Technical Assistance for Designing a Low-Carbon City Plan in Surabaya, Indonesia

July 10, 2013

AMITA CORPORATION
Corporate Profile

- Establishment: April 1, 1977
- Capital: 474,920,000 JPY (as of March 31, 2013)
- Sales: 4,987,699,000 JPY (as of December 31, 2011)
- Stock listing: JASDAQ (Security code 2195)
- Employees: 161 (as of March, 2013)
- Head Office: 28 Sanban-cho, Chiyoda-ku, Tokyo 102-0075 Japan
- Business Offices: Tokyo, Sendai, Ibaraki, Saitama, Chiba, Kawasaki, Hamamatsu, Nagoya, Osaka, Himeji, Hiroshima, Kitakyushu
- Recycling Plants: Himeji, Ibaraki, Kyoto, Kawasaki, Aichi, Kitakyushu
- Amita Group:
  - AMITA Holdings Co., Ltd.
  - AMITA Institute for Sustainable Economies
  - AMITA Institute of Environmental Certification Co., Ltd.
  - AMITA Properties Co., Ltd.
We design sustainable society and economy!

**Sustainable Society**

- Biogas Generation
- Regeneration of environment and its utilization
- Local Design Primary Industry Consultation
- FSC® Certification
- MSC/ASC Certification
- Environmental Risk Consultation
- It system for Environmental Management
- Environmental Business Marketing
- Utilization of Industrial Residues
- Alternative Resource Production

**Terrestrial Resources**
(Material Resources)

**Information Resources**

**Regional Resources**
(Social Resources)
Business Concept  ~Waste Reuse in Cement Plant~

Virgin raw material

CaO  SiO$_2$  Al$_2$O$_3$  Fe$_2$O$_3$  Coal

Waste Generator

AMITA

Alternative raw material

SlurMix  CRM

Cement plant

※CRM is used as alternative SiO$_2$&Al$_2$O$_3$

Mine

Landfill

Incinerator

100% Recycle (Reuse)
AMITA has over 35 years experiences of operating the recycling plants.

AMITA recycle more than 4,000 kinds of industrial residue.

AMITA produces over 150,000t of product per year, and achieve 100% recycle.
【Our KNOW-HOW】
1. The best practices of nation-wide waste recycle operations
2. The uniqueness in the quality adjustment by blending and processing
Role of “Blending”

This is the basic concept of role of blending.

For Example

Cement company request: Quantity: 500t

Specification: Cl < 2,500ppm, Zn < 1,000ppm, Calorie > 2,000kcal/kg

Mixing and processing those residues to meet cement company’s request.

Quantity: 500 t
Cl: 2,000ppm  Zn: 1,000ppm  2,500kcal/kg
Objective of the Survey

Objective
To calculate reduction amount of CO$_2$ emission in case of utilizing raw material made from industrial waste instead of using fossil fuel in Indonesian cement manufactures.

Reduction of CO$_2$
Assumption: Constructing intermediate treatment plant in Indonesia

- Production of SlurMix®: 10,000t/ Year

- Calorific value of SlurMix®: Ave. 3,349kcal/kg
  \[ 10,000t \times 3,349\text{kcal/kg} = 335,000,000\text{kcal/kg} \]

- Ave. calorific value of coal is 6,354kcal/kg
  \[ 5,270\text{t of coal} \]

- CO$_2$ emission of coal is 2.33t/coal ton
  \[ \text{Cement manufacture could save about 12,280t } \text{CO}_2/ \text{ Year by using SlurMix®.} \]
Location of Recycling Plants

Kyotango Recycling Plant

Himeji Recycling Plant

Ibaraki Recycling Plant

Kawasaki Recycling Plant

Kitakyushu Recycling Plant

Tokai Recycling Plant
100% waste is converted into recycled materials
Variety of wastes are different from normal raw materials for products.; Unstable contents and supply timing is discontinuous
“Mixing” technology developed by AMITA can convert wastes into quality liquid fuel, material for cement, material for metal

Himeji
- Process
  - By mixing
    “For Cement”, “For Metal”, “Crushing”

Kawasaki
- Process
  - By Mixing for “Cement”

Ibaraki
- Process:
  - By Mixing for fuel
    For Cement, Crushing

Kitakyushu
- Process
  - By Mixing for “Cement”, “Material for Metal”

100% waste is converted into recycled materials by methane fermentation
Waste foods and beverages are fermented and generate methane gas; used for energy (Power, Heat). Residues from methane fermentation are converted into fertilizers used for farming; Generation of energy and Food recycling is function as Model for Recycle-orient-District

Kyotango
- Process
  - By methane fermentation
    “Power” generation
    “Compost”, “Liquid fertilizer”

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Views of Recycling Plants

Blender (Quality Governing · Grade Adjustment)

Storage for Blended Cement Raw Material

Working by Wheel Loader

Completing Safety and Quality Management by thorough Analysis
## List of Raw Materials

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil containing sludge</strong></td>
<td>Tank sludge, waste white clay, oil-based scum, paint, waste water sludge, printing ink residue, paint waste water sludge, slurry sludge, coal slurry, crude oil sludge, etc</td>
</tr>
<tr>
<td><strong>Sludge</strong></td>
<td>Active sludge, car wash sludge, paper making sludge, lime sludge, neutralization sludge, waste water treatment sludge, carbon sludge, sand sludge, iron containing sludge, water purification sludge, sewage sludge, organic sludge, epoxy sludge, plating neutralization sludge (containing various heavy metals), pickling sludge, Ni sludge, Cu sludge, dehydrated cake, polishing sludge, etc</td>
</tr>
<tr>
<td><strong>Combustion residue</strong></td>
<td>Coal residue, coke ash, heavy oil combustion ash, flue ash, aluminum ash, sewerage combustion ash, paper making sludge, combustion sludge, combustion ash containing various heavy metals, etc</td>
</tr>
<tr>
<td><strong>Dust</strong></td>
<td>Bug filter trapped dust, cyclone trapped dust, coal ash, coke ash, paper making sludge combustion dust, SUS dust, EP ash, waste sand dust, converter furnace dust, steel dust, electric furnace dust, cupola dust, dust containing various heavy metals, etc</td>
</tr>
<tr>
<td><strong>Waste oil</strong></td>
<td>Waste lubricating oil, waste cutting oil, waste wash oil, waste insulating oil, waste rolling oil, waste operating oil, waste mineral oil, waste animal/vegetable oil, tanker cleaning water, tar pitch, waste varnish, waste creosote, tank sludge, EG waste liquid, PG waste liquid, TEG waste liquid, waste coolant, recycled oil, etc</td>
</tr>
<tr>
<td><strong>Waste solvent</strong></td>
<td>IPA waste liquid, methanol waste liquid, DMF waste liquid, waste paint, xylene waste liquid, toluene waste liquid, MEK waste liquid, resist waste liquid, etc</td>
</tr>
<tr>
<td><strong>Waste acid</strong></td>
<td>Sulfuric acid, hydrochloric acid, phosphoric acid, fluonitric acid, etc</td>
</tr>
<tr>
<td><strong>Waste alkali</strong></td>
<td>Metallic soap waste liquid, waste soda liquid, degreasing waste liquid, developing solution, peeling agent, waste cleaning liquid, etc</td>
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<tr>
<td><strong>Waste plastic</strong></td>
<td>Various resins</td>
</tr>
<tr>
<td><strong>Slag</strong></td>
<td>Blast furnace slug, converter furnace slug, electric furnace slug, cupola furnace slug, waste casting sand, etc</td>
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<tr>
<td><strong>Used catalyst</strong></td>
<td>Desulfurization catalyst, FCC catalyst, SiO2 catalyst, Al2O3 catalyst, Ni catalyst, Fe-Cr catalyst, Cu catalyst, Zn catalyst, Ni-Mo-X catalyst, etc</td>
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<tr>
<td><strong>Scrap metals</strong></td>
<td>Scale, polishing powder, shot powder, oil-based polishing powder, meltdown residue, steel cord, various non-ferrous metals, etc</td>
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<tr>
<td><strong>Others</strong></td>
<td>Carbon powder, toner powder, carbon black, activated coal residue, iron powder, animal/vegetable residue, waste syrup, sawdust, waste coffee ground, waste tea leaves, bean residue, residual material after processing, irregular products, defective items, expired raw material, used toner cartridge, waste paper, waste wood, etc</td>
</tr>
</tbody>
</table>
Treatment Process (SlurMix®)

- **Liquid Material**
  - Analysis of Raw Materials
  - Tank 45m³
  - Vibrating Screen
  - ≤2mm
  - Pit 45m³
  - CRM Raw Material

- **Raw Material**
  - Analysis of Raw Materials
  - Agitation tank 40m³
  - Analysis
  - Wet crusher ≤0.2mm
  - Analysis
  - Product Storage

- **Product Analysis**
  - Adjustment tank
  - Analysis
  - Product Storage

- **Shipping**
  - Shipping
  - SlurMix® (Alternative Fuel)
Treatment Process (CRM)

Raw Materials
Analysis of Raw Materials

Quality Control (Mixer)

Size Control (Vibrating Screen)

Magnetic Separator

Product Analysis

Low-Calorie Products

High-Calorie Products

CRM (Cement Raw Materials)

Shipping

Cement Fuel
Utilization of Amita’s Products in Cement Kiln

- Fly Ash
- Mold Sand
- Slag
- Sludge
- Cement Raw Material
- Waste Tire
- Waste Plastic
- Sludge
- Waste Oil
- Waste Plastic
- Cement Raw Material (with calorific value)
- Clinker
## Waste Utilization in Indonesia and Japan

<table>
<thead>
<tr>
<th></th>
<th>Indonesia</th>
<th>Japan</th>
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<tbody>
<tr>
<td>Population</td>
<td>230,000,000</td>
<td>128,000,000</td>
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<tr>
<td>Area</td>
<td>1,910,931 km²</td>
<td>377,930 km²</td>
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<tr>
<td>Industrial waste generation</td>
<td>7,000,000 t / year</td>
<td>400,000,000 t / year</td>
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<tr>
<td>Cement production</td>
<td>55,000,000 t / year</td>
<td>57,579,000 t / year</td>
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<tr>
<td>Waste recycled amount by cement industry</td>
<td>? t / year</td>
<td>44,400,000 t / year</td>
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<tr>
<td>Waste consumption rate in cement industry</td>
<td>? kg / cement 1t</td>
<td>469 kg / cement 1t</td>
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</tbody>
</table>
Survey items

【1】Baseline Survey
  ・Cement production
  ・Waste consumption rate in cement industry
  ・Energy consumption amount, energy consumption rate, CO₂ emission amount

【2】Market Survey
  ・Generation amount of each industrial waste
  ・Simulation of the products
  ・Treatment cost of each industrial waste
  ・Relevant environmental regulation

【3】Fusibility Study
  ・Construction cost of intermediate treatment plant for cement raw material
  ・Government support
  ・Project finance（JBIC, JICA, etc.）
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<tr>
<th>Survey Items</th>
<th>Jul</th>
<th>Aug</th>
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