

# Fiber-Reinforced Foamed Urethane (FFU) Materials Contribute to Safe and Reliable Transportation

Fifty years have passed since Japan went through a phase of advanced economic growth. The aging of social infrastructure that was quickly constructed back then has become a social problem. At Sekisui Chemical, we contribute to safe and reliable railway transportation through the development and sale of railway sleepers made from FFU synthetic wood materials.



**Takashi Oguchi**  
Performance Materials Division  
Urban Infrastructure & Environmental Products Company  
Sekisui Chemical Co., Ltd.

INTERVIEW

## 1 Development

### Alternative materials for wood

Our FFU synthetic wood materials are stronger than wood but are just as light, and do not corrode. They are also easier to fabricate to precise dimensions. Our FFU synthetic wood materials are a perfect alternative for wooden railway sleepers, providing the same benefits as wood, plus more.

Railway sleepers are used to fix rails in place, and any expansion, contraction or warping in them can make the rails unstable. Wood expands and warps when absorbing water, but FFU does not.

### Easier maintenance reduces onsite work

Another major advantage of FFU is that they are easy to maintain. For bullet trains in particular, the space between rails and their height are fine-tuned on a daily basis. Since FFU can be fabricated with a high degree of dimensional accuracy, it helps increase

work efficiency. FFU also has excellent workability, making it possible to conduct repairs at the worksite, such as making holes to match worksite conditions.

### Delivering Japan-grade safety and reliability in transportation to the world

Preparing for the complete prohibition of creosote oil for industrial use in European countries in 2018, railway companies have been searching for an alternative material to make railway sleepers instead of wood. Certifying a material for use in railway sleepers requires 5-10 years of strenuous testing. We have set our sights on developing the business globally in order to deliver to the world Japan's renowned safety and reliability in transportation systems.

\* Creosote oil for industrial use : A type of anti-corrosive agent made by distilling coal tar. In recent years, it has been designated as a carcinogen.



### As an industrial product, uniform performance helps ensure safe and reliable railway transportation

Since wood is a natural material, it is usually not included in strength calculations for structural engineering, owing to the wide variance in performance characteristics of wood.

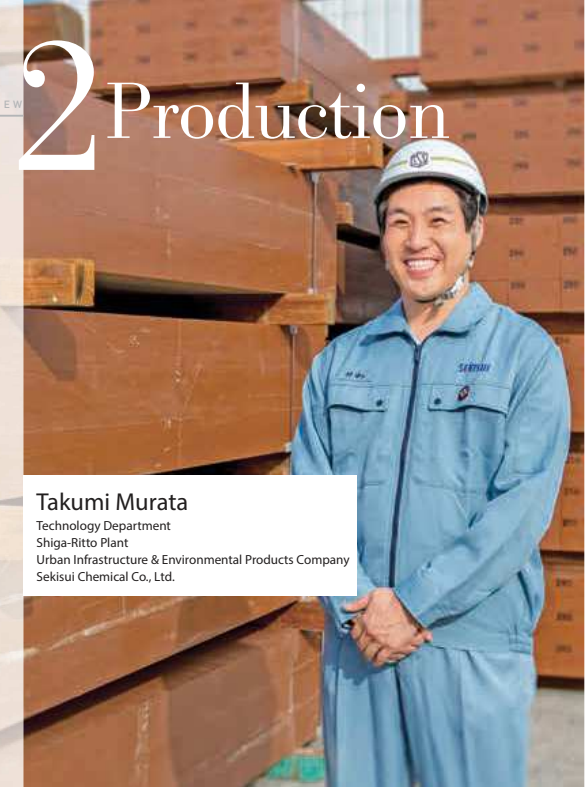
FFU synthetic wood materials are a manufactured product, not a natural material like wood, so variations in strength and quality cannot be tolerated. It must have the same performance characteristics all the time. I believe this is vital within the context of safe and reliable railway transportation.

FFU is light and strong, thanks to its foamed urethane resin structure uniformly reinforced with long glass fibers. It is challenging to impregnate resins uniformly with glass fibers, and products with large cross sections are bonded, a process that we pay particular attention to.

We engage in production activities with the awareness that our products provide value to society, by assuming that our products used in railways, a form of public infrastructure, are constantly fulfilling an important social need.

INTERVIEW

## 2 Production



**Takumi Murata**  
Technology Department  
Shiga-Ritto Plant  
Urban Infrastructure & Environmental Products Company  
Sekisui Chemical Co., Ltd.

INTERVIEW

## 3 Sales

### Synthetic railway sleepers support the main arteries of Japan's economy

It would not be an exaggeration to say that we supply synthetic railway sleepers to almost all of the major railway operators in Japan, including Japan Railway (JR) companies and private railway companies. On the Tokaido bullet train, in accordance with a project to increase the speed of rolling stock in 1992, wood railway sleepers were replaced with synthetic railway sleepers that combine light weight with strength and excellent workability. The Tokaido bullet train is a main transportation artery that supports the Japanese economy by connecting the two major metropolitan areas of Tokyo and Osaka. Any service interruptions or delays, even a few minutes long, can have a major impact on the economy. Railway maintenance work for the bullet train can only be conducted during the hours between the last and first trains every day. Sekisui Chemical's synthetic railway sleepers can be efficiently replaced and repaired in a limited amount of time. I thus believe this material can help make railway transportation safer and more reliable. Since it is also a product that helps protect people's lives on trains, I take care to accurately answer any technical questions about the material from customers.



**Minoru Satou**  
Business Promotion Department  
Chubu Sales Headquarters  
Urban Infrastructure & Environmental Products Company  
Sekisui Chemical Co., Ltd.



## Our lightweight, strong synthetic railway sleepers excel in durability

Our synthetic railway sleepers made from FFU synthetic wood materials are just as light as natural wood materials, are stronger than concrete sleepers, and resist corrosion. They contribute to safe and reliable railway transportation systems.

### What are FFU synthetic wood materials?

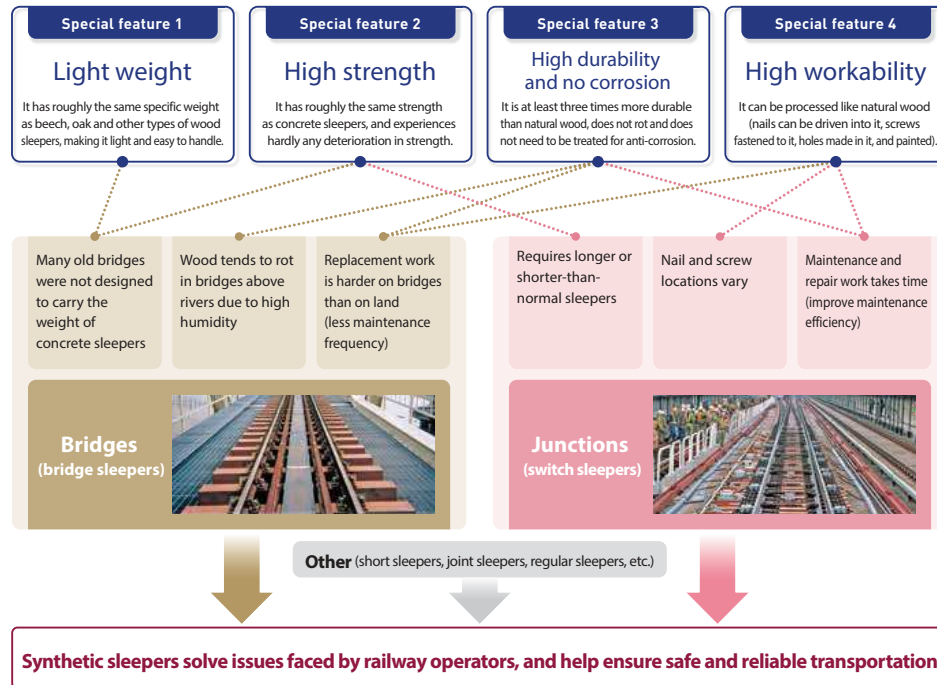
FFU stands for Fiber-reinforced Foamed Urethane (foamed urethane resin reinforced with glass fibers). Made from rigid urethane resin reinforced with glass fibers, it was mainly developed as an alternative to natural wood materials.



## FFU's features a perfect match for railway sleepers

FFU is a material that combines the advantages of natural wood and plastic, namely light weight, strength, resistance to corrosion, and workability. Railways recognize FFU as an ideal material for

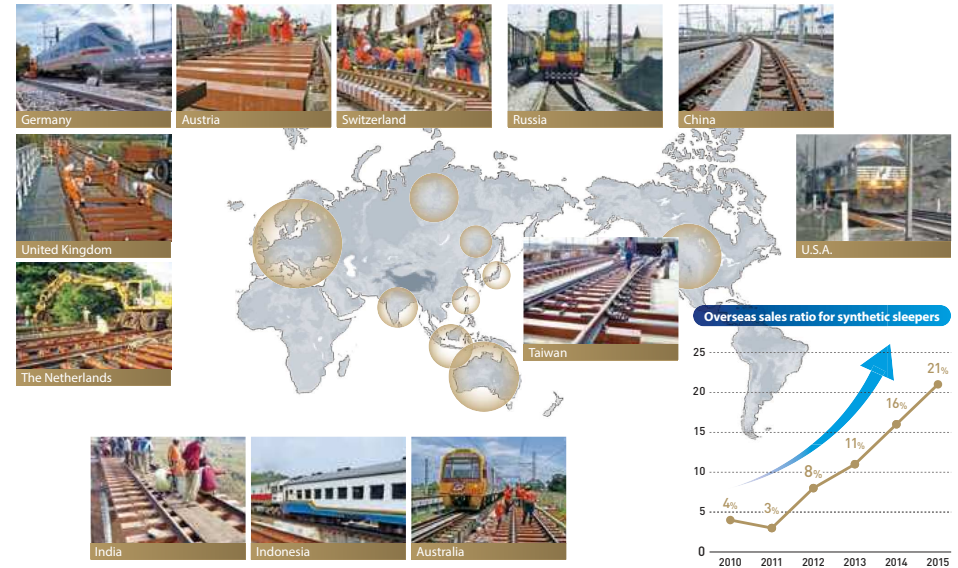
railway sleepers, and it has also been deployed in other areas, centering on bridge and junction sections of railway.



## Use of synthetic sleepers overseas

Around the world, amid growing awareness of environmental conservation, countries are reconsidering the use of natural wood sleepers due to their consumption of natural forest resources and health risks associated with anti-corrosion agents. Synthetic

sleeper technologies created in Japan, highly regarded for their environmental friendliness and contributions to safe and reliable transportation, are starting to be used overseas.



## Sekisui Chemical's involvement in the Tokaido Shinkansen (Bullet Train)

The first full-fledged use of synthetic railway sleepers on a Tokaido Shinkansen track was more than 25 years ago in 1989. Synthetic railway sleepers were deployed extensively on bridges and junctions in particular, as well as on regular tracks, in accordance with an initiative to increase the maximum speed of the Tokaido Shinkansen to 270km/h in 1992. Synthetic railway sleepers were highly regarded for their light weight, strength, and workability, in addition to their stable performance and excellent durability as a manufactured product, on top of their contribution to steeply reducing the frequency of replacements. Thereafter, Sekisui Chemical developed special railway sleepers more able to withstand earthquake damage on railway tracks. Central Japan Railway Company (JR Central) uses reflective sound absorbing panels in large-scale preventive maintenance\* projects for repairing and maintaining civil engineering structures. We continue to work together on such projects with the aim of ensuring safe and reliable transportation.



Track built on synthetic railway sleepers for Line No. 27 at Shin-Osaka Station

\* Preventive maintenance: Maintaining the performance of a structure before it requires repairs in the future.

## TOPICS

### Letter of Appreciation from JR Central

In commemoration of the 50th anniversary of the Tokaido Shinkansen, Sekisui Chemical has received a Letter of Appreciation from JR Central in recognition of its many years of contributions to safe and reliable transportation on bullet train lines.



### Reflective sound absorbing panels

In large-scale maintenance projects for Tokaido Shinkansen civil engineering structures underway since 2013, reflective sound absorbing panels jointly developed by JR Central and Sekisui Chemical have been used to replace existing sound-proof walls as a solution with better noise-suppressing performance that puts less weight on concrete bridges.

