PET Bottle Recycling in Japan

Feb. 16, 2012
The Council for PET Bottle Recycling (CPBR, Japan)
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1. What is CPBR
The Council for PET Bottle Recycling, Japan

Main Objectives

- **Promotion** of PET Bottle Recycling
- **Research and Study** of PET Bottle Recycling
- **Advice and Guidance** for PET Bottle Recycling
- **Co-operation** with related PET Bottle Recycling Organizations and Associations

Members

- The Japan **Soft Drinks** Association
- The Japan **Fruit Juice** Association
- The Japan **Soy Sauce** Brewers Association
- The Nippon **Distillers’ PET** Bottle Recycling Association
- Japan **PET Bottle** Association
2. History of PET Bottle and PET Bottle Recycling in Japan

1977: Application of PET Bottle into Soy Sauce was started
1982: Application of PET Bottle for Soft Drinks was approved
   Japan PET Bottle Association was established
1992: **Voluntary Design Guidelines for designated PET Bottle** was published
1993: Foundation of CPBR
1995: Enactment of **“The Containers and Packaging Recycling Law”**
1996: Application of PET Bottle expanded to start the Small Sized PET Bottles (less than 500ml) for Soft Drinks
2001: The issue of “PET Bottle Recycling Annual Report” by CPBR was started
2004: **Chemical Bottle to Bottle (BtoB) Recycling** was approved
   by the Food Safety Commission
2006: **The 1st Voluntary Action Plan for 3R Promotion** was started
2006: Post Consumer PET became Valuables
2008: Global Financial Crisis
2009: Feasibility Study Report on **Reuse of PET Bottle** was published by the Ministry of Environment
2011: **The 2nd Voluntary Action Plan for 3R Promotion** is started
   **Mechanical BtoB Recycling** is started
3. Outline of PET Bottle Industries in Japan

PET Resin Market

- 000 Tons

- 2010 ratio

- O-recycle 14.2%
- Others 4.8%
- Export 0.3%
- S-import 0.6%
- S-recycle 4.3%
- Sheet 1.0%
- Film 1.4%
- F-recycle 19.7%
- Fiber 16.6%
- BtoB 34.1%
- Bottle 5.6%
3. Outline of PET Bottle Industries in Japan

PET Bottle Applications

Designated for Recycling

2010 ratio
- Pharmaceuticals: 2.3%
- Cosmetics: 3.7%
- Detergent: 6.9%
- Edible Oil: 6.9%
- Soy Sauce: 0.8%
- Liquor: 1.8%
- Soft Drinks: 86.9%

000 Tons

3. Outline of PET Bottle Industries in Japan

 Packages for Beverage

2010 ratio

- Pet: 64.9%
- Can: 20.6%
- Glass: 10.4%
- Paper: 1.9%
- Others: 2.2%

Billion L

- 1996: 1.2 billion L
- 2000: 1.4 billion L
- 2005: 1.6 billion L
- 2006: 1.8 billion L
- 2007: 2.0 billion L
- 2008: 2.2 billion L
- 2009: 2.2 billion L
- 2010: 2.0 billion L
3. Outline of PET Bottle Industries in Japan

PET Bottle Market for Beverage and Beer Applications in 2010

000 Tons

- Beer
- Aseptic
- Hot Fill
- CSD

JAPAN: 16% Beer, 48% Aseptic, 36% Hot Fill
ASIA PACIFIC: 25% Beer, 24% Aseptic, 24% Hot Fill
EUROPE: 8% Beer, 46% Aseptic, 44% Hot Fill
NORTH AMERICA: 1% Beer, 29% Aseptic, 14% Hot Fill, 56% CSD
4. PET Bottle Recycling System in Japan

Scheme of Packaging Recycling Law: **Share of Obligation**

- **Consumer** (Sorted Discharge) → **Municipality** (Sorted Collection) → **Bottle Manufacturer & User** (Reclaim) → **Resin Producer**

  - **Used Bottles** → **Bales**
  - **Resin**

- **Bottle Manufacturer & User** → **Recycler** (Chemical, Mechanical / Material) → **PCR User** (Fiber, Sheet, etc)

  - **PCR** (Flake, Pellet)

**BtoB Recycling**
5. 3R (Reduce, Reuse, Recycle) in Japan

Collaboration with other Recycling Associations

**Members**

- The Council for **PET Bottle** Recycling
- Japan **Steel Can** Recycling Association
- Japan **Aluminum Can** Recycling Association
- **Glass Bottle** Recycling Association
- Japan Recycling Council for **Beverage Cartons**
- **Paper Packaging** Recycling Council
- **Corrugated Packaging** Recycling Council
- **Plastic Packaging** Recycling Council
## 5. 3R (Reduce, Reuse, Recycle) in Japan

### Target of 3R for PET Bottles

<table>
<thead>
<tr>
<th>Voluntary Action Plan</th>
<th>The 1\textsuperscript{st} 2006=&gt;2010</th>
<th>The 2\textsuperscript{nd} 2011=&gt;2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reduce</strong> (2004 BM)</td>
<td>PET Bottle Weight Reduction Target: more than 3%</td>
<td>PET Bottle Weight Reduction Target: more than 10%</td>
</tr>
<tr>
<td><strong>Reuse</strong></td>
<td>Study of Returnable System</td>
<td>Promote Mechanical BtoB instead of Reuse</td>
</tr>
<tr>
<td><strong>Recycle</strong></td>
<td>• Collection Rate Target: more than 75%</td>
<td>• Recycling Rate Target: more than 85%</td>
</tr>
<tr>
<td></td>
<td>• Promote Outsiders to comply our Design Guideline</td>
<td>• Promote Outsiders to comply our Design Guideline</td>
</tr>
</tbody>
</table>
5. **3R (Reduce, Reuse, Recycle)** in Japan

**Voluntary Design Guideline for Designated PET bottles = Obligation of PET Bottle Manufacturers & Users**

- Plastic Closures must be made of PE or PP.
  - Do not use Aluminum Closures.

- Bottles must be made of only Clear PET (no color). When use multi-layer / coating for barrier, must evaluate a recycling performance.

- Labels must be easily removable by hand.
5. 3R (Reduce, Reuse, Recycle) in Japan

Bale Quality: Obligation of Consumers & Municipality

Data from the Japan Containers and Packaging Recycling Association http://www.jcpra.or.jp/
5. 3R (Reduce, Reuse, Recycle) in Japan

Collection Status of PET Bottle

<table>
<thead>
<tr>
<th>Year</th>
<th>Voluntary Collection</th>
<th>Municipality Collection</th>
<th>PET Bottle Sales Amount</th>
<th>Collection Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
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<tr>
<td>2009</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
<td>72%</td>
</tr>
</tbody>
</table>

Voluntary collection: 22%
Municipality collection: 50%
5. 3R (Reduce, Reuse, Recycle) in Japan

Comparison with Collection Rates in EU, USA and Japan

[Graph showing comparison of 3R rates and collection rates in Japan, EU, USA, and Europe over the years 2001 to 2010.]
5. 3R (Reduce, Reuse, Recycle) in Japan

Value of Post Consumer PET

- Municipality collection
- Domestic recycling
- Contract Price for Bale

Export to China, etc.

40,000 JPY ≈ 500 USD

77%
67%
49%
66%

Estimate

000 Tons

0 50 100 150 200 250 300 350


1000 JPY/ MT
5. 3R (Reduce, Reuse, Recycle) in Japan

Collection and Recycling Channel

Unit: 000 Tons

2009 China Trade Statistics

- Export to China: 1,361
- Export to North America: 171
- Export to Europe: 241

Europe (sales 3,004)
North America (sales 2,429)
Japan (sales 595)
5. 3R (Reduce, Reuse, Recycle) in Japan

Flow of Collection and Recycling, 2010

- Actual Collection Volume
  - Domestic: 298
  - Export to China, etc.: 330
  - Include Closure, Label: 628

- Recovered Flake Volume
  - Municipality: 206
  - Voluntary: 36
  - Recovered Overseas: 256

- Confirmed Flake Volume
  - Sheet: 84
  - Fiber: 59
  - Bottle: 20
  - Others: 9
  - Total: 172

Unit: 000 Tons
5. 3R (Reduce, Reuse, Recycle) in Japan

High Quality Recycled PET generates many Applications

Unit: 000 Tons

- Sheet, 84 kt, 49%
- Bottle (Chemical BtoB), 20 kt, 11%
- Fiber, 59 kt, 34%
- Others, 9 kt, 6%
5. 3R (Reduce, Reuse, Recycle) in Japan

PET BtoB Recycling Processes

Post Consumer PET Bottle → Sorting, Crashing & Washing

Chemical BtoB Recycling
- Glycolysis (BHET)
- Transesterification (DMT)
- Purification
- Hydrolysis (TPA)
- Polymerization (PET)
- TEIJIN Method
- AIES Method

Mechanical BtoB Recycling
- Flakes
- Melt Extrusion
- SSP
- Bottle (Food Contact Grade)
- Fiber etc.
- Material Recycling

Material Recycling
- Melt Extrusion
- SSP
- Fiber Sheet etc.
Mechanical BtoB recycling was started in Japan last year.

Guideline for use of Recycled Plastics in Food Package is being made by the Ministry of Health, Labour and Welfare.

The Guideline consists of the Following Items:

- Source Control
- Challenge Test
- Evaluation of Recycled Plastics
- Safety Standard
- Process Quality Control
5. 3R (Reduce, Reuse, Recycle) in Japan

Weight Reduction 2004 vs. 2010

2004 (g/btl)

<table>
<thead>
<tr>
<th>Category</th>
<th>2004</th>
<th>2015 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soft Drinks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Fill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>350ml</td>
<td>25.1</td>
<td></td>
</tr>
<tr>
<td>500ml</td>
<td>27.5</td>
<td></td>
</tr>
<tr>
<td>1.5L</td>
<td>55.7</td>
<td></td>
</tr>
<tr>
<td>2L</td>
<td>63.5</td>
<td></td>
</tr>
<tr>
<td>C.S.D.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500ml</td>
<td>31.1</td>
<td></td>
</tr>
<tr>
<td>1.5L</td>
<td>48.3</td>
<td></td>
</tr>
<tr>
<td>Aseptic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500ml</td>
<td>25.2</td>
<td></td>
</tr>
<tr>
<td>2L</td>
<td>51.7</td>
<td></td>
</tr>
<tr>
<td><strong>Liquor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.7L</td>
<td>89.9</td>
<td></td>
</tr>
<tr>
<td>4L</td>
<td>138.9</td>
<td></td>
</tr>
<tr>
<td>Sweet sake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1L</td>
<td>36.2</td>
<td></td>
</tr>
<tr>
<td>1.8L</td>
<td>78.2</td>
<td></td>
</tr>
<tr>
<td>Soy Sauce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500ml</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>1L</td>
<td>33.0</td>
<td></td>
</tr>
<tr>
<td>1.8L</td>
<td>77.0</td>
<td></td>
</tr>
</tbody>
</table>

2010 Target = 97% (-3%)

2015 Target = 90% (-10%)

2004 = 100%
5. 3R (Reduce, Reuse, Recycle) in Japan

Examples of Weight Reduction

KIRIN Beverage “Pecology Bottle”
World Star Sustainability Award Winner

2L Hot Fill
63 g/btl
Reduced in 2005
-21g

2L Aseptic
42 g/btl
Reduced in 2010
-4g

2L Aseptic 38 g/btl
Universal Design
5. **3R (Reduce, Reuse, Recycle)** in Japan

### Examples of Weight Reduction

<table>
<thead>
<tr>
<th>事例項目</th>
<th>会社名</th>
<th>効果</th>
</tr>
</thead>
<tbody>
<tr>
<td>軽量化・つぶしやすさ</td>
<td>日本コカ・コーラ株式会社</td>
<td>ボトル1本当たりの重量…20.5g ⇒ 12g</td>
</tr>
</tbody>
</table>

#### Coca-Cola (Japan) “Eco-ru Bottle: Shiboru”

- **500ml Aseptic**
  - 20.5 g/btl
- **520ml Aseptic**
  - 12 g/btl

- Bio-based Resin

**Reduced**

-8g

Determined by 2011 DuPont Awards for Packaging Innovation

- 2011 Warc Asia Strategy Prize
5. 3R (Reduce, Reuse, Recycle) in Japan

Examples of Weight Reduction

Suntory (Pepsi) “Hybrid Bottle”
Multi-Layer

500ml C.S.D. 31 g/btl

500ml C.S.D. 24 g/btl

Reduced - 7g
Feasibility Study on Reuse of PET Bottle was started in 2008 and the Report was issued by the Ministry of Environment in 2009.

The report concluded that the Returnable System of PET Bottle was Superior to the One Way System in LCA only in the Following Conditions:

- **Collection Rate of the Bottle**: More than 90%
- **Distance of Deliver / Return**: Within 100 km
6. Summary

- Scheme of Packaging Recycling Law sharing Obligation among PET Bottle Manufacturer & User, Consumer and Municipality is Quite Effective
  - Keeping High Collection Rate
  - Keeping High Quality of Bale
  - A Big Problem: Most of PCR are exported to China
- Mechanical BtoB Recycling was started.
- Voluntary Action Plan for 3R Promotion is Very Effective
  - Bottle Weight Reduction
  - Knowing the Difficulty of Reuse of PET Bottle
  - Higher Collection Rate
Thank You for Your Kind Attention!!

The Council for PET Bottle Recycling (CPBR, Japan)

http://www.petbottle-rec.gr.jp/
http://www.petbottle-rec.gr.jp/english/