Introduction to Waste Management Systems in Japan

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- Supercritical Technology
- Development and Assessment of Recycling Technology
- Biomass Town and Eco Town
- Biomass Utilization in Indonesia
Waste Management Concept in JAPAN

Waste management:
Collection
Transport
Processing
Recycling
Disposal

Reduce the negative impacts waste has on environment and society.

Methods of Waste Management:
Disposal Methods
• Incineration
• Land fills

Recycling Methods
• Biological reprocessing (C and M)
• Energy recovery
  i) Pyrolysis
  ii) Gasification

Efficiency?

Food waste (I and M), Leaf and Wood (I)
Sludge (I and M jokaso)

Waste Classification:
Industrial → Enterprise is responsible for treating it.

Municipal → Municipalities are responsible for management

Biomass I

Biomass M

Attention!!!
Recycling-oriented Society

Transformation into a Recycling-oriented Society:
- Reduction of natural resource consumption and waste generation
- Minimization of environmental risks in the process of waste treatment

General Law Concerning the Dissemination of the 3R
- Reduce the generation of sub-products in the production process.
- Adopt Zero Emission measures; Collection and recycling of used products.

Waste Management Hierarchy under the Fundamental Law:
1. Source reduction or waste prevention
2. Re-use
3. Recycling
4. Energy recovery
5. Appropriate disposal
Considering Recycling (Cascade Utilization)

High value material
Human food
Horizontal use - Composite
Pet food
Feed
Compost - Fertilizer
Building material
Fuel

Note) Factor in
- Organic and inorganic
- Location
- Scale
- Social status
- Self-sufficient - Recycling society
- Oil price
- Low carbon society
- Others...
(2) Effective utilization development of unused biomass resources

Next generation tool for forest management and forestry support

a. Plantation - Forestry
   - Development of high performance forestry machines introduced
   - Rediscovery of non-timber forest products
   - Plantation conversion

b. Forestry activity
   - Human resources
   - Employment
   - Recreation and ecotourism
   - Business Development
   - Citizen Participation

Natural Wisdom alive
Activation of primary industry, environmental and mountains protection

Evaluation of sustainable society base on forest

a. Evaluation of environment and biodiversity
   - CO₂ absorption/fixation
   - Landslide prevention
   - Water conservation
   - Shoreline•beach sands•fishery conservation
   - Biodiversity conservation

b. Economic system evaluation
   - CDM national practice
   - Eco-economy

c. Infrastructure and network formation
   - Core of various group
   - Information dispatch base
   - Entire summary

Low-carbon society through cooperation in different fields and industries

Biomass Advanced technology available

a. Biofuel production
   - Bioethanol from wood

b. Biorefinery
   - Fiber
   - Plastic
   - New material

c. Hydrothermal treatment of waste
   - Methane fermentation
   - Burning
   - Hydrogen fermentation

d. Mixed combustion
   - CO₂ emissions
   - Mixed catalyst

e. Agriculture Engineering
   - Cellulose feed
   - Bark compost

Forest resource base in Aichi and creation of a recycling society

Complex regional resource recovery plan
Effect of material properties and liquid introduced to methane fermentation on liquid fertilizer utilization >>> Biomass town concept

Chita Biomass utilization project year 2010

- Livestock feed
- Ethanol production
- Methane fermentation
- Food waste
- Digested wastewater

Chita Hantou Goichigo region fiscal year 2011
Livestock, Bio-oil, Bamboo and pruning branches, Sludge and garbage, Bank group

- Manure surplus
- Odor problem
- Water contamination?
- Wastewater treatment costs

Used as liquid fertilizer

A large number of cow manure

Milk cow

Manure 10〜30kg/day/cow
Urine 6〜20kg/day/cow

Problem
Center for biomass compound utilization and waste water treatment (My plan)

- Wastewater
- A waste-based business
- Human waste Septic tank sludge
- Pruned branches

**Purification**

**Volume reduction**

**Drying**

**Sewage treatment**

**Methane fermentation**

**Biogas**

- ★ Discharge
- ★ Power
- ★ Car fuel
- ★ Pretreatment fuel
- ★ Home garden
- ★ Phosphorus recovery
- ★ Municipal waste Incinerator

**Fertilizer**

**Fuel conversion**

- High fertilizer
- Carbonized fuel

**Power**

**Car fuel**

**Pretreatment fuel**

**Home garden**

**Phosphorus recovery**

**Municipal waste Incinerator**
Utilization of biomass from sewage sludge to produce high quality fertilizer

- Domestic waste project
- Industrial waste
- Households garbage
- Pruning branches and grass
- Septic tank sewage sludge
- Sewage sludge

**Biomass**

- First precipitated sludge

**Survey • Social research**

- Plastic waste

**Pretreatment • Bio-gasification**

- Drying of liquid feed
- Biogas
  - Power • Truck fuel
  - Sewage sludge
  - Pig

**Waste sludge**

- Compost • Fertilizer conversion (drying)
- Digested waste
  - Sewage plant

**Recycling Center**

- Carbonized fuel
- Fertilizer Field
- Pig

**Cleaning**

- Waste heat utilization
- Carbonization

- Fuel material
The resource conversion center which utilizes incinerator exhaust heat 2010.8.2

**Resource recovery recycle support data base**
- Effect of separation emitted by factories (reducing greenhouse gas emissions, increase recycling rate) presented in a number
- Construction support of food recycling loop
- Production conditions Recycling Technology, a component of a product display

**Quality Management**
- Regular analysis of compost and manure nutrients ingredients in feed
- Simple and accurate quality check of the compost by microbial community structure analysis

**Organic sources**
- Fish company
- Food retailing
- Restaurant

**Dry feed conversion**
- Vacuum dry process

**Composting**
- Aerobic system

**Energy Plant (Incenerator)**
- High
- Low
- Fractional precision

**Steam**
- Hot water
- (Hot fermentation)

**Container and packaging plastic waste**
- Plastic waste washing machine
- Warm water ultrasonic washing system

**Agricultural plastic waste type**
- Agricultural residu
- Material recycle
  - Or
  - Fuel conversion
Establishing an Environmental Recycling-based Society research Project FY 2007 - 2009

High-quality organic resources liquid feeding conversion by hydrothermal reaction cycle

Pig feed: ★☆ Solid content ① for, Moisture ③ intake ★ Variety of subjects. But ....

Dry feed

Dry feed from liquid feed

By professional
Liquid feed Fermentation feed

Hydrothermal reaction
High quality liquid feed conversion (Less than 200 °C)

Eco-Feed

An organic resource recycling1
Liquid Feed
organic resource recycling2
Liquid Feed

Total available • Recycling society • Local production for local consumption • Increased self-sufficiency • Only one technology • Japan meat
Innovation and expected social benefit ~Purpose~

~Expected social effects~

1. Construction of a recycling society
   - Effective waste utilization
   - Promotion of the Food Recycling system
   - Livestock manure emissions reduction
2. Activation of domestic pig industry
   - Improvement of food self-sufficiency
   - Food Manufacturing Brands
3. Creation of innovation
   - Regional revitalization
   - Development of eco-life

Object

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<th>Material1</th>
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<th>Material3</th>
<th>Material4</th>
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Existing Technology
(such as lactic acid fermentation)

Technology apply
(Hydrothermal treatment)

~Promising technological innovation~

1. Reduce processing costs
   - Drying after-treatment is unnecessary
   - Decrease of manure discharge quantity
2. Quality Improvement of Feed
   - Improve meat quality
   - Improved feed efficiency
   - Shortening Fattening period
   - Disease decrease (sinusitis)
   - Odor abatement

~Technological innovation by hydrothermal reaction~

★ Expansion of raw material
★ Improvement of digestion and absorption
★ Effective use of phosphorus
★ Sterilization effect
★ Quality stabilization
★ Feed conversion for cow

Purpose of this study
✓ Validation hydrothermal advantage
✓ High value-added liquid feed
✓ Network construction and FS investigation
Research Overview

Construction of energy recycling

Material

Palm oil factory

Energy

High concentrations of water

Products

Oil Palm

Crude Palm Oil

Energy

Biogas

Treatment

Emissions

CH₄

More efficient anaerobic digestion process

Production: World No. 1

POME

Liquid fertilizer
Palm oil production process

Palm oil (1 ton)

Steam

Fruit removal

Crushing, Grinding

Clarification

Drying, purification

CPO※※ (0.22 t)

Oily water separator

POME (0.84 m³)

Emission at high temperature

TS (mg/L) 36000

COD_{Cr} (mg/L) 44000

※CPO: Crude Palm Oil

Fruit Seed
Summary (in JAPAN?)

- Out put
- Amount and Quality
- Material and Energy Balance
- Complex System
- Cooperation
- Sustainability • Flexibility
- Waste Treatment Enterprise
- Purpose