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Biodiesel Fuel: A Next Microturbine Challenge

Noriyasu Mimura

MEIDEN

Agenda

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- *Market Landscape in Japan*
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Introduction of MEIDEN
Corporate Data

- Head office: Nihonbashi Hakozakicho Tokyo Japan
- Founded:December 22, 1897
- Representative Director
  Mr Shigeo Seko, Chairman of the Board
  Mr Keiji Kataoka, President and C,E,O
- Paid up Capital: 17,070million Yen
- Number of Shareholders:17,330
- Number of Employee:4,448
- Stock Listing: Listed on Tokyo Stock Exchange
- Home Page :http://www.meidensha.co.jp

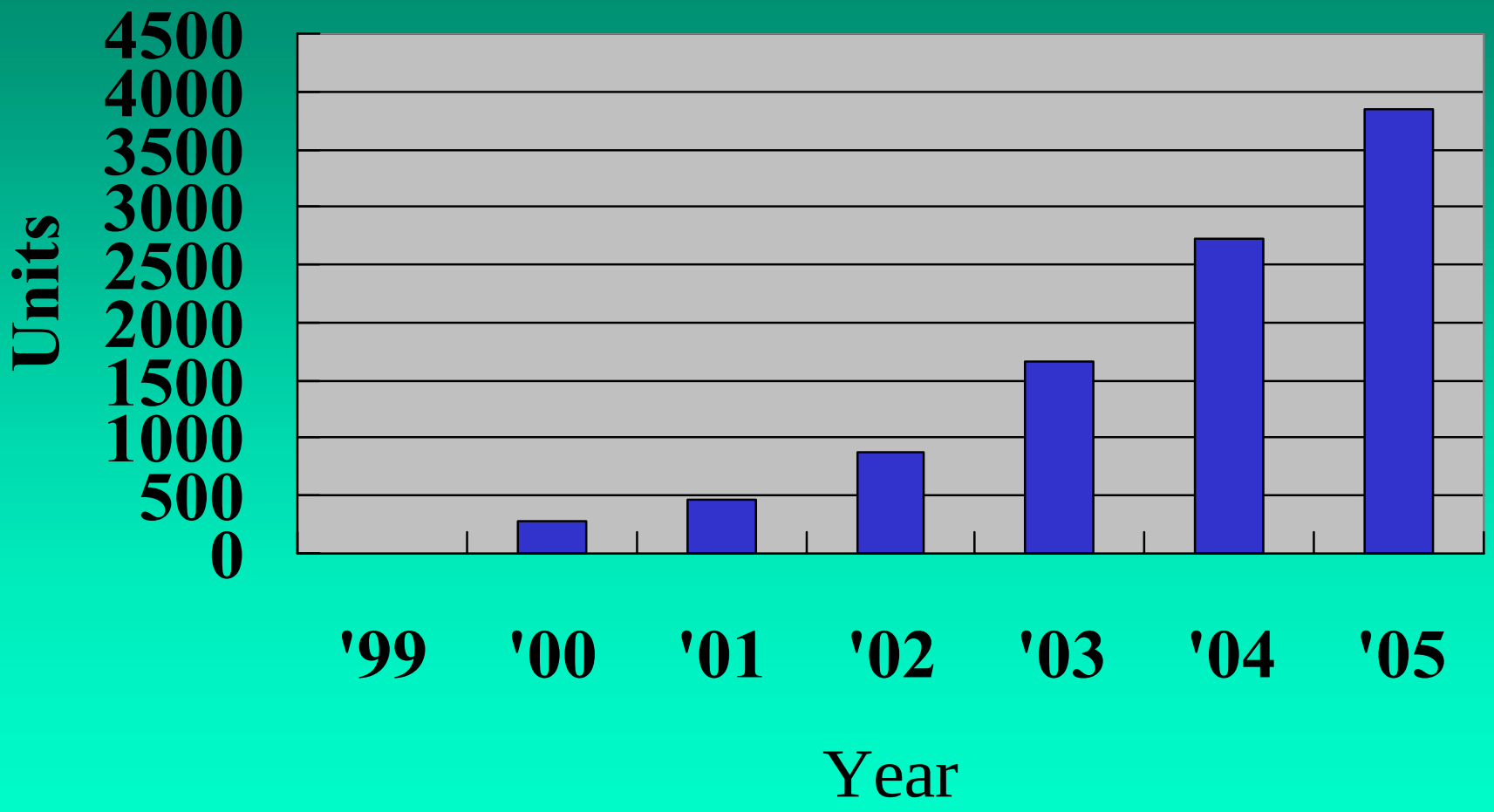
As of April.2002

Introduction of MEIDEN

Product Portfolio

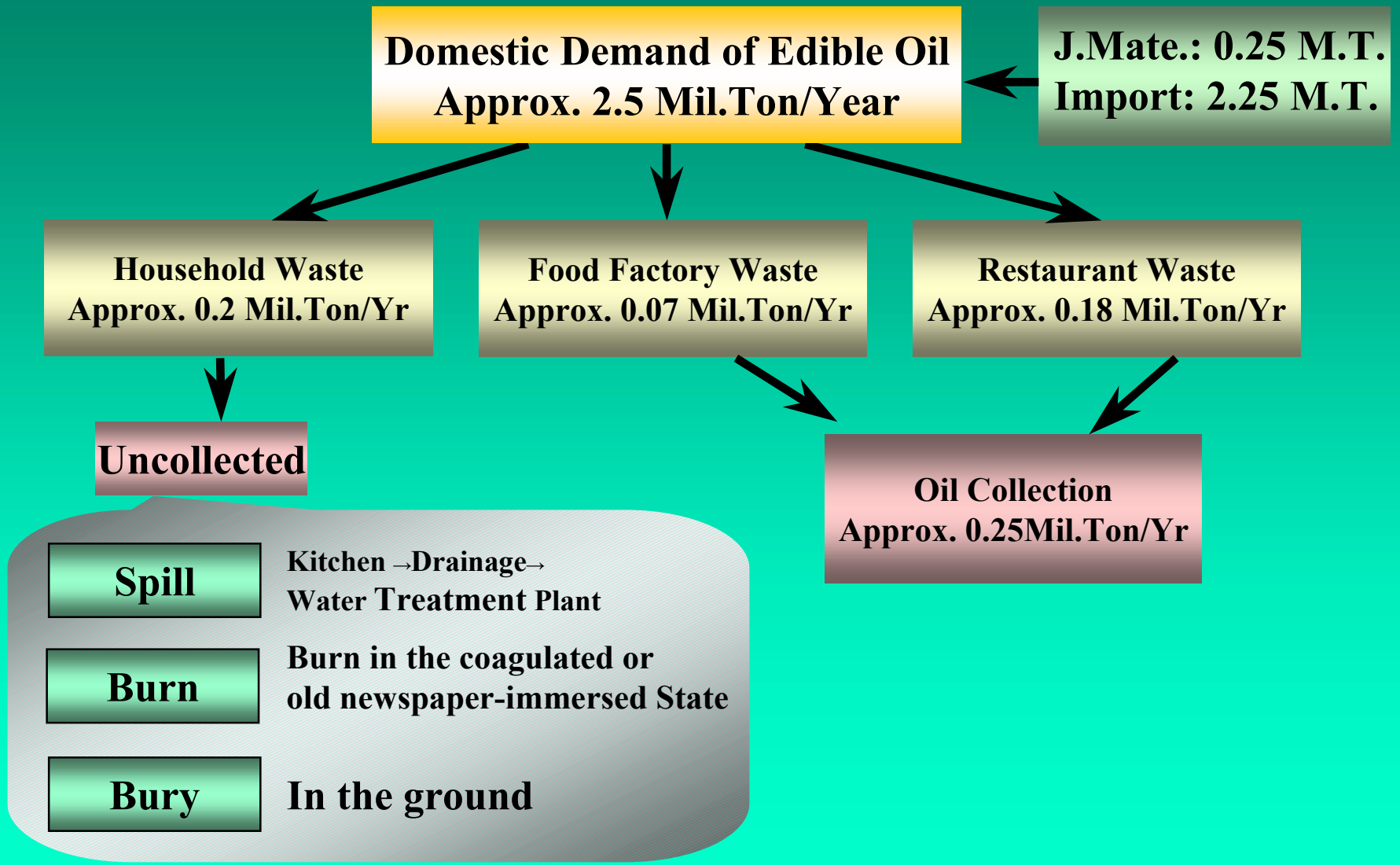
Energy Business Group	Environmental Solutions Business Group	Info. & Com. Business Group	Industrial Sys. Business Group
* Hydro Power Plant * Diesel Power Plant * Turbine Generator * Co-generation Systems * Substation Sys. * Surge Arrester * RailwaySystems	* Water Treatment * Water Resource Administration System * Refuse Treatment System	* Industrial Computer * SCADA System * Topographical Map Input & Editing System * Pulse Source for Krypton Flouride (KrF) Laser * Programmable Controller	* Motor * Inverter * Dynamometer-applied Sys. * Factory Auto-mation System

Market Landscape in Japan
(Microturbine 30-200kW)



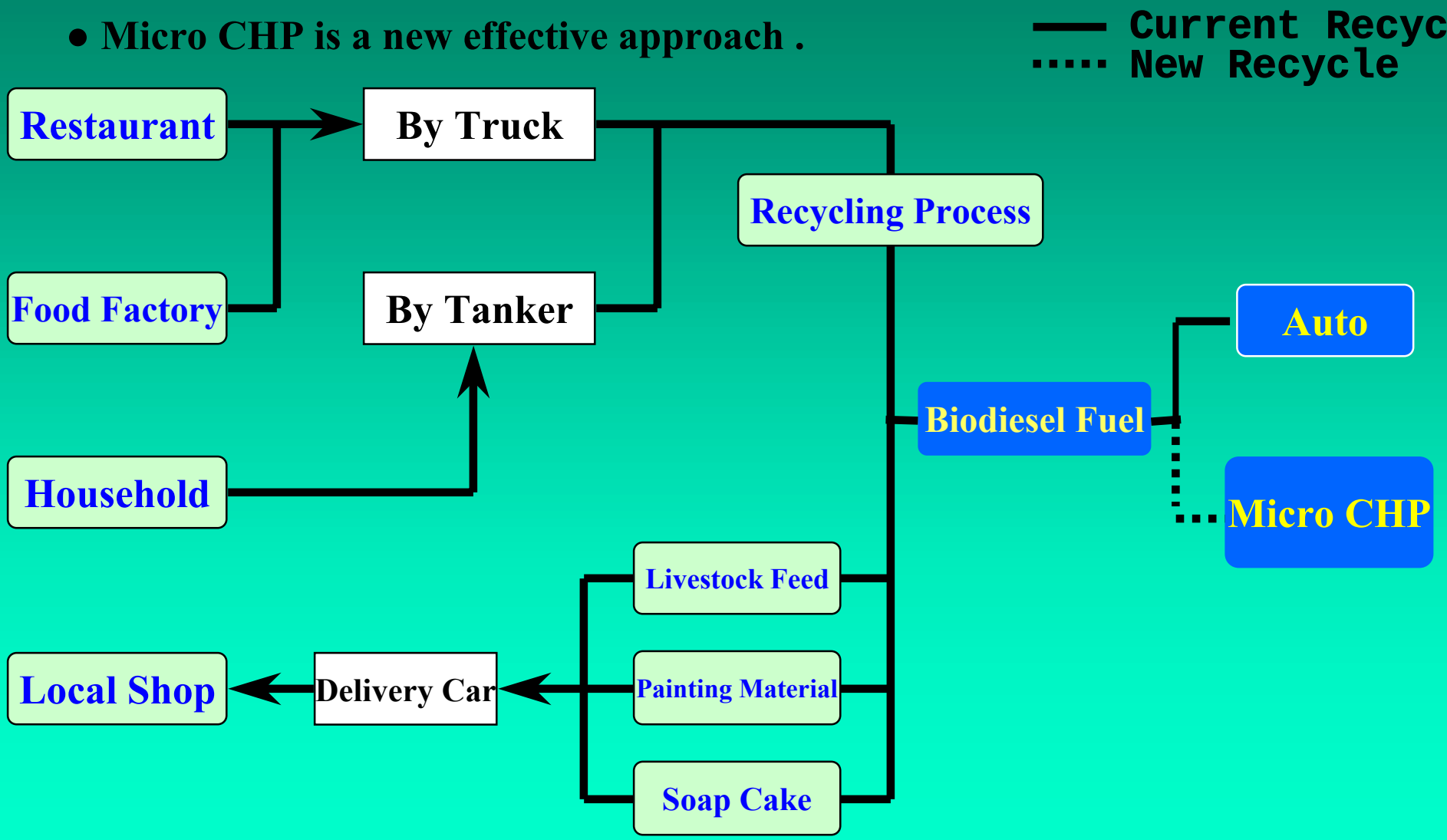
Source:”New Energy System Market in Japan ,2002”(Yano Research Institute Ltd.)

Flow of Waste Edible Oil Processing



Recycle of Waste Edible Oil

- Micro CHP is a new effective approach .



Scope of Microturbine CHP System by Biodiesel Fuel

System Outline

Reformed waste edible oil will be used as a fuel for the microturbine.

Features

●No Processing Charge Payment to Third Party !!

●No Noticeable Odor Eco Friendly !!

●Benefit of Heat and Power!!

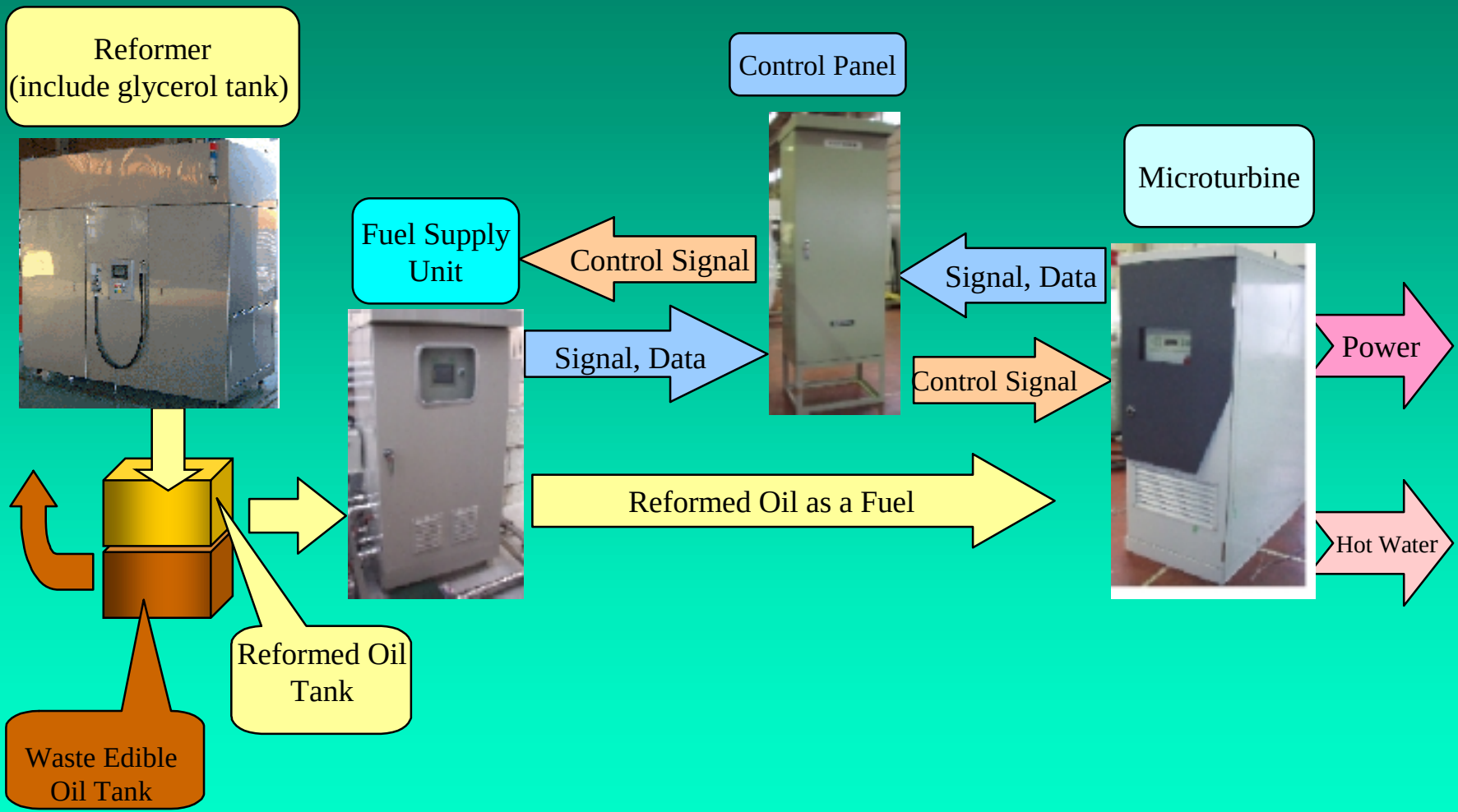
Effects

●Near Zero Emission Level Exhaust Gas

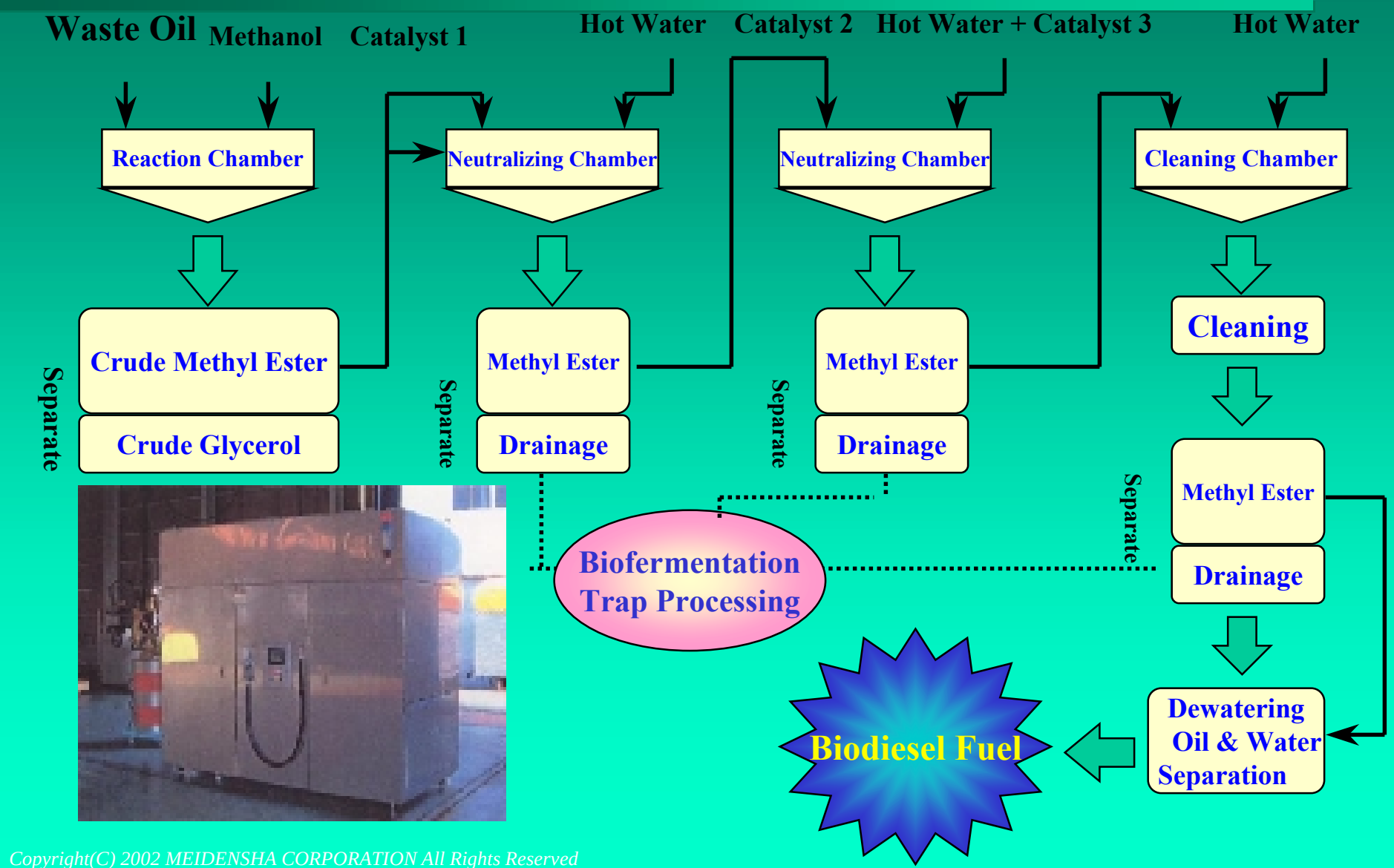
●Better Corporate Identity Image and Increased Benefit

Quoted from Japan Co-generation Center

System Configuration



Process of Reforming (Reaction Process)



Effective Use of Waste Edible Oil

Heat Recovery
(Hot Water/Air Conditioning)

Power

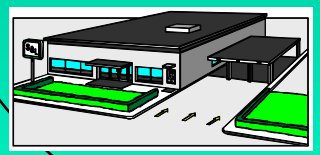
Resource Recovery

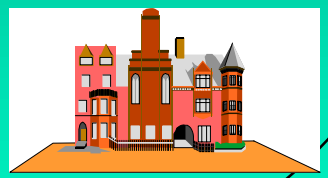
Where the waste oil is from?

Waste Volume: 0.4 - 0.5 Mil.Ton/Yr

Central Kitchen for School Foods

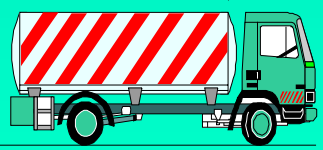
Hotel
□Dept.Store



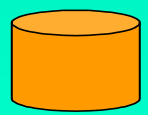


Restaurant

Hospital



Collection



Tank

Waste Edible Oil CHP

Total Energy Efficiency: More than 70%

Microturbine

Biodiesel Fuel

Reformer

Kanazawa Biodiesel Fuel CHP System
A View of System

Project Site: A Public Hospital in Ishikawa Prefecture

Partly Financed by New Energy and Industrial Technology Development Organization (NEDO)

Kanazawa Biodiesel Fuel CHP System

Field Test Verification Items

1. Fitness

   Exhaust Gas Characteristics

   Effects of Impurities (Moisture and Alcohol) to the System

   (Operation and Corrosion Aspects)

2. Economics

   Efficiency, Fuel Consumption, Running Costs

   Waste Heat Recovery Volume

3. Eco-friendliness

   NOx, SOx, Particular Materials

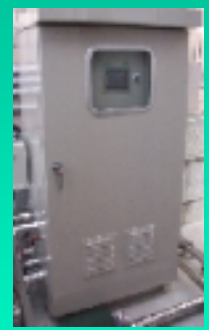
Kanazawa Biodiesel Fuel CHP System Specification

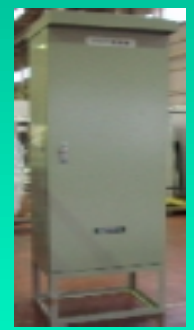
MioSpectrum(MEIDEN Microturbine CHP)

Turbine Unit : Capstone Model 330 Liquid Fuel Type
Output : 28kW 480V 50 Hz
Waste Heat Recovery: Hot Water Collection Boiler 197MJ/hour
Transformer : Dry Type 480/210 V 50 Hz
Low Noise Enclosure: 65 dB(A) at one meter from the Main Body

Fuel Supply Unit

Fuel Transfer Pump: 13 liter/hour 2 Units
Fuel Flow Meter : 2 Units
Fuel Control Unit : 1 Program Controller
Fuel Tank : Waste Oil 450 liter Reformed Oil 300 liter





Reformer

Performance : 400 liter/8 hours
Derivative : Reformed Waste Edible Oil
Calorific Value : 40 MJ/kg

Kanazawa Biodiesel Fuel CHP System

- Characteristics Comparison at the rated rating and the temperature of 15 degrees centigrade or 59 degrees. Fahrenheit

Items/Type of Fuel	Reformed Oil (Measured)	Light Oil (Reference Value)
Specific Gravity g/cm^3	0.887	0.835
Flash Point	174	96
K.Viscosity mm^2/S	6.17	3.8
Pour Point	-7.5	-15
Cetane Value (Index)	58	57
Calorific Value kcal/kg	9,560	10,930
Sulfur Content	0.03	Less than 0.20

Kanazawa Biodiesel Fuel CHP System

- Exhaust Gas Component(using microturbine)
- Energy Efficiency

Exhaust Gas Component	Reformed Oil
O_2(%)	16
CO(ppm)	6.0
HC(ppm)	12.0
NOx(ppm	23.0
CO_2(%)	2.0
Sox(ppm)	Under 1.0
Black Smoke(%)	Under 0.01
Odor	Unnoticeable

Fuel Consumption L/h	12.3
Gene.Effi.(%)	21
Thermal Effi.(%)	43
Total Effi.(%)	64

Note: Measured Conditions: at the Rated Rating under 15 degrees C or 58 degrees F

A Flow of Recycling Society

□Contribute to Recycling Society

Promoting Near Zero Waste

Secure the Profits

Near Zero Emission

Better Corporate Identity

Adopting Waste Edible Oil Reformer

Increased Profit

No Processing Charge for Third Party!!
Labor Saving for the Processing!!

Closing Thoughts

- ***Expanding the Horizon of Microturbine Universe***