e-waste recycling at DOWA

November 7\textsuperscript{th}, 2018

\texttt{DOWA ECO-SYSTEM CO., LTD.}
Introduction of DOWA

e-waste recycling
Global expansion
eco-friendly recycling system in Asia
DOWA Group

- Foundation: 1884
- Capital: 330 million USD
- Sales: 4,280 million USD ※
- Employee: 6,500 ※
- DOWA Global Activity
  - Over 100 Network

Sales by Business Segment ※
※ Fiscal Year 2017

- Nonferrous: 42%
- Environmental Management: 20%
- Electronic Materials: 15%
- Metal Processing: 18%
- Heat Treatment: 5%

Sales by Region:
- Japan: 70%
- Asia: 30%
- Europe: 10%
- America: 10%
DOWA Group comprises five main businesses diversified from its success in mining and smelting operations.

- **Environmental Management & Recycling** — DOWA ECO-SYSTEM CO., LTD. —
  - Offering comprehensive services in waste treatment, soil remediation, and recycling.

- **Nonferrous Metals** — DOWA METALS & MINING CO., LTD. —
  - Recovering of more than 20 types of metal from various raw materials.

- **Electronic Materials** — DOWA ELECTRONICS MATERIALS CO., LTD. —
  - Developing cutting-edge technologies in making semiconductors, electrical and magnetic materials.

- **Metal Processing** — DOWA METALTECH CO., LTD. —
  - Supplying high-performance copper alloys, electroplated products and metal-ceramic substrates.

- **Heat Treatment** — DOWA THERMOTECH CO., LTD. —
  - Supplying industrial furnaces and high quality commercial heat treatment services.
DOWA ECO-SYSTEM

- Sales: 928 million USD ※ as of Mar 2018
- Employee: abt 2,500 ※ - abt 50% employees in overseas
- Services:
  - Recycling
  - Waste Management
  - Soil Remediation
  - Logistics
Introduction of DOWA e-waste recycling
Global expansion eco-friendly recycling system in Asia
Overview – Focus Metal Recycling

**Dismantle & Shredding**
- **Automobile**: Domestic Catalyst
- **E-waste**: Household Appliance - Domestic
  - TV
  - Refrigerator
  - Washing machine
  - Air conditioner
- **E-scrap**: World Wide
  - PC
  - Cell Phone
  - Printed Circuit Board
  - Metal Scrap

**Dowa’s Activities**
- **Incineration**
- **Smelting**
- **Dismantle/Separation**

**ASR**
- Gold
- Silver
- Copper
- Platinum Palladium Rhodium

**Printed Circuit Board**

**Household Appliance** - Domestic

**ASR**

**PC**

**Cell Phone**

**Metal Scrap**

**motivate our planet**
Household appliance dismantling
(AC/WM/RE/TV)

Eco-Recycle
- Capacity: 150K unit per year
- Employee: 50
- Operation: since 2001
☞ Dismantling by manual operation
  Flexible operation

Act-b Recycling
- Capacity: 300K unit per year
- Employee: 80
- Operation started from year 2001
☞ High efficient operation supported by automation.
Extract Various Metals – Recycling Smelter complex

- **Zinc Concentrate**
- **Metal Scrap**
- **E-scrap**
- **Auto Spent Catalyst**
- **Steel Dust**

![Akita Zinc](image)

- **Pb/Ag Residue**
- **Zn Residue**

**Kosaka**

- **Au, Ag, Cu, Pb, Bi, Sn, Sb, Ni, Se, Te, etc**

**Nippon PGM**

- **Pt, Pd, Rh, etc**

**DOWA**

- **Zn, In, Ge, Ga, Cd, etc**
History of Kosaka

- **1861** Silver Vein found / Start Mining by Gov
- **1884** Mine disposed of by Gov to DOWA
- **1902** Start Open Pit Mining (**KUROKO**)
  - Start Complexed Copper ore Smelting
- **1980** Start E-scrap smelting / Overseas concentrate
- **1985** High Yen recession
- **1994** Domestic mines closure
- **2008** Install
  - New Furnace / Process
  - Advanced Smelting Technology for complex material
  - Various Metals recovery
  - Safety treatment of Hazardous

![Component](source)

<table>
<thead>
<tr>
<th>Component</th>
<th>KUROKO</th>
<th>General Conc.</th>
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<tbody>
<tr>
<td>Au</td>
<td>50 g/t</td>
<td>20</td>
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<tr>
<td>Ag</td>
<td>1500</td>
<td>150</td>
</tr>
<tr>
<td>Cu</td>
<td>20 %</td>
<td>28 ~ 30</td>
</tr>
<tr>
<td>Pb</td>
<td>4</td>
<td>0.1 ~ 0.3</td>
</tr>
<tr>
<td>Zn</td>
<td>5</td>
<td>0.1 ~ 0.4</td>
</tr>
<tr>
<td>As</td>
<td>0.5</td>
<td>0.01 ~ 0.04</td>
</tr>
<tr>
<td>Sb</td>
<td>0.5</td>
<td>0.01 ~ 0.03</td>
</tr>
<tr>
<td>Bi</td>
<td>0.04</td>
<td>&lt;0.01</td>
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</table>

DOWA

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Introduction of DOWA e-waste recycling

Global expansion

eco-friendly recycling system in Asia
DOWA’s Network in Asia

- Waste Management (Landfill)
- Waste Management (Incineration)
- Waste Management (Landfill)
  - Metal Recycling
  - Soil Remediation
- Waste Management (Incineration)
  - Metal Recycling

Metal Recycling

Soil Remediation

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Global quantity of E-waste generated

*Data: UN University report
• Global E-Waste Volume Hits New Peak in 2014
Global trade of E-waste

Global Marketing Network

Kosaka Smelter Complex

Auto Spent Catalyst

Printed Circuit Board

Nurnberg

Bangkok

NY
Company: **DOWA Environmental Management Co., Ltd.**

Foundation: 2003

Business Activity: Precious Metals recycling, Electronic appliances recycling

The first Japanese company to advance environmental / recycling business in earnest.
Company: DOWA ECO-SYSTEM SINGAPORE Pte.
Foundation: 2012
Business Activity: Precious Metals Recycling
- Precious metal recovering through Chemical process
- Pretreatment for Kosaka smelter complex
Thailand (Incinerator and Landfill)

Bangpoo Environmental Complex Co., Ltd. (BPEC)
A Joint Venture Project with Industrial Estate Authority of Thailand (IEAT)

Eastern Seaboard Environmental Complex Co., Ltd. (ESBEC)
Landfill for Non Hazardous waste, Waste blending, WWWE recycling.
PT. PRASADHA PAMUNAH LIMBAH INDUSTRI (PPLi)

5% share owned by Indonesian Government.
Only one integrated waste management facility in Indonesia.
GOLDEN DOWA ECO SYSTEM MYANMMAR Co., Ltd.

420,000 m² area in Thilawa Special Economic Zone. Just started operation in Dec/2015.
Introduction of DOWA e-waste recycling
Global expansion
eco-friendly recycling system in Asia
Japan Mining Industry Association (JMIA)
Industrial organization representing mining and smelting companies producing non-ferrous metals such as gold, silver, copper, lead, zinc and nickel in Japan.
Proper recovery precious and base metal from E-Scrap in Asia

There are copper smelters in Asia countries.

Some smelter can’t or don’t receive PCBs as raw material due to technical and environmental problem.

Capacity ton per month

**Japan**: 17,000 ton

Korea: 5,000 ton

China: ???

(non official data)

Copper Smelter location

Copper Smelter
Blank Area
Green List items traceability system

Import side (Japan)

- JMIA
- Smelters

Export side

- MOE Competent Authority
- Competent Authority
- Exporter

JMIA report receiving and treated QTY and origin countries

Smelter report receiving and treated QTY and origin countries

Control origin and QTY with traceability code

Trans boundary Movement confirmation

Material flow

Traceability code

Traceability Report
## Smelters Compliance with JMIA rule

<table>
<thead>
<tr>
<th>Company</th>
<th>Plant</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOWA HOLDINGS CO., LTD</td>
<td>KOSAKA SMELTING &amp; REFINING CO., LTD</td>
<td>60-1, Otarube, Kosakakouzan, Kosaka-machi, Kazuno, Akita, 017-0202, Japan</td>
</tr>
<tr>
<td>DOWA HOLDINGS CO., LTD</td>
<td>ECO-System Recycling CO., LTD. East Japan Plant</td>
<td>1781-3 Nitte, Honjo-shi, Saitama-ken, 367-0002, Japan</td>
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<tr>
<td>DOWA HOLDINGS CO., LTD</td>
<td>ECO-System Recycling CO., LTD. West Japan Plant</td>
<td>1 Chome-3-1, Kaigandori, Minami-ku, Okayama-ken, 702-8045, Japan</td>
</tr>
<tr>
<td>DOWA HOLDINGS CO., LTD</td>
<td>ECO-System Recycling CO., LTD. Northern Japan Plant</td>
<td>Sugisawa-96, Kosakakozan, Kosaka-machi, Kazuno-gun, 017-0202, Akita-ken, Japan</td>
</tr>
<tr>
<td>MITSUI MINING &amp; SMELTING CO., LTD.</td>
<td>Takehara Refinery</td>
<td>1-5-1, Shio-machi, Takehara-shi, Hiroshima, 725-0025, JAPAN</td>
</tr>
<tr>
<td>Kamioka Mining and Smelting Co., Ltd.</td>
<td></td>
<td>1-1 Shikama, Kamioka-cho, Hida City, Gifu, 506-1196 JAPAN</td>
</tr>
<tr>
<td>Mitsui Kushikino Mining Co., Ltd.</td>
<td>Recycling &amp; Smelting Plant</td>
<td>12955 Mitsui, Ichiki Kushikino, Kagoshima, 889-0068, Japan</td>
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<tr>
<td>Sumitomo Metal Mining Co., Ltd.</td>
<td>Toyo Smelter &amp; Refinery</td>
<td>145-1, Funaya-Aza-Shinchi-Otu, Saijyo, Ehime 793-0005, Japan</td>
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<tr>
<td>Ohkuchi Electronics Co., Ltd.</td>
<td></td>
<td>1755-2, Ohkuchi-Ushio, Isa, Kagoshima 895-2501, Japan</td>
</tr>
<tr>
<td>Mitsubishi Materials Corporation</td>
<td>Naoshima Smelter &amp; Refinery</td>
<td>4049-1 Naoshima-cho, Kagawa-gun, Kagawa 781-3110, Japan</td>
</tr>
<tr>
<td>Onahama Smelting &amp; Rofining Co., Ltd.</td>
<td>Onahama Smelter &amp; Rofinery</td>
<td>1-1 Nagisa, Onahama, Iwaki-cho, Fukushima 971-8101, Japan</td>
</tr>
<tr>
<td>JX Nippon Mining &amp; Metals Corporation</td>
<td>HMC Department, Hitachi Works</td>
<td>3453, Miyaco-cho, Hitachi-cho, Ibaraki 317-0055 JAPAN</td>
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<td>JX Nippon Environmental Services Co., Ltd.</td>
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<td>3453, Miyaco-cho, Hitachi-cho, Ibaraki 317-0055 JAPAN</td>
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<tr>
<td>Pan Pacific Copper Co., Ltd.</td>
<td>Saganoseki Smelter &amp; Refinery</td>
<td>3-3382 Saganoseki, Oita-cho, Oita-ken 879-2201, Japan</td>
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<td>JX NIPPON MIKKA CHI RECYCLE CO., LTD.</td>
<td></td>
<td>8, Tenjinshin, Kurobe-cho, Toyama 938-0042 Japan</td>
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<td>JX NIPPON TOMAKOMAI CHEMICAL CO., LTD.</td>
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<td>152, Yufutsu, Tomakomi-cho, Hokkaido, 059-1372, Japan</td>
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<td>JX NIPPON TSURUGA RECYCLE CO., LTD.</td>
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<td>1, Wakaizumi-cho, Tsuruga-cho, Fukui 914-0027 Japan</td>
</tr>
</tbody>
</table>
Expanding traceability e-waste in Asian network (Stop informal materials flow)

Encourage eco-friendly recycling system in Asia

Exchange information of regulation and law for e-scrap each courtiers.

Establish common rule for e-waste materials movement in Asia

Simplification a permission exporting e-waste to authorized Japanese smelters

Speed up approval of transit e-waste to Japan
Dowa Future

- Contributing to environmental improvement in Asia
- Contributing to Recycling-oriented society
- Expanding services - Low-Carbon emission

Our Mission at DOWA ECO-SYSTEM is to discover, nurture and bring to life the ideals of people and companies who share our planet.