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Shiki ❊ Oriori

Nippon Paper Group
CSR Communication Brochure
Vol.28

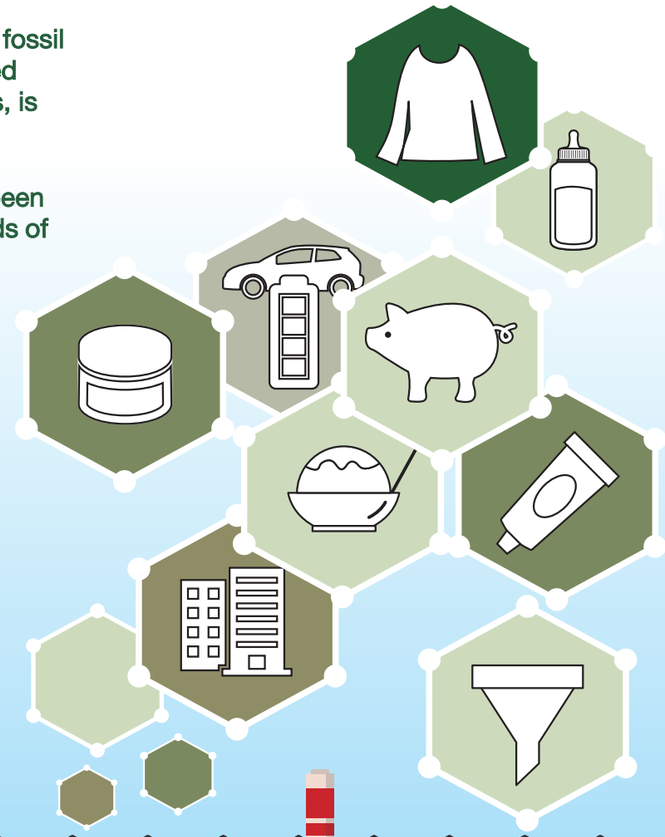
The story of a mill that creates various products from trees

With society turning against using fossil resources, work on using bio-based (especially wood-based) resources, is attracting worldwide attention.

For example, much research has been undertaken into advanced methods of making chemicals from wood.

Nippon Paper's Gotsu Mill is something of a surprise. It's a paper company's mill that makes no paper. What it does produce, however, is a whole variety of materials, such as chemicals, which are used in a large range of useful products.

In this issue we will introduce you to Gotsu Mill and how it produces such a range of quality materials.



Shaping the Future with Trees

A story of Forests and Wood

Associate Professor, The University of Tokyo, **Kiyohiko Igarashi**

Kiyohiko Igarashi

Born in Yamaguchi prefecture, in 1971

Associate Professor Kiyohiko Igarashi, is a specialist in cellulolytic enzymes. He is an Associate Professor at the University of Tokyo and since 2016 has served as a visiting professor at the VTT Finland Technology Research Center. His interest is in new materials and their eventual decomposition and return to nature.

As Bioeconomy becomes mainstream, I look forward to Nippon Paper's technology

Associate Professor Kiyohiko Igarashi shared his thoughts with us about wood-based bioeconomy, and how he expects Nippon Paper Industries to follow the bioeconomy trend.

New materials and their decomposition

My research topic is cellulolytic enzyme. The enzyme cellulase can be used to decompose cellulose, the main component of plant material, to produce sugars. From that there is the growing possibility of creating new energy and materials such as biofuels and bioplastics.

Look at the natural world. Plants grow by using sunlight-powered photosynthesis. When they die, they are consumed by fungi and molds which use enzymes to break down the plant material. It is a well-balanced system which takes materials from earth resources and returns them to the earth. It contrasts dramatically with the way humans take natural resources such as oil from the earth, process it into non-decomposing plastics, and then discard them when finished with, causing lasting problems such as marine waste.

The public understanding of bio-economy

Since 2016, I have served as a visiting professor at the VTT Finland Technology Research Center. We are researching into on cellulolytic enzymes.

In Finland I feel there is a strong will to develop the country's potential, and to achieve 100% self-sufficiency.

Like Japan, Finland is rich in forests. Finland, also like Japan, has used imported crude oil for the manufacture of many petrochemical products such as plastics. Now, however, Finland are trying to switch oil-based products to materials derived from becoming more common in Finish life, fresh attention is being paid to things such as clothing fibers made from dissolved pulp, and new wood-derived product development is progressing rapidly.

The Finish people accept this strategy too, because they understand that bioeconomy is "economic activity that does not stress the biosphere". Based on that, Finland is trying to achieve economic growth centered on wood resources.

Gotsu Mill and sulfite digestion

Nippon Paper's Gotsu Mill is very interesting, because it uses the Sulfite (SP) digestion process*1 to break down wood. It's an old technology, and the newer Kraft (KP) digestion process*2, which makes stronger paper has made it largely obsolete for papermaking. However, SP digestion makes it easier to utilize woody biomass. Because of this, the process is now attracting attention worldwide.

At the Gotsu Mill, the SP process is used to readily separate wood into its three main ingredients (cellulose, hemicellulose, lignin).

In addition, Nippon Paper's has vast overall experience and expertise with woody biomass, and has accumulated knowledge in papermaking and environmental technologies. In Northern Europe and Canada, where woody biomass utilization is more advanced, several paper companies have evolved into comprehensive material manufacturers.

Due to environment and energy issues, I think it is vital to develop materials using the sustainable resources we have, such as our extensive forests.

I expect the Gotsu Mill to develop greatly in the future. I believe that Nippon Paper Industries, has the potential to become the most prominent base for developing the Japanese bio economy.

*1 for SP digesting, see inside
*2 for KP based digesting, please see Vol.21 for alternative processing of wood components.

https://bit.ly/2SNB6YK

TOPIC

NPG Sustainability Report 2018 received the "22nd Environmental Communication Award" Excellence Award

The Nippon Paper Group's Sustainability Report 2018 was named winner of the Prize for Excellence at the Environmental Communication Awards 2018,sponsored by the Japanese Ministry of the Environment and the Global Environmental Forum.

While promoting CSR activities in the future, we will endeavor to disclose fulfilling information in an easy-to-understand manner.

Prize of Excellence at the Environmental Communication Awards

Nippon Paper group's Sustainability Report 2018

Information

We are waiting to hear from you.

Please complete our survey on the web.

https://bit.ly/2TDZ5ZV

Editor's Note

We have previously (Vol.21) looked at advanced use of wood components through KP based digestion. In this issue, we introduce SP digestion at the Gotsu Mill which already uses wood in various forms. Associate Professor Igarashi tells us that both are getting a lot of attention right now.

Our initiative is founded in sustainable forest management. Following our slogan "shaping the future with trees", Nippon Paper Group uses renewable wood to make various kind of products.

We will continue introducing our group's possibilities through our brochures.

Keiko Fujita

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2019.3.27

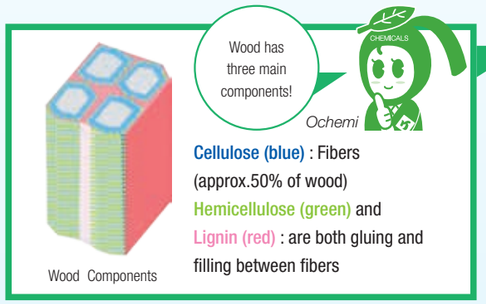
There is Only One Sulfite Digestion Mill in Japan, but it Produces a Whole Range of Products.

Nippon Paper Industries' Gotsu mill is located in nature-rich Shimane prefecture. Using Sulfite Process (SP) digestion, the only mill in Japan to do so, it produces dissolved pulp*. The pulp is the raw material for making rayon for use by clothing industry and others. Making full use of the cellulose pulp and its by-products such as hemicellulose and lignin, the mill makes a wide range of chemical products. Even the process waste is used, as effluent is turned into methane energy using the methane fermentation method.

** 'Dissolved pulp'*
Pulp with a high cellulose content which is used mainly for textiles and cellophane. It is so named because it uses solvent to make textile fibres and film.

Nippon Paper Gotsu Mill

Point 1 Using wood from sustainably managed forests



Wood Chips

Dissolved Pulp and water-soluble by-products

Dissolved Pulp

By-products

Half used as product

Half used as energy

Point 2 Effective use of raw materials and industrial wastewater.

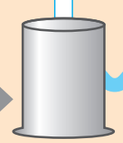
Effective use as energy

For use as heat and electricity in the mill

Mill effluent

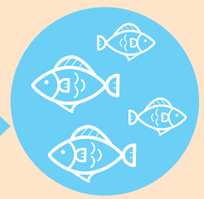
Methane

Water Treatment by methane fermentation



Microorganisms decompose organic matter in the wastewater, making methane as an energy source.

After treatment, the water goes to the ocean



Effective Use of Wood's Three Components

Cellulose

Obtained as dissolved pulp

Dissolved Pulp (High cellulose content)

- ● Dissolved Pulp
- ■ Powdered Cellulose
- ▲ Carboxyl Methyl Cellulose (CMC)
- ★ Cellulose Nano Fiber (CNF)

Hemicellulose

Used as nutrient in yeast production

Yeast (Nucleic acid and nutrient rich)

- ● Nucleic Acid (Extracted from yeast)
- ■ Nucleic acid-free yeast

Lignin

Lignosulfonate is produced

Lignosulfonate
(Having water solubility, dispersibility, and binding property)

Examples of Various Usage

Cellulose

● Clothing (rayon)

● Cellophane tape material

■ Filtering aid

▲ Battery material

▲ Preservative for toothpaste

■▲★ Cosmetic thickener

■▲★ Water retention and thickening agent for food

Hemicellulose

● Milk powder nutrients

● Raw materials for flavour enhancers

●■ Raw materials for feed

Lignin

Fertilizer binder

Recovery of useful metal

Concrete admixture

Point 3 Wide variety of Usage

From food * to concrete, our products are used in a wide range of applications.

*Gotsu mill has acquired three safety management system certifications: quality (ISO 9001), food (FSSC), and feed (GMP + B2).

Details of usage are here

https://bit.ly/2FeshyH

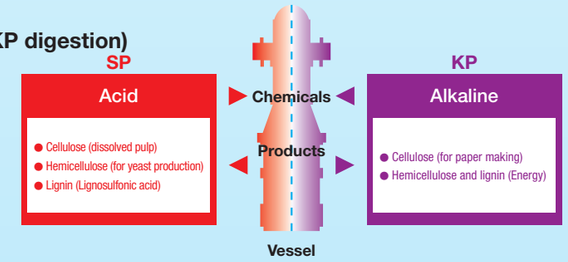
SDGs (Sustainable Development Goals) and Gotsu Mill

The SDGs, adopted by the United Nations in 2015, are common goals for the realization of a sustainable world. Gotsu Mill's efforts can contribute in particular to goal 12.2 "achieve sustainable management and efficient use of natural resources by 2030"

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

What is digestion? (SP & KP digestion)

Digestion is the process extracting fiber by softening wood with chemicals, heat and pressure in a vessel. The chemicals used differ between SP and KP digestion (KP is mainly used for papermaking).



Past, Present, and Future of Gotsu Mill

Head of Gotsu Mill
Kazunori Itaya

Nippon Paper's Gotsu Mill has been consistently producing mainly dissolved pulp since it was established in1951 by Sanyo Pulp . There was a high demand for rayon after the war but, since about 1960 petroleum-based synthetic fibers have dominated the market. The demand of rayon dropped globally. However, as competitors withdrew from dissolving pulp production (SP digestion), the Gotsu Mill expanded its business by developing by-products of dissolved pulp, creating high added value. As times change, interest in products derived from bio-based resources such as wood is now increasing.
As society moves away from being oil and carbon dependent, Gotsu Mill will be ready to play its part.