Closed-loop Oriented Recycling System for WEEE

Endeavor to Advance WEEE Recycling into a Societal System

October 29, 2013

Panasonic Corporation
Why Am I Here Today?

Making people before making products

We are making electronics products

We recycle used products, too
It is the duty of the human beings to make use of all things appropriately. Now we must remind ourselves to appreciate the worth of all things with the spirit of “Mottainai”.

By Konosuke Matsushita
Founder of Panasonic
1. Recycling system in Japan
2. Panasonic way of promoting recycling society
3. National discussion is underway in Japan
4. Recycling is a societal system
Recycling System in Japan: Physical responsibility on manufacturer

**Consumers and businesses**
- Proper handing over and payment for collection & recycling

**Retailers**
- Mandated handing over

**Producers and importers**
- Mandated take-back of products
- Mandated recycling in line with standards

**Designated collection point (377 sites)**
- Receiving & unloading
- Verification with a HA Recycling Manifest
- Input and sending data to the HA Recycling Manifest System
- Transport from DCP to RP

**Recycling plant (49 facilities)**
- Recovery of refrigerant fluorocarbon from fridge
- Dismantling CRT of TV
- Recovery of refrigerant fluorocarbon from AC
- Manual dismantling of washing machine

**Mandated takeback of EoL products**

**Recycling, etc.**
Corporate Profile of Panasonic Eco Technology Center

《Profile》
(1) Founded: April 4, 2000
   Launched operations: April 2, 2001
(2) Employees: 207 (Oct 2013, including contractors)
(3) Annual handling: 0.76 million units
   (FY2012 results)
(4) Annual visitors: 12,000
   * Cumulative total visitors until Oct 2013: 128,000

《Basic business operation concept》
“From products to products” through recycling
TREASURE HUNTING
The cumulative total number of treated waste home appliances reached **10 million units** (July 2013)

[Cumulative total volume of recovered resources] As of July 2013

- **Iron**
  - 154,203 t
  - 188,052 cars
    - *820 kg/car*

- **Copper**
  - 24,036 t
  - Great Buddha of Nara
    - 96 statues
    - *Statue weight: 250 t*
    - *Statue height: 14.98 m*

- **Aluminum**
  - 13,589 t
  - Jumbo Jets
    - 118 jets
    - *115 t/jet*

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Recovered Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2001</td>
<td>0.56 million</td>
</tr>
<tr>
<td>FY2002</td>
<td>0.64 million</td>
</tr>
<tr>
<td>FY2003</td>
<td>0.70 million</td>
</tr>
<tr>
<td>FY2004</td>
<td>0.71 million</td>
</tr>
<tr>
<td>FY2005</td>
<td>0.70 million</td>
</tr>
<tr>
<td>FY2006</td>
<td>0.67 million</td>
</tr>
<tr>
<td>FY2007</td>
<td>0.68 million</td>
</tr>
<tr>
<td>FY2008</td>
<td>0.75 million</td>
</tr>
<tr>
<td>FY2009</td>
<td>1.05 million</td>
</tr>
<tr>
<td>FY2010</td>
<td>1.44 million</td>
</tr>
<tr>
<td>FY2011</td>
<td>1.09 million</td>
</tr>
<tr>
<td>FY2012</td>
<td>0.76 million</td>
</tr>
</tbody>
</table>
PETEC: Factory Visits to Provide Environmental Education

The accumulated number of visitors reached **128,000** (July 2013)

Provide environmental education to elementary and junior high school students.

In the last few years, the annual total of visitors exceeded **12,000**, including those from overseas.

Visitors from 115 countries (as of October, 2013)

Minister of the Environment Saito visited PETEC in 2008.

HK EPD visited PETEC in 2010.
Today’s Presentation

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2. Panasonic way of promoting recycling society

3. National discussion is underway in Japan

4. Recycling is a societal system
**Rise of Resource Risks**

**Resources are limited and unevenly distributed**

- **Resource durable years and output**
  - Rare earth
  - Copper
  - Platinum

- **100 years**
  - Resource durable years

- **100 years**
  - Gold
  - Copper
  - Oil
  - Iron

**Wild fluctuations of resource prices**

- **Changes in non-ferrous metal prices**

  * Indexes with the May 2003 prices set to one

- **Gold**
- **Copper**
- **Zinc**
- **Lead**
- **Nickel**
- **Aluminum**

**Other risks**

- **Impact on the ecosystem**
  - Destruction of nature by resources mining

- **Increase in waste**
  - Causing health problems in developing countries
Excavate around 300 kg of soil to obtain 1 kg of copper.

Copper mining site

1000 m
What are Recycling Technologies?

Recover a highly pure **single material**

**Metal recovery technologies**
- Magnetic sorting systems
- Non-ferrous metal sorting systems
- Vibration sorting systems

**Plastic recovery technologies**
- Mixed plastics
- Single plastic

* PP: Polypropylene, PS: Polystyrene, ABS: Acrylonitrile butadiene styrene

**Crushing in one shot (Refrigerators)**

Refrigerators
Sort Metals: High-purity copper and aluminum sorting system

**Features**

- **Recovers high-purity copper and aluminum** from AC heat exchangers
- Crushes heat exchangers after removing the remaining refrigerant oil. Granulates particles and then sorts materials using air and vibration table

**Benefits**

- Recovery of high-purity copper and aluminum to directly process into freezer pipe-related products (elimination of the refining process)
- Simple mechanism simplifies and reduces system cost

Gives high added value to recycled resources
Sort Plastics: High-precision plastic sorting system

Features

- Auto-detects plastic types at high speed with the near-infrared reflectance spectrum
- Detects and remove RoHS-regulated substances (bromine, etc.)
- Achieves high-precision recovery with a unique high-speed air ejection system

Benefits

- Recovers single plastics (PP, PS and ABS) from mixed plastics with a high degree of accuracy
- By adopting the all-dry method, the system is small and easy to maintain

Contributes to the further expansion of recycled plastic use
Promote recycling-oriented manufacturing where we reduce total resources used and increase total recycled resources used

(1) Reduction of total resources used
- Development of lighter-weight products
- Resource conservation

(2) Resource recovery
- Development of recycling technologies
- Disassembly, crushing and sorting by material

(3) Recycled resource utilization
- Technologies to utilize recycled resources
- Develop uses

Design
Procurement
Production
Use
Recycling

Total resources used
New resources

Product factory
Products

Recycling plant

Society

Recycled resources
Resources recycled at the factory
End-of-life products

Resources recycled from products

(2) Resource recovery
- Development of recycling technologies
- Disassembly, crushing and sorting by material

(3) Recycled resource utilization
- Technologies to utilize recycled resources
- Develop uses
Utilization of Recycled Resources –Plastic Recycling–

Recover plastics from used home appliances and expand the use of recycled plastics.

Home appliance recycling plant (PETEC)
- Waste home appliances
- Crushing mixed plastic
- Automatic sorting (New method)
- Sorted plastic

Material development (Degradation recovery, etc.)

Product factory

Plastic recycling plant
- Cleaning
  - Removal of foreign substances
- Pelletizing
  - Recycled pellets

Kato site, Hyogo Prefecture

Markets
Recycle CRT glass and use it as vacuum insulation

We succeeded in producing approx. 4 µm fine fiber from waste glass wool, which enabled the use of this fiber as a vacuum insulation.
Four Resource Recycling-oriented Products

From products to products

Recycled plastic and glass use ratios

17%  20%  26%  90%
1. Recycling system in Japan

2. Panasonic way of promoting recycling society

3. National discussion is underway in Japan

4. Recycling is a societal system
“Shared Responsibility”: Key Driver to Promote Recycling-oriented Society

**Consumers and businesses**
Proper handing over and payment for collection & recycling

**Mandated takeback of EoL products**

**Retailers**
Mandated handing over

**Producers and importers**
Mandated take-back of products

Mandated recycling in line with standards

- Designated collection point (377 sites)
- Mandated recycling in line with standards
- Proper handing over and payment for collection & recycling
- Mandated takeback of EoL products
- Process flow
  - Receiving & unloading
  - Verification with a HA Recycling Manifest
  - Input and sending data to the HA Recycling Manifest System
  - Transport from DCP to RP
  - Recycling plant (49 facilities)
  - Issuance and keeping of the HA Recycling Manifest
  - Recycling plant (49 facilities)
  - Dismantling CRT of TV
  - Recovery of refrigerant fluorocarbon from fridge
  - Manual dismantling of washing machine
  - Recovery of refrigerant fluorocarbon from AC

- Consumers and businesses
- Retailers
- Producers and importers
Revision of Japanese Home Appliances Recycling Law: Under Discussion

1. Overview of Japanese Home Appliances Recycling Law

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Enforcement</td>
</tr>
<tr>
<td>2008</td>
<td>Announcement of decisions by revision council</td>
</tr>
<tr>
<td>2013</td>
<td>Revision council</td>
</tr>
</tbody>
</table>

Law enforcement status presented at councils* every year.

The law requires the review of the recycling system every five years.

* Councils: Industrial Structure Council (Ministry of Economy, Trade and Industry) and Central Environment Council (Ministry of the Environment)

2. Overview of the joint revision council

<table>
<thead>
<tr>
<th>Committee members</th>
<th>Academic experts and representatives from manufacturers, retailers, consumers and local governments</th>
</tr>
</thead>
</table>
| Deliberation period | • May ~ December 2013  
• Revised law to be enforced from April 2014 |
| Major issues under discussion | (1) Recycling fee collection system  
(2) Making breakdown of recycling fee visible, reducing fee  
(3) Optimizing product recycling rate  
(4) Collection and transport by retailers  
(5) Regulation of illegal export  
(6) Making “invisible routes” transparent and regulation of illegal waste handling  
(7) Measures for remote islands and illegal dumping |
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Advancement of Recycling WEEE

(1) How to collect more WEEE at low cost

(2) Search for most efficient way to recycle

Success of recycling is dependent on whether we can create a business model that effectively matches (1) collection and (2) recycling systems.
Home Appliance Recycling System: Panasonic’s Business Model

Recycling Management Company
Ecology Net Co., Ltd.

Panasonic and 21 manufacturers

Waste Generator (Consumers)
Retailers
Government
Local

Designated Collection Points
Secondary logistics

Recycling Plants (36)
Manufacturers’ RP (5)
- PETEC (Panasonic)
- PETECK [(Panasonic) (Mitsubishi Materials)]
- CETEC [(Mitsubishi Materials) (Panasonic)]
- TERM (Toshiba)
- NKRC [(Toshiba) (Panasonic)]

Entrusted recycling plants that have existed before the law (31)
In addition to complying with recycling laws in each country, we attempt to go further: we endeavor to play an active role in creating the most efficient recycling system in each country in view of its local recycling infrastructure.

* Actual treatment volume / weight of fiscal year 2012
Introduction of our New Recycling Plant in China

Social background

(1) Increasing number of waste home appliances in China
(2) Enforcement of the Regulation for the Management of Recycling and Disposal of Waste Electrical and Electronic Products

Company concept

1. Harmony between the environment and humans
2. High-efficiency recycling with advanced technologies
3. Promotion of resource recycling

Panasonic Dadi Dowa Summit Recycling Hangzhou Co., Ltd. (PDSH)

<table>
<thead>
<tr>
<th>Location</th>
<th>Tonglu county, Hangzhou city, Zhejiang province</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation</td>
<td>November 15, 2011</td>
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</tbody>
</table>
| Investors         | • Hangzhou DADI Environmental Protection Engineering Co., Ltd.  
|                   | • Panasonic Corporation of China               |
|                   | • DOWA ECO-SYSTEM Co., Ltd.                    |
|                   | • Sumitomo Corporation                         |
| Description of business | Recovery, dismantling and resource sales for five designated waste home appliances in Zhejiang province |

Annual handling

Around one million units (plan)

Comment by Chinese Gov (Sep 2013 at plant site)

After studying recycling facilities around China which are invested by foreign companies, we are highly impressed by PDSH’s advanced recycling technology and management system which are adopted from PETEC Japan. They are far better than the others in China.

View of Tonglu county, Hangzhou city
Lastly

Panasonic has been endeavoring to play an active role in creating most efficient recycling system in Japan, Europe, US and China in view of its local recycling infrastructure. It is hoped that the most efficient recycling system, which is also the most suitable to “Hong Kong society”, will be implemented in the near future. Panasonic is committed to contribute to “Hong Kong society” through making a proposal for the design of recycling system as societal system.
Thank you for your kind attention