



Unique Technology with Added Value

- Utilization of Environment-responsive Material
- Produce the Function
- Sense of Fun , Pleasure



Developing products

- ① PLA Straw
- ② Biomass Plastic Straw
- ③ Tapered Straw
- ④ ϕ 8.4 Reversed Telescopic Straw
- ⑤ Exstraw
- ⑥ Perforated Straw
- ⑦ Print Straw
- ⑧ Smooth in Straw
- ⑨ Other (Various development products)

① PLA Straw

■ Characteristic

PLA: Poly Lactic Acid

a. Biodegradable

- The raw materials are dent corn.
- Decomposed Into water and CO₂ with the help of bacteria and enzyme in the soil.

b. Low combustion calorie

- Be able to be combusted by lower calorie.

c. Environmental sustainability

- Reduce consumption of oil resources.
- Control CO₂ emission.



■ Our Approach

- The machine assembly of construction processing technology is established.

The material resin is being jointly developed with the manufacturer. (patent application schedule)

- Plan to examine Ladder wrapping by biodegradability film and OPP another.
- Plan to promote an environmental practice that saves the oil resource and reduce the amount of CO2 generation in the disposal process.

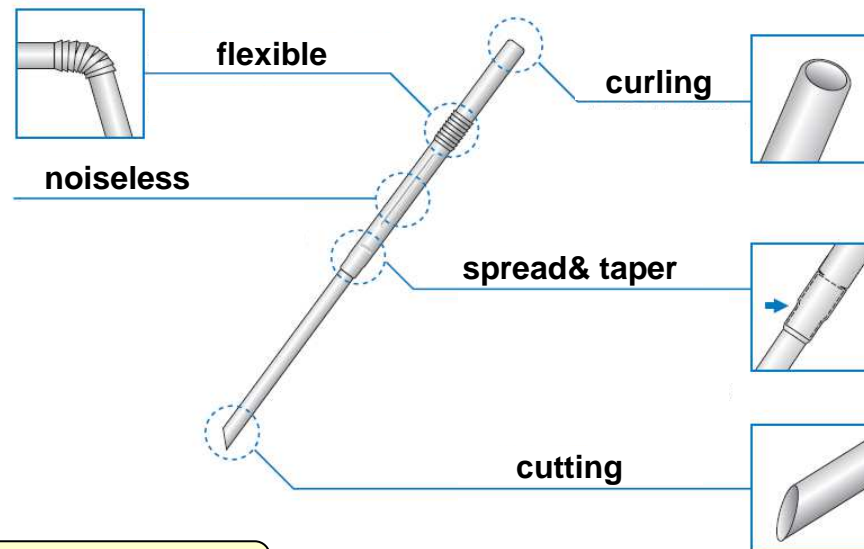
In the prototype, the effect of the CO2 reduction estimate 50% per pc.



Explanation of the processing department

(1) Telescopic straw

- The temperature of the molding processing department is around 65°C.



(2) Packaging film

- Ladder packaging materials are biodegradable film and OPP film and other film.
- The print to the film is possible.

Reference : Decomposition speed of straws made of poly lactic acid

The decomposition speed was examined at our facility.

- Under the conditions of 70°C、periodical moisturizing the straws in compost (cow dung)
- Resulting in bleached and form deterioration

original sample



after 2 weeks



after 4 weeks



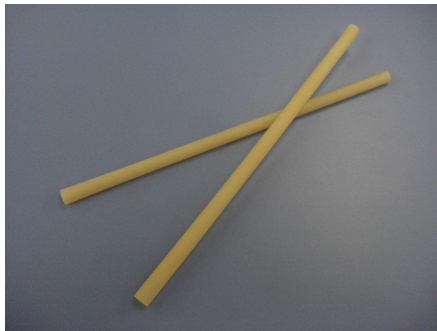
② Biomass plastic (Rice)

■ Characteristic

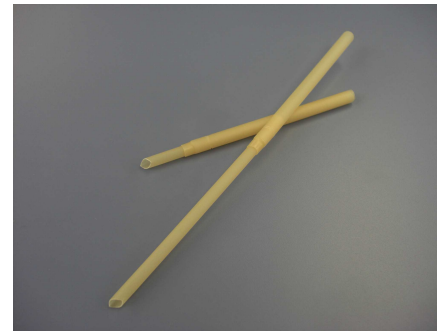
- Use Japan origin biomass plastic (JORA)
- The biomass plastic which made with rice is really eco-friendly. We plan to make over-due date rice which has been disposal as biomass plastic resource. But smell issue is still remaining.

■ Reference

- Telescopic straw use example 【BT pellet combination ratio: 25%】



Single straw



φ 5 telescopic straw

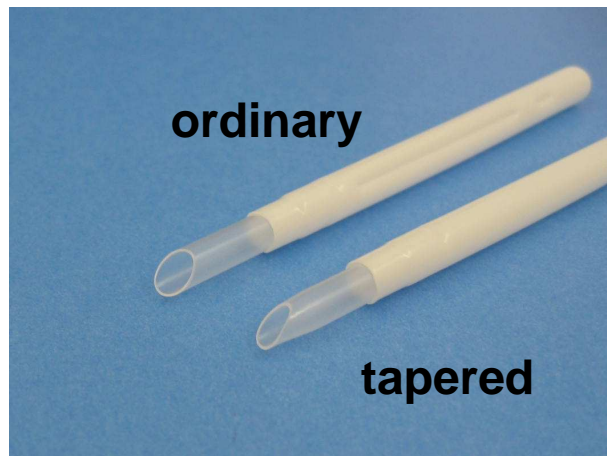
- ◆ BT pellet: resin of Biomass Technology Co.,Ltd.
- ◆ Combination ratio: Test successfully 21%, 25%, 35%, 50%
- ◆ JORA: The Japan Organics Recycling Associate

③ Tapered Straw

■ Characteristic

- Protect dropping the straw hole seal by tapered straw
- Low resistance on sticking through straw hole

■ Reference Figure



Compare products



Scale-up 1

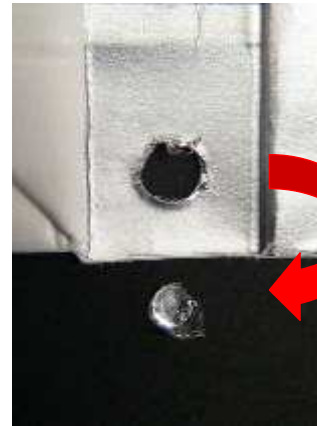


Scale-up 2

■ Straw hole seal dropping

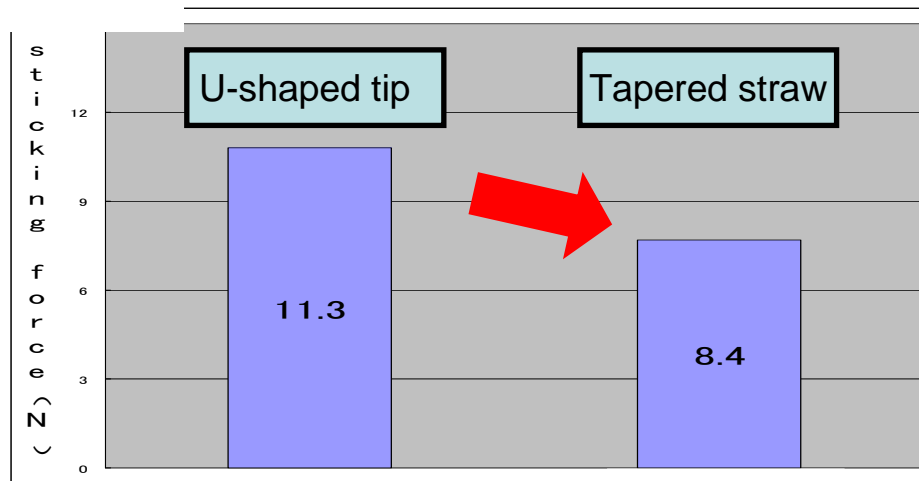


Normal Outlook
Straw hole seal remains
at the straw hole edge



Straw hole seal dropping
Straw hole seal leaves away
completely from the straw hole
edge

■ Sticking force into straw hole (ex. $\phi 6$ with U-shaped tip)



Sticking force (N)
is approximately
25% cut down

④ ϕ 8.4 Reversed telescopic straw

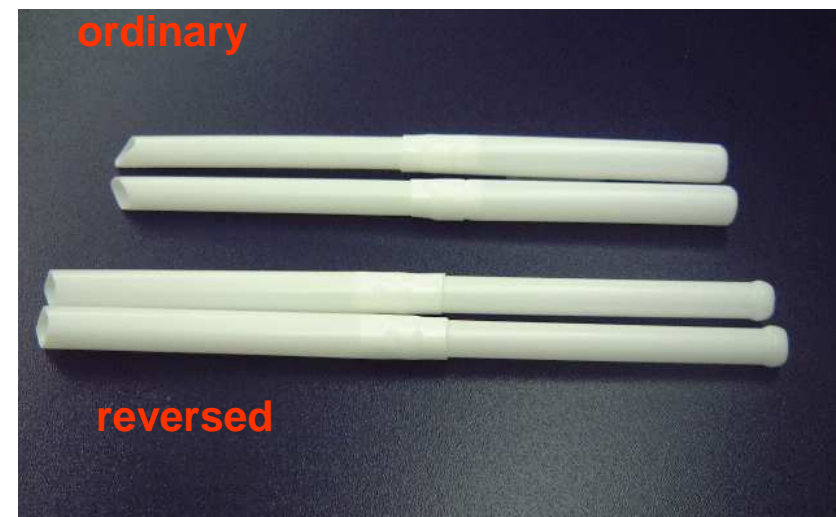
■ Characteristic

Because of the reversed telescopic shape

- Easy to drink up
- Difference in feeling on the tongue

Large diameter reduce sipping noise.

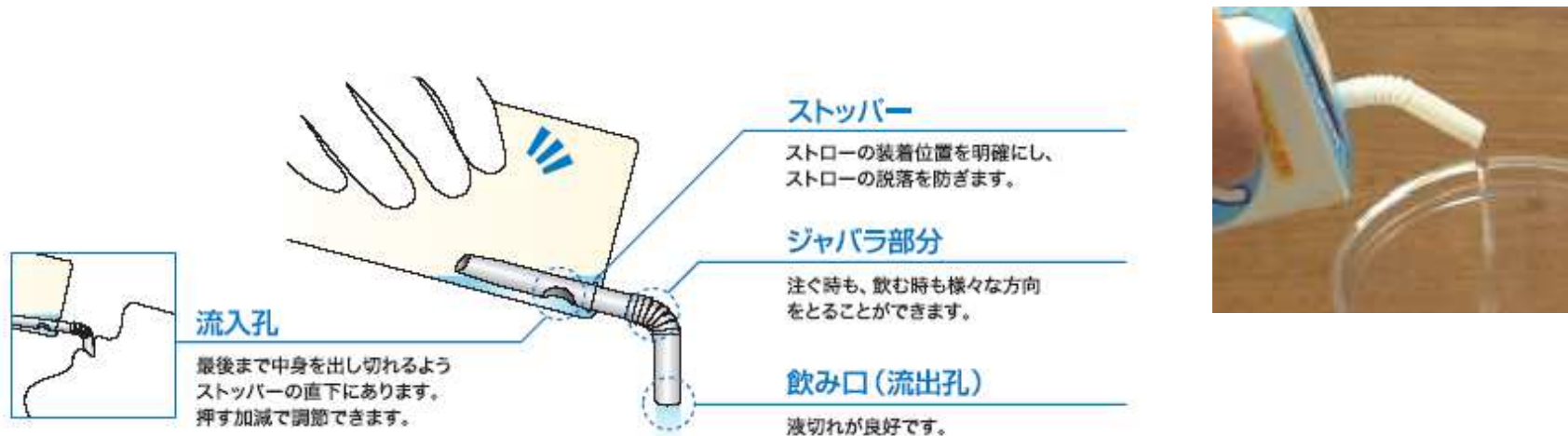
■ Reference Figure



⑤ Exstraw

■ Characteristic

- Both pouring and drinking are available with 6.2 ϕ bendable straw.
- Pour to cup from brick pack available
- Available for every viscosity liquid
- Offering a comfortable drink for person lying face up



⑥ Perforated Straw

■ Characteristic

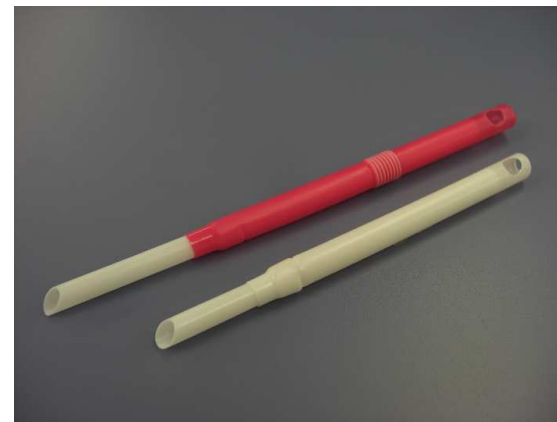
- Feeling to spread in the mouth
For sports drinks
- This straw can usually differentiate products. ($\phi 6$)

■ Processing

- $\phi 6$ to cut a hole in the side tap.

■ Reference

- Cut to telescopic straw



⑦Print Straw

- Characteristic: Available printing on the side of the straws.
- For the advertising purpose or for fun to print drawings or words such like characters images, fortune telling etc.

The project is under development because of the non-availability of the ink for food contact.



⑧ Smooth in Straw

■ Characteristics

- Tapered and angled at outer straw so that the whole telescopic straw is stuck into a pack easily. Inner straw is also tapered.
- Possible to drink higher viscous content with a straw of one-step-bigger diameter (ex. $\phi 6$ straw into $\phi 5$ straw hole)

■ Reference

- $\phi 6$ Smooth in straw (Package equipped with $\phi 5$ straw hole)



Normal



Smooth in

⑨-1 Telescopic Straws with smallest and largest diameter

Characteristic

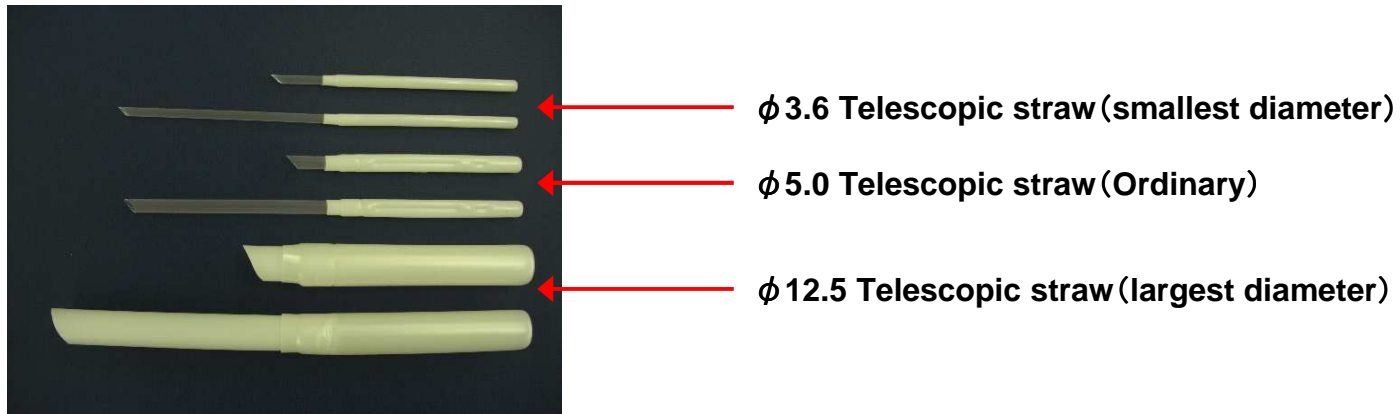
a) Telescopic straw with smallest diameter

- We produce straw with the smallest in diameter
【Out pipe ϕ 3.6mm Inner pipe ϕ 2.4mm】
- Suitable for small container such as small glass bottle
Possible to reduce the amount of content to come out

b) Telescopic straw with largest diameter

- We produce straw with the largest in diameter
【Out pipe ϕ 12.5mm Inner pipe ϕ 10.6mm】
- Suitable for drinking content with pulp or solid pieces

Reference Figure



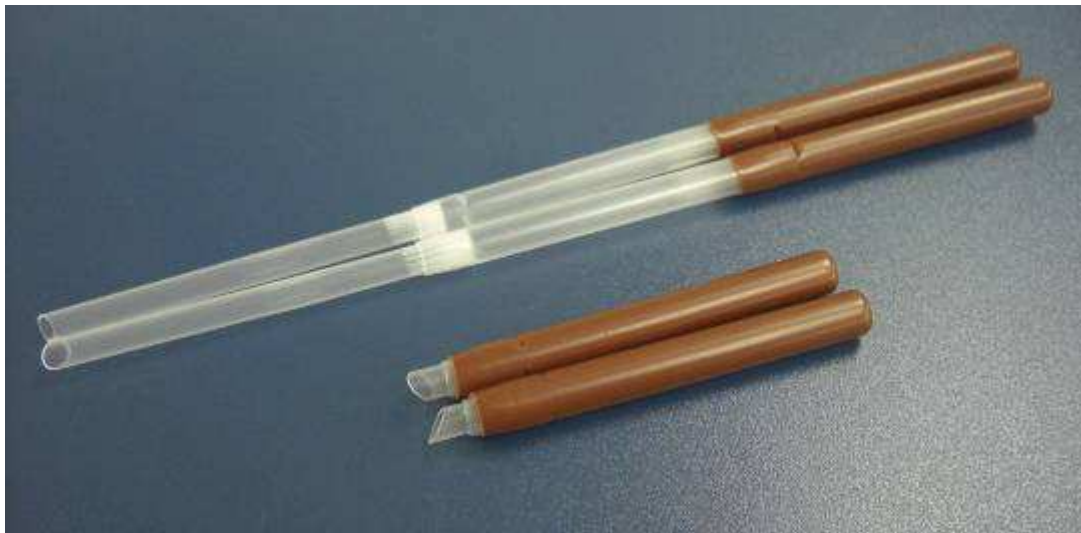
⑨-2 Three staged straw

■ Characteristic

- Consisted of three pipes with different diameter
Upon stretching, the length of straw is almost tripled
- Most suitable for Gable Top carton because of space limitation

■ Reference

- $\Phi 7.3$ 3 Staged straw
Dimension with 65mm upon shortened, and 170mm upon pulled out



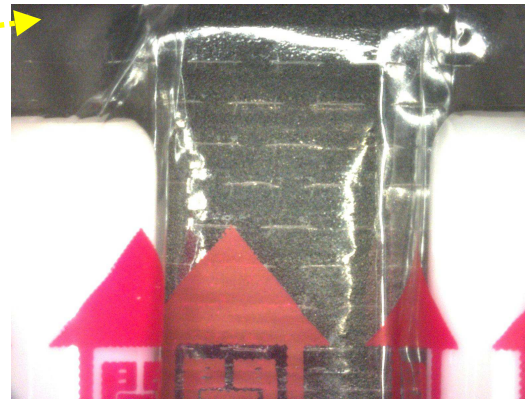
⑨-3 Easy-Open

■ Characteristic

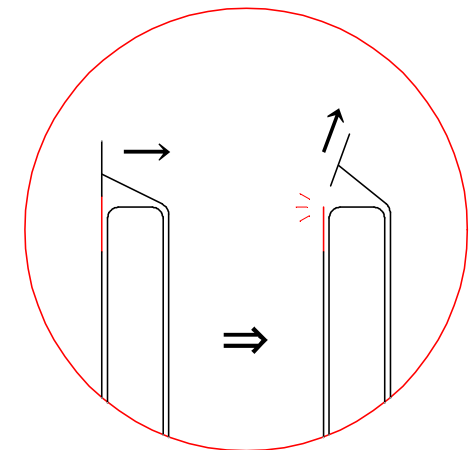
- Consisted of two layers films. One layer with perforation and another layer without perforation are joined by lamination process of extrusion. Because of lamination, no penetration at the perforation.
- By pulling apart the film where straw-end is located, possible to extract a straw easily.

■ Reference

■ $\Phi 5$ Easy-Open film



**Perforation
close-up**



**Method for
pulling apart**

2) Easy-Open straw

■ Characteristic

3 type of method for opening

① **Slit type**

- Tear off from top part of ladder
- Base film formed two layers. The upper layer has slit

② **Microporous type**

- Tear from side of cross seal
- Dense microporous on cross seal

③ **Vertical seal type**

- Easy open to push down straw from top to bottom
- Combination of narrow seal area and non-seal area