Waste-to-Energy Technologies
INTRODUCTION OF DOHWA
## COMPANY OVERVIEW

<table>
<thead>
<tr>
<th><strong>Date of Foundation</strong></th>
<th>August 15, <strong>1957</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Business Areas</strong></td>
<td>Feasibility Study &amp; Master Plan, Engineering Design, Construction Supervision, Construction Management, Project Management, EPC, O&amp;M</td>
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<tr>
<td><strong>Personnel</strong></td>
<td><strong>2,003</strong> Persons (P.E 503)</td>
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<tr>
<td><strong>Total Asset (2017)</strong></td>
<td><strong>USD 300.8 million</strong> (KRW 324.9 billion)</td>
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<tr>
<td><strong>Total Liability (2017)</strong></td>
<td><strong>USD 85.9 million</strong> (KRW 92.8 billion)</td>
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<td><strong>Annual Turnover (2017)</strong></td>
<td><strong>USD 368.5 million</strong> (KRW 398.2 billion)</td>
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<td><strong>Project Amount Awarded (2017)</strong></td>
<td><strong>USD 495.4 million</strong> (KRW 600.3 billion)</td>
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</tbody>
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WHO WE ARE

Total Solution Provider
Multidisciplinary Engineering, Procurement, Construction Supervision, PMC, EPC, O&M

Total Number of Employees: 2,003
Total Number of Engineers: 1,761

MANPOWER COMPOSITION

- Junior-level Engineer: 474
- Intermediate-level Engineer: 165
- High-level Engineer: 226
- Special Grade Engineer: 393
- Professional Engineer: 503
2 WHO WE ARE
Plant Division has 3 sub-divisions:
1. Renewable Energy Plant
2. Environmental/Waste-to-Energy Plant
3. Power Plant

The Environmental Plant Division is in charge of environmental infrastructure’s (Incineration, Landfill, Biomass, Organic waste to energy plant) F/S, planning, design, construction supervision relate to CDM. With the high-tech expertise and patent rights, it is proudly recognized as a leader in environmental plant sectors.
WHERE WE ARE

Award by Sector (2017)

- **Water**: 20%
  *Water Supply/Sewerage, Drainage/River/Dam/HPP*
- **Transport**: 14%
  *Railway/Metro, Road/Bridge/Tunnel, Harbor/Port*
- **Urban Development**: 9%
- **Plant**: 40%
  *Renewable Energy, Environmental Plant, Power Plant*
- **Construction Supervision**: 17%
395 overseas projects throughout in 65 countries
$594 in millions of US dollars for overseas projects
20 regional offices cover Asia, Caucasus Region, Middle East, Africa and Americas
DOHWA Engineering, ranked 109th in ENR's July, 2017 publication of the "Top 150 Global Design Firms". In 2016, we were ranked 121th in the same list.

WHERE WE ARE

1. 당사는 지난해 세계 유수의 기업들과 함께 ENR The Top 150 Global Design Firms List(국내외 매출액 합산 기준)에 109 위(작년 121 위, 12 단계 상승)로 등재되었습니다.

2. 또한, 해외 매출액에 근거한 ENR The Top 225 International Design Firms List에는 105 위(작년 135 위, 30 단계 상승)를 기록하였습니다.

* ENR (Engineering News Record)
- 1917년 4월 5일 창간
- 창간이래 100여년 역사를 바탕으로 한 권위 있는 국제건설, 엔지니어링 분야 전문잡지
- 전 세계 건설, 엔지니어링 기업의 연간 수주, 매출 실적을 근거로 상위 업체 순위 정보 제공
Waste Management Paradigm
Waste management policy in Korea

- Announcement of “Waste and Biomass Energy Action Plan”
  (2009, Ministry of Environment and other six ministries)
- In order to achieve the nationwide renewable energy target of 6.08% by 2020, energy from waste-to-energy has been set to 4.16% (as much as 68% of renewable energy resources)
Priority of Solid Waste Management

- **Zero Waste**
- **CO₂ Reduction**
- **3R (Reduce, Reuse, Recycle)**
- **4R (Reduce, Reuse, Recycle, Recovery)**

**Reduction**
- Waste charging system / Suppression of disposable product etc.

**Reuse**
- Empty container program / Reuse of packing container / recycling center etc.

**Recycling**
- EPR / Eco-assurance system of electrical electronic product etc.

**Energy Recovery**
- Waste to energy / Energy recovery of incinerator and landfill etc.

**Safe Treatment**
- RFID for medical waste / Allbaro system for proper waste treatment etc.
03

Waste-to-Energy Technologies of DOHWA
SRF (Solid Refuse Fuel) Production Process

- **Crusher**: Crushing for high separating efficiency
- **Granularity**: Separation (Foods, Sands by granularity)
- **Specific gravity**: Incombustible waste separation
- **Metal**: Metals, Non-metals
- **Optical**: PVC Separation from combustible waste
- **Grinding**: Grinding suitable for SRF Formation
Experience in SRF Production Facility

- Wonju SRF Production Plant
- SRF Production Pilot Plant in Sudokwon Landfill Site
- Multifunctional Administrative City SRF Production Plant
- Daegu SRF Production Plant & Boiler System
Incineration Process

Objectives

- Reduction of waste disposed
- Sanitary treatment of combustible waste
- Energy recovery
2 INCINERATOR

Experience in Incinerator

Ulsan Waste Incinerator

Mungyeong Waste Incinerator

Jucheon Waste Incinerator

Changnyeong Waste Incinerator

Gumi Waste Incinerator

Jindo Waste Incinerator
Utilization of Sewage Sludge for Fuel

**Drying & Converting into energy of Sewage Sludge**

*In case of drying sludge*

**Fuel value similar with coal**

- **Sewage sludge**
  - Moisture content : 80%
  - Character : Microorganisms
  (Organic sludge)

- **Sludge fuel**
  - Moisture content : Less than 10%
  - Diameter : 2~8mm
  - Caloric Value : More than 3,500kcal/kg

- **Combustible content** → More than 60%
- **Carbon content** → More than 35%
- **Low calorific value** → More than 3,500kcal/kg
Sludge Fuel Production Process

Sludge input  First Drying Process  Second Drying Process  Storage Process

- Sludge Storage
- First condenser (for drying)
- Moisture content of mixing sludge: 25%
- Heat exchanger
- Biogas, LNG
- Manufacturer

- Second Heat exchanger
- Dust Collector
- Moisture content of mixing sludge: 30%
- Second dryer
- Secondary Condenser

- Odor Reduction Facility
- Fuel Storage
- Moisture content of fuel 10%
- sludge
- stack

1. Sludge Storage
2. First condenser (for drying)
3. Moisture content of mixing sludge: 25%
4. Heat exchanger
5. Biogas, LNG
6. Manufacturer
Experience in Sludge Treatment Facility

- Yangsan Sewage Sludge Drying Facility
- Pyungtack Sewage Sludge Drying Facility
- Daegu Sewage Sludge Drying & Carbonization Facility
**Food Waste to Energy Production Process**

**Input & Feeding fac.**
- **Feed in (Food waste)**
- **Crusher**
- **Pulver**
- **Multi-Sorter**
- **Unqualified object for fermentation (Sorting)**
- **Storage Facility for solubilization**
- **Fine substance remover**

**Methane gas Fermentation fac.**
- **Methane gas**
- **Desulfurizer**
- **Safety equipment**
- **Dehydrator**
- **Dryer**

**Energy Recovery Fac.**
- **Generator**
- **Heat**

**Treatment fac. for food waste leachate**
- **Denitrification Tank**
- **Secondary Denitrification Tank**
- **Settlement Tank**
- **Aeration**
- **Reaeration**

**Composting plant**
- **Sewage treatment plant**

**BIOGAS**

**Food Waste to Energy Production Process**

- **Energy Recovery Fac.**
  - **Power**
  - **Heat**

**Treatment fac.**
- **for food waste leachate**

**Sewage treatment plant**
Experience in Food Waste to Energy Facility

Wonju Foodwaste Anaerobic Digestion Facility

Daegu Foodwaste Anaerobic Digestion Facility
Landfill Gas (LFG) to Energy

The principle of generation
- LFG generated from landfill includes 50% of CH₄ and 50% of CO₂ by keeping anaerobic decomposed state of organics. Methane gas is used directly or by refining process.

LFG characteristic in landfill
- LFG is methane gas generated from landfill and utilized as gas generation
- Advantage: Utilizing methane gas directly or by refining process.
LFG to Energy  Production Process

1. LFG COLLECTOR
   - COLLECTION

2. LFG FILTER #1
   - KNOCK-OUT

3. LFG SCRUBBER

4. LFG COOLER

5. FLARE STACK

6. DEHUMIDIFIER

7. LFG COMPRESSOR

8. BALL TANK

9. Option I: Medium Quality Gas
   - END USER

10. Option II: Generation
    - ENGINE / GENERATOR
    - HIGH QUALITY GAS
    - END USER

Option III: Use

Collection

Purification

(H₂S, NH₃, Dust removal)

Use
Experience in LFG to Energy Facility

- **Landfill Area:** 435,000m²
- **Landfill Capacity:** 32,378,541m³
- **Power Production:** 1.5MW/h

- **Landfill Area:** 15,412,427m²
- **Landfill Capacity:** 289,329,000m³
- **Power Production:** 50MW/hr
Bioreactor

Leachate re-circulation (Bioreactor)?

- A method to accelerate waste decomposition and LFG generation by providing organic waste water or moisture

- Improvement of waste decomposition process with increasing water content through injection water into landfill
  → Maximization of LFG Production
  → Early Stabilization of landfill
**Integrated MSW Management Complex**

- Eco Center (Underground type)
- Ecology Park
- Treatment Facility (Underground Type)
- Management Zone
- Gas Storage

**Facilities:**

- Waste Preprocessing & Resource Facility: 300 ton/day
- Recycling Sorting Facility: 100 ton/day
- SRF COGEN Generating Facility: 250 ton/day
- Bio-gas Production Facility: 250 ton/day
- Sludge Treatment Facility: 184 ton/day
Integrated MSW Management Complex

Daejeon Environmental Energy Town

- Waste Preprocessing & Resource Facility: 400ton/day
- SRF COGEN Generating Facility: 200ton/day
- Sludge Treatment Facility: 240ton/day
• **PROJECT SUMMARY**

1) Location: Kalimantan, Indonesia
2) Fuel: Biomass (Wood Bark)
3) Capacity: 34 TPH / 7.3 MW
4) Period: 2011. 09 ~ 2013. 03

• **Reason for success of project**

1) Cooperation with Indonesia’s local companies
2) Technical support and cooperation in “Standard Castle”
3) Facility planning appropriate to local conditions
Contact us

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People, Collaboration, Creativity