources

■ Reducing CO_2 emissions with carbon neutrality

Using plant-based raw materials contributes to reducing greenhouse gases because the CO_2 emitted when combusting the product is the same amount of CO_2 absorbed by the plants during their growth.



Case.3 NCV Project participation

Cellulose nanofiber (CNF) to make products lighter

The Nano Cellulose Vehicle (NCV) Project is run jointly by industrial, academic and government institutions, and our company has been participating in it since its establishment. The project's goal is to make vehicles lighter by utilizing CNF.

Led by Kyoto University and the Ministry of the Environment, the NCV Project is aiming to make vehicles over 10% lighter by 2020 by utilizing next-generation CNF, which is a fifth of the weight of steel and over five times stronger. For our part in the NCV Project, we will test the possibilities that CNF has as automotive components by March 2020 and aim to apply it commercially by FY 2025.

We are currently working to further strengthen resins by using CNF to develop resin vehicle components with foamed resin molded articles, which also make the product more lightweight. By adding 10% of CNF to the resin material and applying our foam molding technologies, we have succeeded in making the molded articles 20% lighter than before.

Through our R&D efforts, we will contribute to making the shift to carbon neutral materials, reducing the use of petroleum-based resin and improving fuel efficiency by making vehicles lighter.

Hiroaki Suzuki
Director
Evaluation Technology Section of the Development Division
Global Automotive-related Products Division

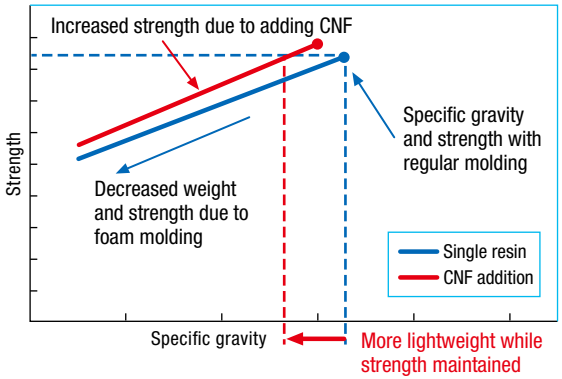
NCV Project

The NCV Project was launched by the Ministry of the Environment to improve automobile fuel consumption by making vehicles lighter and to reduce CO_2 by applying CNF—a lightweight and high-strength next-generation material—to the automotive field. Kyoto University leads the project and more than 20 industrial, academic and governmental institutions participate.

Strengthening resins by adding CNF

●Characteristics of the technology and product

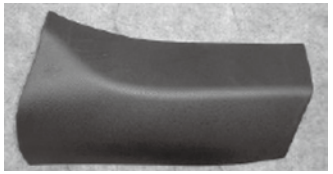
Adding CNF strengthens the resin to supplement a decrease in strength caused by foaming.

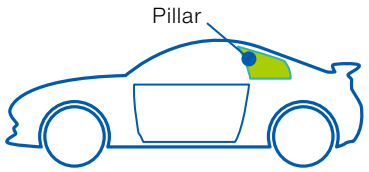


Product example

●Foamed resin injection molded article

(Car interior pillar: product with 10% CNF addition)





Case.4 Realization of material recycling

Recycling process waste of polyethylene foam

We are planning to start material recycling by turning the process waste of polyethylene—produced during the manufacturing (vacuum forming) process of automotive components—into material pellets and reusing them for different products. Our ultimate goal is to reduce the over 4 tons of industrial waste produced on average every month by 100% and achieve a “ZERO” industrial waste reality.

In our developments, we will focus our efforts on establishing a recycling method that takes into consideration the volume reduction method, defoaming method and cross-link cutting method for cross-linked foam.

Until now, we have been undertaking thermal recycling, which reuses the energy produced when combusting industrial waste. However, from now on, we will also be undertaking material recycling, which reuses industrial waste as a different product.

Going forward, we will proceed with developments with the aim of establishing a technology capable of transforming all recycling pellet materials back into products.

Shinji Sugie
Subsection Chief
Resin Product Development Section of the Development Department
Global Automotive-related Products Division

Yoshihisa Takamori
Resin Material Development Section
Material Technology Department
Global Technology Development Division

To achieve a zero industrial waste reality

Our aim is to reduce the over 4 tons of industrial waste produced on average every month by 100%.

Goal
Reduce industrial waste by 100%

Process waste of polyethylene foam

Convert to pellets

Recycling process