Efforts for use of methane gas in wastewater treatment of Japan

Sewerage and Wastewater Management Department
Ministry of Land, Infrastructure, Transport and Tourism, Japan

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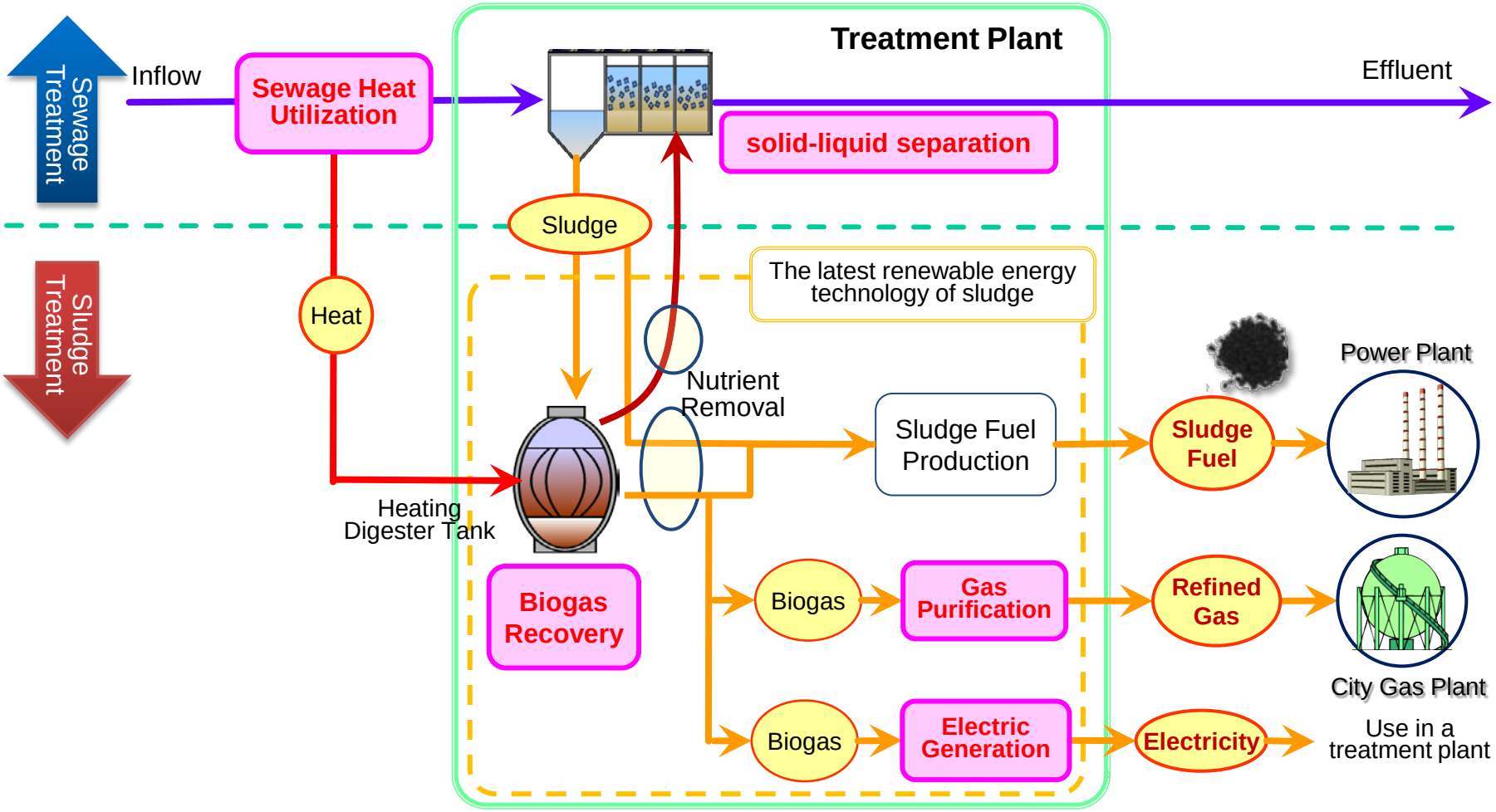
Effective use of sludge in Japan

- Sanitation coverage in Japan is over 70%. and there are about 2100 wastewater treatment plants in Japan.
- Most plants adopt aerobic treatment methods such as conventional activated sludge process or oxidation ditch process.
- Most of sewage sludge is used for cement material and so on, but the rate for use of biogas and sludge fuel is small.
- There are digester tanks in about 300 treatment plants. About 70% of the biogas generated by digestion (218 million m^3) is utilized, for example, about 20 % of biogas(66 million m^3) is used for the power generation, but the rest(86 million m^3) is incinerated in2010.

B-DASH Project (Breakthrough by Dynamic Approach in Sewage High technology)

- Accelerate the government-led development of new technology and its practical application by promoting technical validation through installation of actual size plants and by formulating guidelines.
- Achieving cost reduction in the sewerage projects and generation of renewable energy.



Budget	2.4 billion yen (2011FY)	2.9 billion yen (2012FY)

Demonstration Research 1 in Osaka City

META / JSWA
Joint Research Org.

Demonstration research for an energy management system using intensive solid-liquid separation technology

Outline of Project

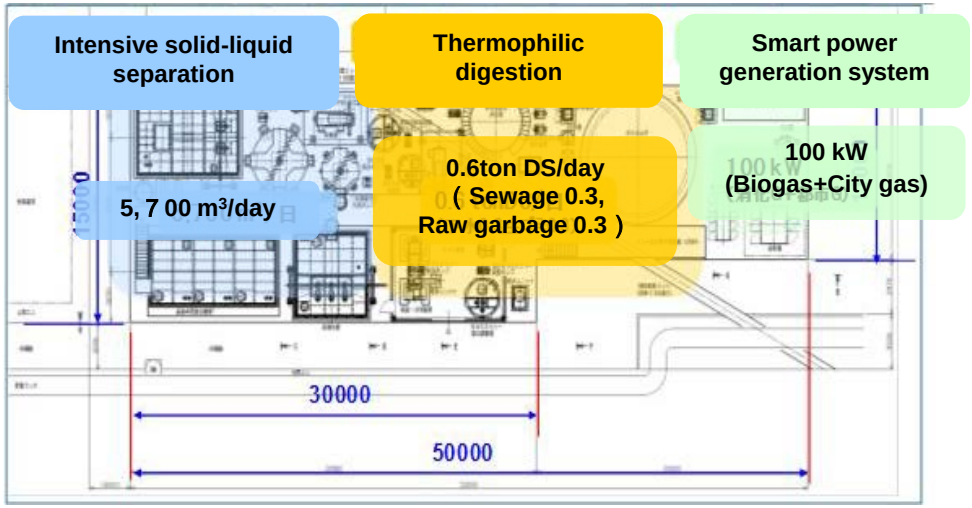
- ■NILIM (National Institute for Land Infrastructure Management) contract research
- ■Conducted by：METAWATER Co., Ltd and JSWA joint research organization
- ■Demonstration site：Nakahama WWTP, Osaka
- ■Outline of demonstration：

  Demonstration research for an combined system of;

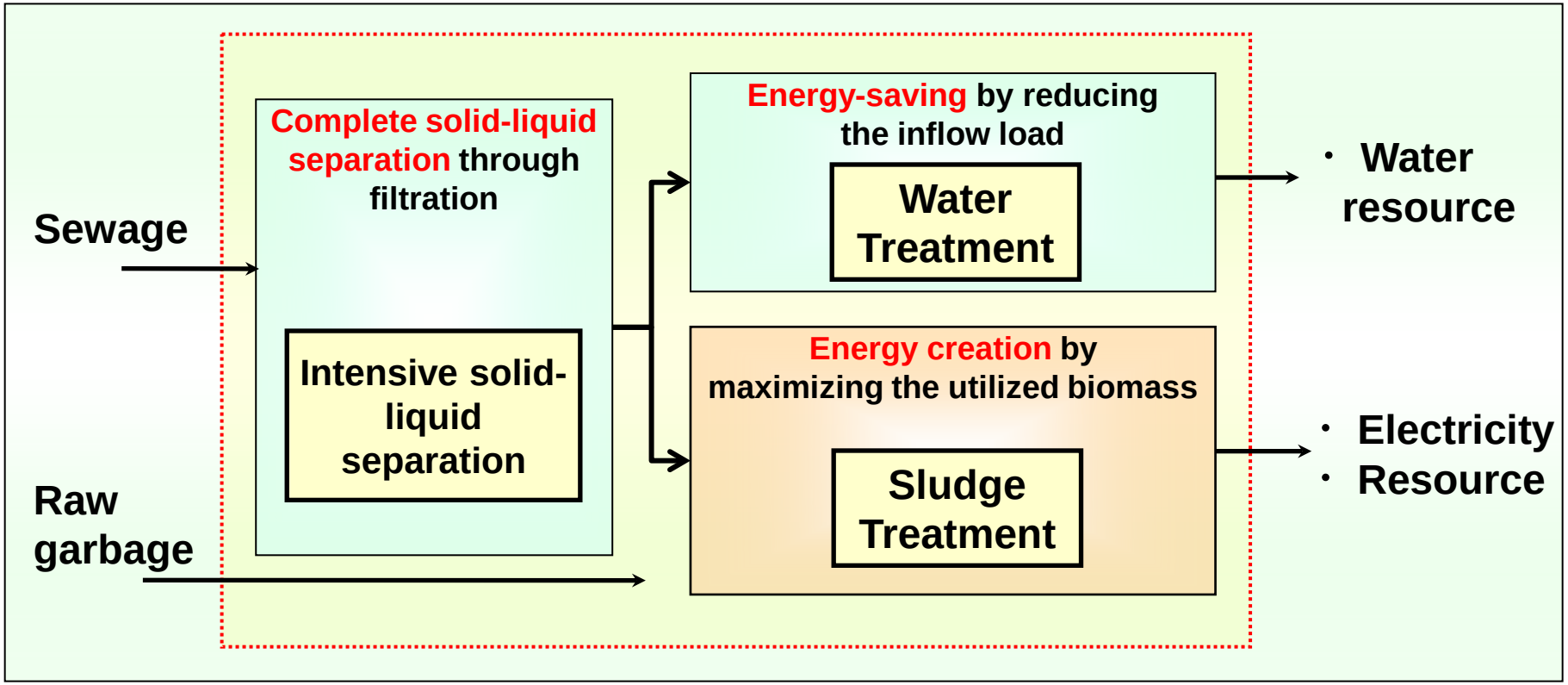
  (1) intensive solid- liquid separation technology,

  (2) thermophilic digestion technology,

  (3) smart power generation system, etc.



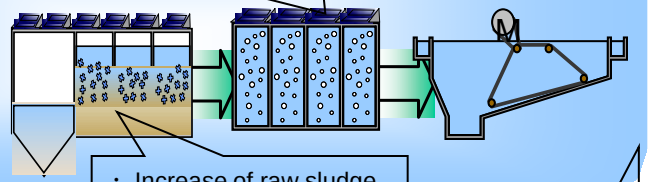
Basic Principles of Treatment



To achieve “energy-saving water treatment” and “energy creation sludge treatment” through intensive solid-liquid separation before biological reactor.

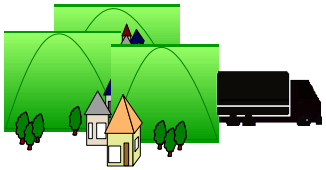
Outline of demonstration experiment 2011

Intensive Solid-liquid Separation



・ Decrease of aeration air because of cleaner treated water
・ Reduction of air blower / air diffuser

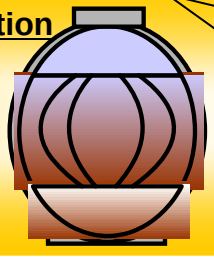
・ Increase of raw sludge



Raw garbage

Sludge

Thermophilic Digestion



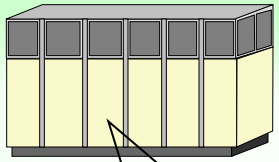
・ Feed of easily decomposable raw sludge and raw garbage

・ By immobilizing bacteria, able to increase the digestion rate and stabilize operation.

City gas

Biogas

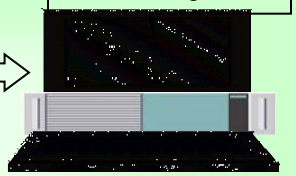
Smart Power Generation System



Hybrid fuel cell

・ Filling the shortage of biogas with city gas

・ Automatic power load leveling



Plant optimized control

Sedimentation ➔ Filtration

■Recover raw sludge: 40% UP (compare to sedimentation)
■Electricity cost: 15-20% DOWN (compare to standard activated sludge method)
(Effect of SS and BOD reduction in treated water)

Civil work ➔ Steel Plate & Control

■Raw garbage : Possible to treat (up to equal amount of sewage sludge)
■Digestion period : 1/4 (20days➔5days)

No Control ➔ Power- saving & generation

■Electricity (purchase) : 20% DOWN
■Biogas : 100% USE

Target

Advantage

Construction cost
⇒25% Reduction

O&M cost
⇒2% Reduction

Energy
⇒88% Reduction

Greenhouse gas
⇒65% Reduction

LCC
⇒30% Reduction

※Calculated based on the scope of B-DASH work
※Raw garbage = Sewage raw sludge x 0.6
※No subsidy included in the construction cost

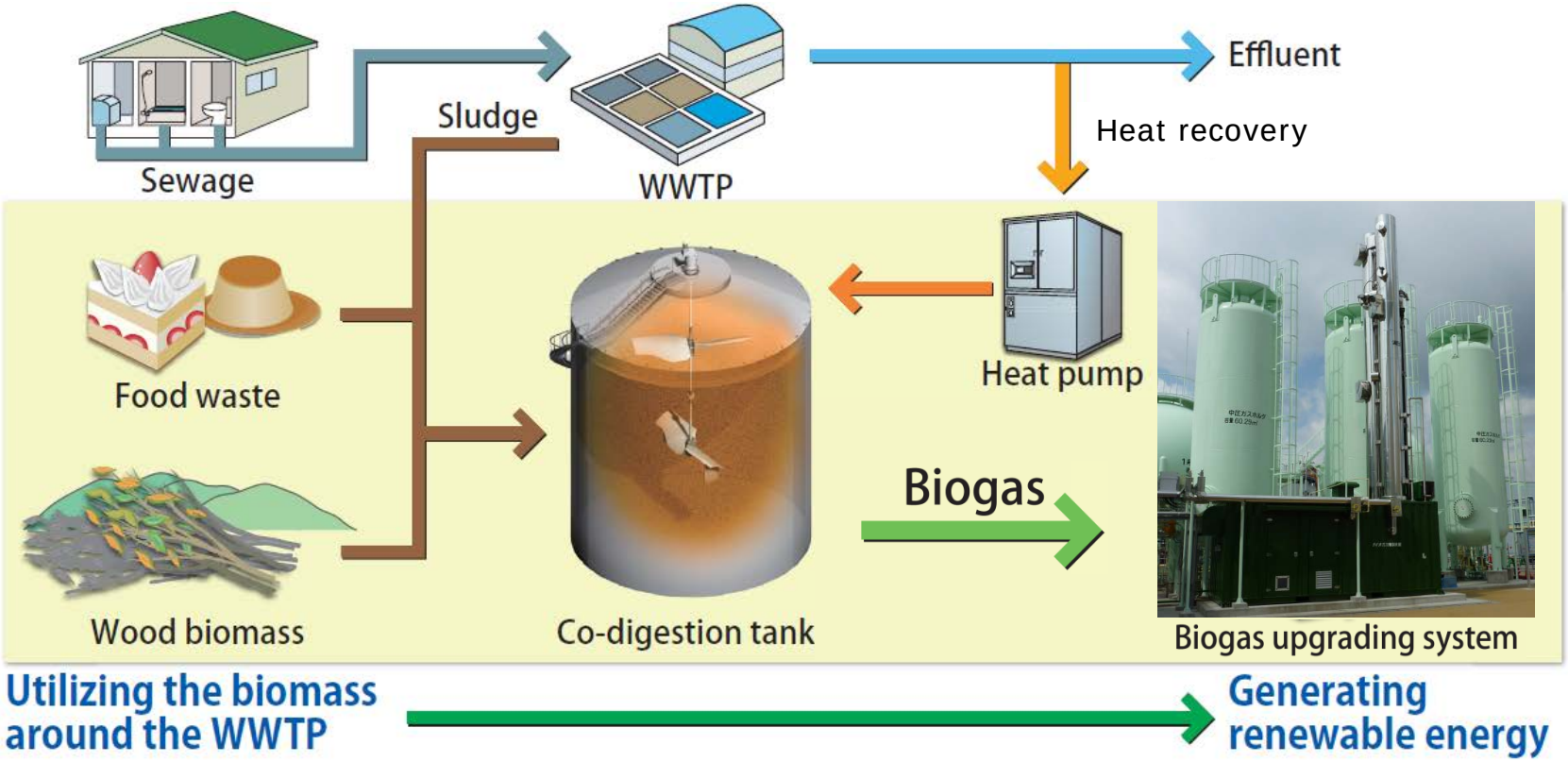
【 METAWATER Co.】 http://www.metawater.co.jp/eng/index.html

Outline of Project

- NILIM (National Institute for Land Infrastructure Management) contract research

- Research conducted by
  Consortium consisting of Kobelco Eco-Solutions and Kobe City
- Demonstration Field
  Higashinada Sewage Treatment Plant, Kobe
- Objectives
  - Reduction of CAPEX and construction period of sewage sludge digestion facility by using digestion tank made of carbon steel
  - Reduction of OPEX and construction period by using advanced biogas upgrading system which refines biogas into methane by 97% purity
  - Reduction of OPEX of sewage sludge digestion facility by increasing revenue from biogas
  - Reduction of GHG emissions by increasing biogas utilization (injection into gas grid and use as NGV fuel)
- In operation since January 2012

Flow diagram



Feature

- Biogas production can be significantly increased by co-digesting sewage sludge with suitable biomass
- Biogas produced can be fully utilized by using heat pump to heat digester

Evaluation of demonstration test results

- Suitable biomass for co-digestion in WWTP are selected through laboratory analysis and testing
  - sludge, waste acid and residues from food industry
  - wood biomass (pretreatment required)


Wood biomass

- More than 60% increase in biogas production by co-digestion (in case approx. 50% of biomass is added to sewage sludge in dry matter)
- More than 40% reduction in life-cycle cost (CAPEX and OPEX) of sludge treatment facility by using steel digestion tank and increasing revenue from biogas
- Reduction of GHG emissions by biogas utilization beyond GHG emissions from co-digestion and biogas upgrading facility
- Dewatering efficiency of digested sludge is improved due to residual fibrous component derived from wood biomass

【Kobelco Eco-Solutions Co.】 http://www.kobelco-eco.co.jp/english/

Thank you!