

### Activity Highlight 3

# Developing Environment-friendly Products

## — Soprano Recorders Made of Plant-based Resin —

Recorders are traditional woodwind instruments that many people are familiar with.

They are often used in schools because even young students can readily produce sounds with them.

Yamaha started manufacturing and selling recorders in 1967. Since then, the qualities of Yamaha recorders, such as their impact resistance, pitch accuracy and agreeable tone, have been widely recognized. Many elementary and junior high schools have adopted them for their music programs.

Against this background, Yamaha began developing musical instruments for students that not only have great sound quality, but also are environment-friendly and safe to use.

The YRS-401 and YRS-402B soprano recorders developed in July 2014 are the world's first musical instruments made using plant-based resin.\*1 This section discusses their features and how they were developed.

\*1 Yamaha recorders are sold at music stores.



# World's First Recorder Made using Plant-based Resin Developed with a Materials Manufacturer

Yamaha strives to manufacture products that are environment-friendly and safe to use. We use no adhesives in manufacturing our soprano and alto recorders. The Yamaha Group Environmental Policy states that the Group focuses on developing technologies and providing products that are more environment-friendly. One approach we have taken is to use an environment-friendly resin in the production of recorders. By incorporating the ecodear™ polylactic acid developed by Toray Industries, Inc., the world's first recorders made using a plant-based resin were developed. \* The use of renewable plant-derived polylactic acid, as opposed to fossil fuel-derived materials, helps reduce greenhouse gas CO<sub>2</sub> emissions.

Recorders are one of the first teaching tools students encounter when they enter elementary school. Providing them with an instrument that is familiar to them not only arouses their interest in music, but also in the case of Yamaha recorders that have prominent environmental attributes, enhances their awareness of environmental issues. Yamaha and Toray have gone the extra mile not only to create instruments of the highest quality, but that also feature designs that convey environmental information.

\* Musical instruments commercially available as determined by Yamaha in-house research in June 2014.



**ecodear**  
Plant-based PLA Compound Resin

## Yamaha's commitment to environment-friendly, safe recorders

Our ABS recorders comply with the following regulations related to the production and use of chemical substances. (May 2015)

Japan: Food Sanitation Law  
Europe: REACH  
The United States: CPSIA

• Manufacturing at factories that have received ISO quality assurance certification.

• Adoption of ultrasonic welding that eliminates the need for adhesives (soprano and alto recorders)

• Adoption of environment-friendly, natural, plant-derived cloth case

**Use of ecodear™ for recorder bodies**

\* ecodear™ is a trademark of Toray Industries, Inc.

## Goals in developing recorders made with resin derived from plants

### Significance for and benefits to society

- Raises environmental awareness of students
- Reduces CO<sub>2</sub> emissions
- Arouses student's interest in musical instruments
- Creates new values that meet the needs of the era

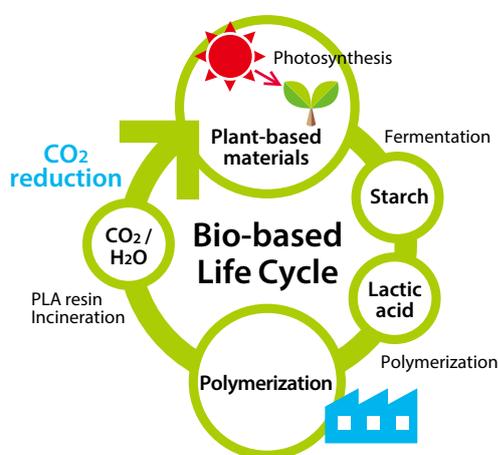
### Significance for Yamaha

- Promotes development of environment-friendly products
- Differentiates Yamaha in the educational musical instruments market

## Helps Students Experiencing a Musical Instrument for the First Time Discover the Fun of Playing Music and Raises Their Environmental Awareness

### Helping to prevent global warming by using renewable, plant-based materials

ecodear™ is a composite material that combines plant-based polylactic acid\* and petroleum resin (ABS resin) developed by Toray Industries, Inc. Recorders manufactured using ecodear™ have about the same workability, durability, strength and



#### ecodear™ plant-based polylactic resin

The use of ecodear™ generates about 20% less CO<sub>2</sub> emissions than conventional ABS resin. Therefore, substituting ecodear™ for ABS resin in the production of one million soprano recorders would reduce CO<sub>2</sub> emissions by 230 tons. This is the amount of CO<sub>2</sub> that a car traveling around the earth 25 times\* would produce.

\* At a fuel consumption rate of 10L/100km and an Earth circumference of about 40,000km.

appearance as conventional ABS resin recorders, but the production process generates about 20% less CO<sub>2</sub>.

Given that plants grow by absorbing CO<sub>2</sub> in the atmosphere, the amount of CO<sub>2</sub> generated in the production of a recorder is reduced by the amount of CO<sub>2</sub> absorbed during plant growth. Furthermore, fossil fuel resources are finite and being depleted, so using renewable biomass to make instruments is a significant benefit.

\* Plant-based polylactic acid resin is produced from plant starch (currently, primarily corn starch) via a process that includes lactic acid fermentation and polymerization.

### Recorders as a teaching tool

Collaboration with Toray has also resulted in the production of better-sounding recorders. Since the specific gravity of ecodear™ is slightly greater than that of ABS resin, use of ecodear™ has given Yamaha recorders a mellower, centered tone similar to that of wooden recorders.

Yamaha has also completely changed the image of school recorders by making them in bright colors that elicit images of plants such as corn and sugar cane, materials from which polylactic resin is produced. The cases are also different, having a gentle leaf-like color and being made of natural-fiber cloth, making Yamaha recorders even more environment-friendly.

### Comments



**Yoshiyasu Naito**

Toyolac Technical Dept., Chiba Plant  
 Toray Industries, Inc.

**“I want upcoming generations to have greater environmental awareness.”**

I was really hoping to help reduce global warming through the use of ecodear™ and found the request to use it to produce recorders rather timely. I am confident that this environment-friendly recorder is an ideal tool for students to learn about the environment.



**Keiko Hakozaiki**

Tokyo Toyolac Sales Section, Toyolac Dept.  
 Resins Division  
 Toray Industries, Inc.

**“It was a great opportunity to expand the use of an environment-friendly material.”**

I talked about ecodear™ at a new product release, which was a great opportunity to get the word out about this environment-friendly material. The marriage of a musical instrument and this material was much discussed in journals of both the musical instrument and chemical industries. The public response has been great. I am very happy that we have been able to make the world a better place through products for students.

### Opportunities for environmental education for students

In response to requests from schools and agents, Yamaha provides introductory seminars to teach students how to play recorders. These seminars focus on arousing the interest of students who are playing a recorder for the first time and on training teachers how to teach.

Fujisaki Town Tokiwa Elementary School in Minami Tsugaru, Aomori Prefecture, Japan uses the YRS-401 for third-grade students. The school praises the instrument highly, stating that it is easy to make sounds with and very durable. Students in the third and fourth grades study waste processing, recycling and



the environment in social studies, and the recorder has been a useful tool in helping them learn about these issues.

Yamaha is committed to developing even better musical instruments and environment-friendly manufacturing for a sustainable society.



Taishi Kodate

Teacher  
Fujisaki Town Tokiwa Elementary School  
Minami Tsugaru, Aomori Prefecture, Japan

**“The recorder is an environmental education tool that sounds beautiful.”**

The basic requirements for school musical instruments are that even young students can play them, they sound good and they can be played in a group. We decided on the YRS-401 because it meets all of these requirements. There’s also the added benefit that we can use such a familiar object for environmental studies.

### Recorder designer

**“We are committed to providing students with safe, fun musical instruments.”**

Recorders are one of the first musical instruments students experience. Therefore, recorders need to be of high quality, as well as safe and fun. I would be very happy if my goals are realized when students play our recorders.



Toru Ohno

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