# Presentation of Waste-to-Energy Power Plant



- I. Present Situation of Municipal Garbage Treatment
- II. Development Trend of Waste Incineration Power Generation
- III. Introduction of Typical Waste-to-Energy Power Plant Scheme
- IV. Key Data and Preliminary Analysis on Economic Benefit
- V. SEPCO1's Advantages in Contracting Waste-to-Energy Power Projects

# Part I

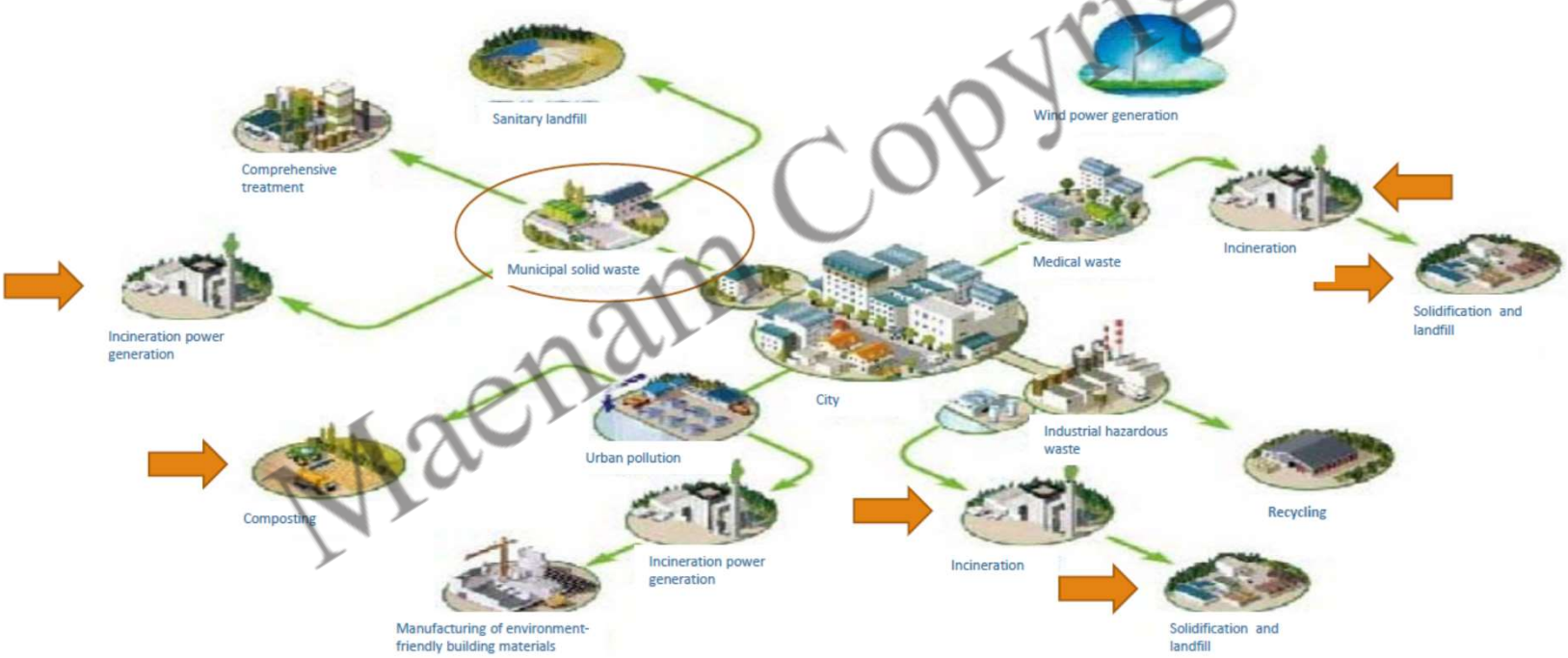
## Present Situation of Municipal Garbage Treatment

## Ⅰ. Present Situation of Municipal Garbage Treatment

- Garbage is being produced every day, and city is besieged by garbage.
- Garbage has begun to surround the world's lands and oceans, and is polluting the global environment.
- The innocuous treatment of garbage is urgently needed.
- Can we find a solution to it?

## I. Present Situation of Municipal Garbage Treatment

Figure Solid waste treatment process




Data source: www.eguard-rd.com

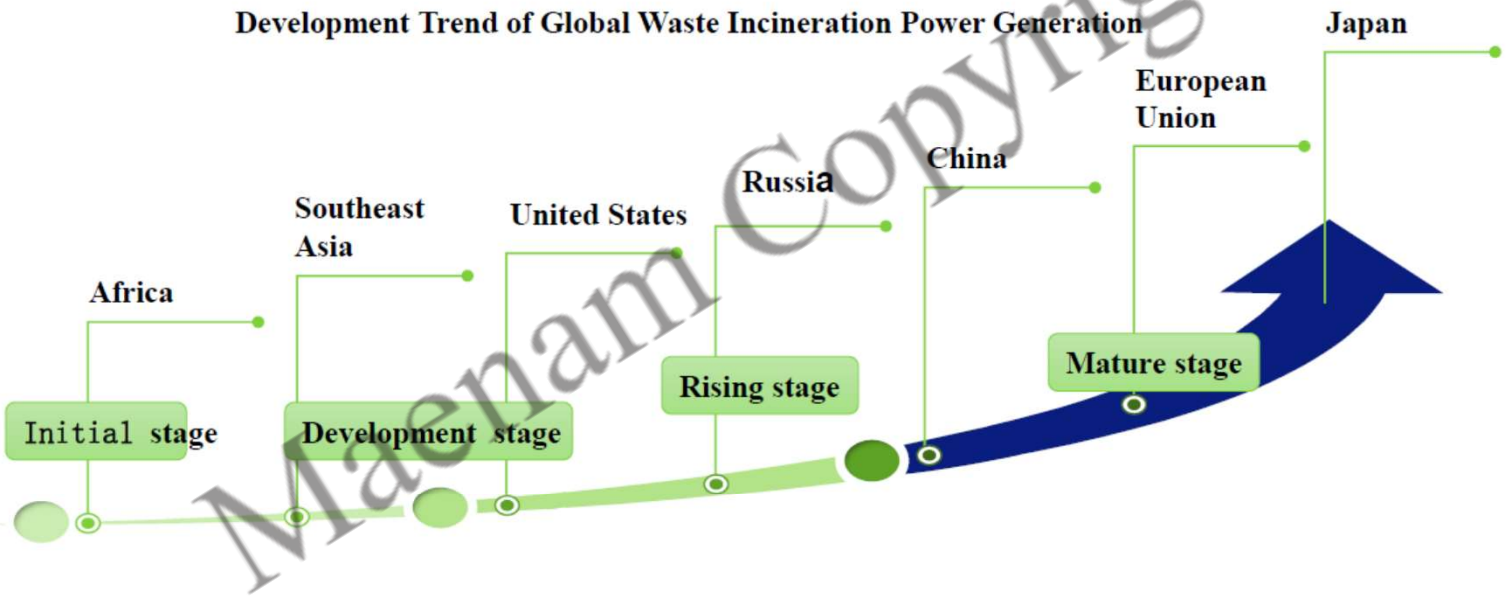
## I. Present Situation of Municipal Garbage Treatment

| Disposing mode | Features | Status |
|---|---|---|
| Composting | It is difficult to solve the problem of manure utilization. | This method is rarely used. |
| Landfilling | ◆Natural landfilling: bacteria and harmful elements in garbage spread easily, causing pollution to the environment.<br>◆Sanitary landfilling: garbage pit needs to be treated with osmosis prevention and anti-spreading measure. Greening treatment needs to be done for the surface of garbage pit, and the investment is large.<br>The period for cyclic utilization of land is long; it requires a lot of land resources for building the landfills. | It is prohibited to use this method.<br>It is not recommended to use this method. |
| Incineration | ◆Disposal speed is rapid and disposal quantity is large.<br>◆The volume of garbage is reduced greatly after incineration.<br>◆Improve urban environmental sanitation<br>◆Considerable economic benefits. | This method serves as the main utilization manner. |

# Part II

## Development Trend of Waste Incineration Power Generation

## II. Development Trend of Waste Incineration Power Generation






**The industry is mature in Japan and some European countries; it develops in full swing in China; it receives more and more attention in Russia; it is in startup stage in Southeast Asia and Africa.**

## II. Development Trend of Waste Incineration Power Generation

### Waste Incineration Power Plants in various Countries


**Britain**

The largest waste incineration plant— Riverside waste incineration plant. It is capable of treating 750,000 tons of waste in London annually (about 2,000 tons per day) with operating profit being 43.1 million pounds (379 million Yuan).

**Thailand (in full swing)**

Six waste incineration power plants have been built in 2016.
It is expected to construct 18 waste incineration power plants in 2018.
Bangkok garbage incineration power plant with a capacity of disposing 600 tons waste per day is shown in picture.

**Africa**

**The first waste incineration power generation project, the Reppie Waste-to-Energy Plant, is located in Ethiopia with a capacity of disposing 1000 tons waste daily. This power plant has been completed and put into operation.**

**China**

**The world's largest garbage disposal power plant was built in Shenzhen.**
**Waste incineration processing capacity is 5000 tons/day.**
**Solar photovoltaic power generation is applied in building roofs of 40,000 square meters.**
**The total investment is about 4.4 billion Yuan.**
**It is expected to be completed and put into operation by 2020.**

## II. Development Trend of Waste Incineration Power Generation

1. At present, there are more than 2,000 waste incineration power plants in 35 developed countries and regions worldwide.

2. In Europe, United States, Japan and other developed countries and regions, 70% ~ 90% of household garbage is disposed by incineration.

3. By the end of 2017, China's installed capacity of garbage power plants amounts to 6.8 million kilowatts, with an annual power generation being more than 35 billion KWH and an annual garbage treatment capacity more than 105 million tons. China ranks first in the world in terms of the installed capacity, annual power generation and garbage treatment capacity.

# Part III

## Introduction of Typical Waste-to-Energy Power Plant Scheme

## III. Introduction of Typical Waste-to-Energy Power Plant Scheme

### Main features of household garbage

- Without effective classification and collection, the composition is complex and varies greatly in different regions and seasons.
- Kitchen waste and muck are the main components, and the caloric value of waste is low, which is generally around 4000-4800kJ/kg;
- Water content of garbage is high, which is generally in 40-60%.

Table 2-4 Household Garbage Composition (%)

| | | | |
|---|---|---|---|
| **Kitchen waste** | 62.7 | **Metal** | 0.5 |
| **Glass and ceramics** | 1.0 | Fabric | 2.0 |
| **Plastic and rubber** | 10.0 | Paper | 6.0 |
| **Vegetation** | 1.5 | Lime soil, brick and tile | 16.3 |

## III. Introduction of Typical Waste-to-Energy Power Plant Scheme

### A Direct Burning

- Garbage is placed in the proper combustion equipment for direct burning and power generation.
- The work process is simple and practical

——a widely adopted method

### B Derivative Incineration

- Garbage is classified and sorted to pick out the inorganic and non-combustible components , and the remaining is fuel with higher calorific value for burning.
- It is difficult to classify and sort garbage accurately.

——it is difficult to apply this method universally.

### C Thermal decomposition, Vaporization and Incineration

- Garbage is placed in the pyrolysis furnace for thermal decomposition, and the lightweight compositions are separated out to generate the pyrolysis gas. Pyrolysis gas and garbage semi-coke are burned respectively.
- Theoretically, the application value is high; however, since the system is complicated, the application in large scale and industrialization are rather difficult.

———still in research phase.

## III. Introduction of Typical Waste-to-Energy Power Plant Scheme

**Option for Direct Fired Incinerator**

1. ***Mechanical grate incinerator***

   *Dispensing with sorting and drying and being widely applied to domestic waste- most widely used*

2. ***Fluidized bed incinerator***

   *Doing with sorting and pre-treatment and generally applied to the sorted construction waste*

3. ***Rotary kiln incinerator***

   *Being used for incineration of medical and hazardous wastes*

## Advantages of grate incinerator:

- large handling capacity of single incinerator
- even distribution of garbage in the incinerator , steady material layer and complete combustion
- low dust content in flue gas which eases the burden of dust remover and reduces the operation cost
- wide feeding port so as to dispense with garbage sorting and crushing
- layer combustion method is adopted so that dust concentration at the inlet of flue gas purification system is low, reducing the cost thereof and the cost of the fly ash treatment

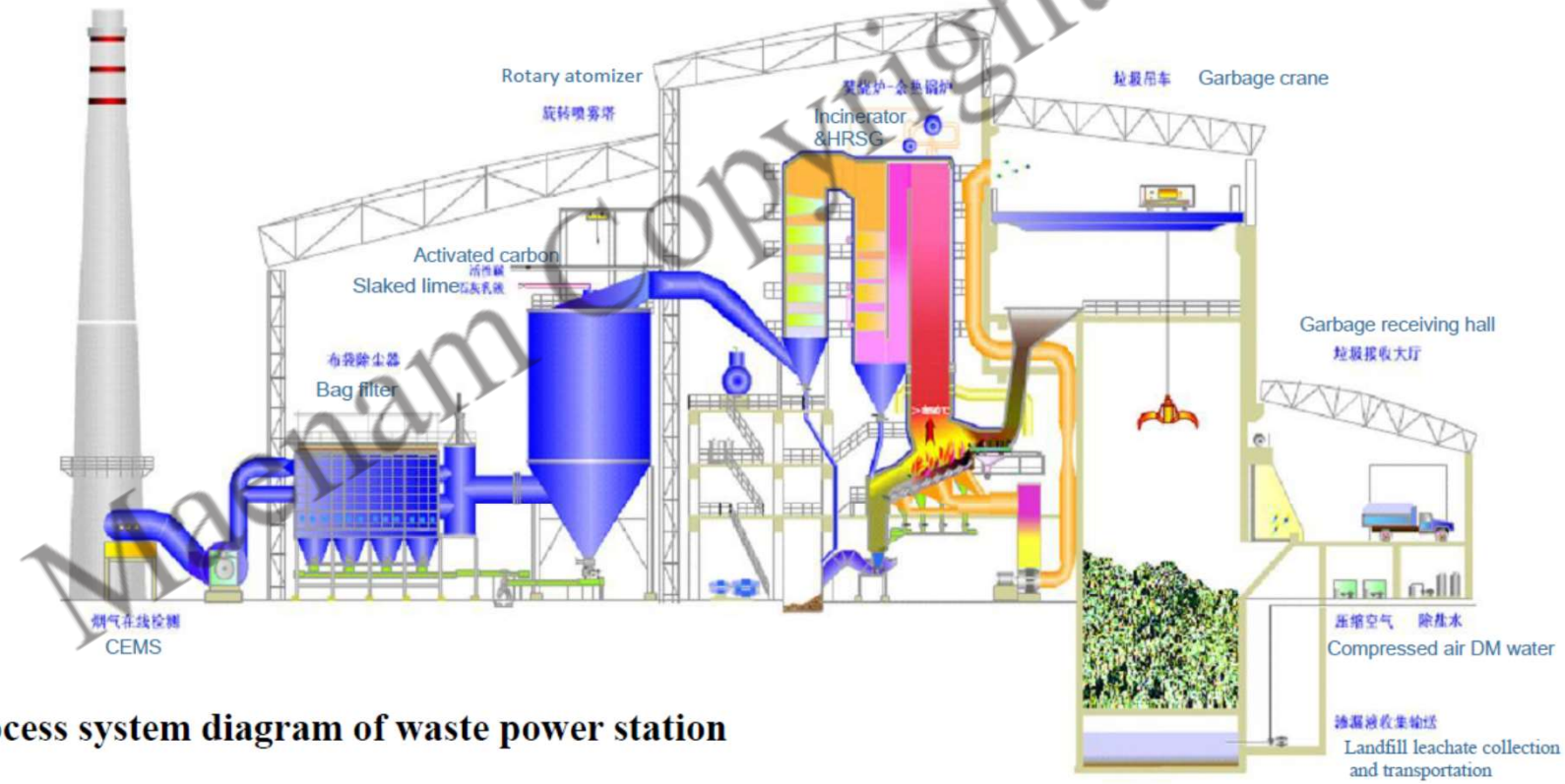
## III. Introduction of Typical Waste-to-Energy Power Plant Scheme

### System composition of waste power plant of grate incinerator

The process system mainly includes the following:

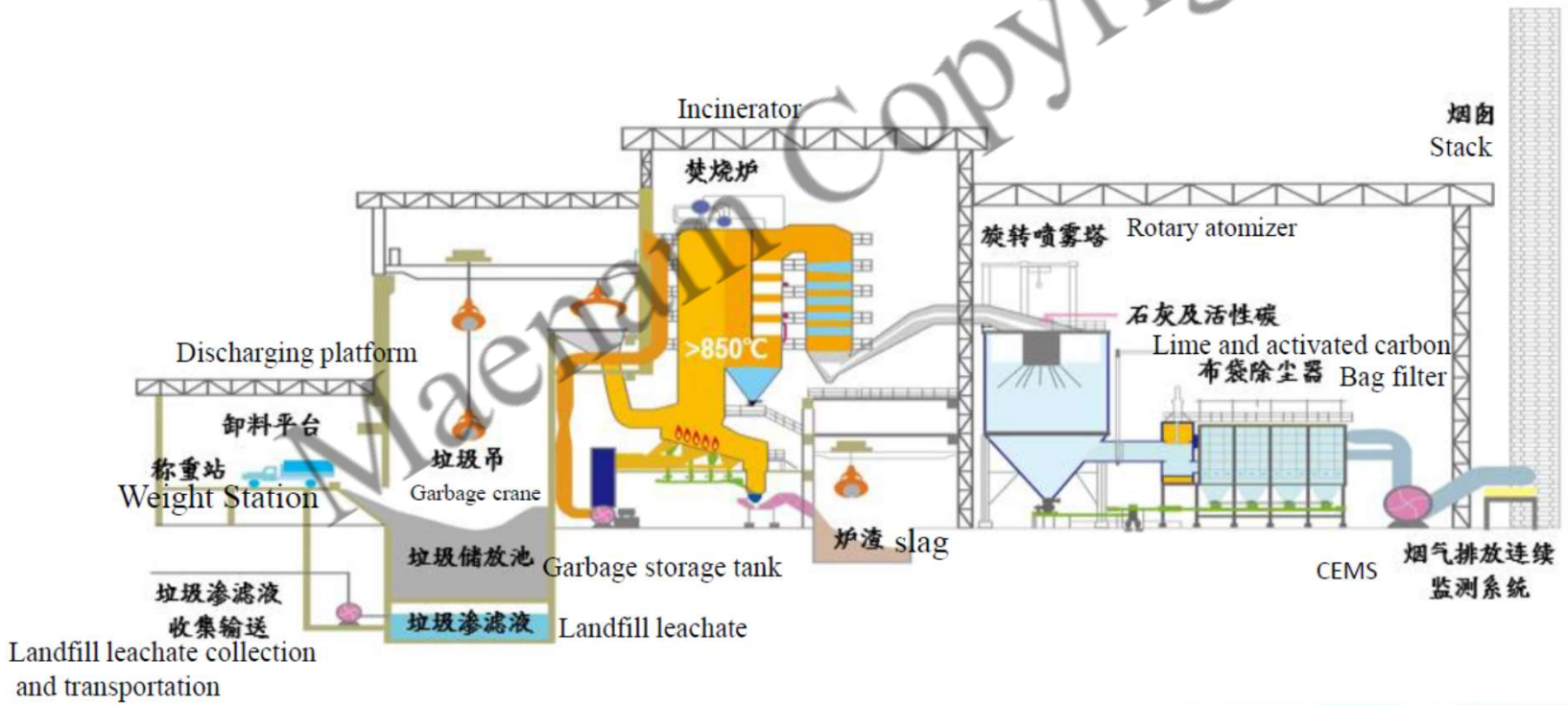
1. Garbage delivery system
2. Garbage firing system
3. Waste heat power generation system( steam generation system, cooling system, water supply system, circulating water system, chemical water system)
4. Flue gas treatment system
5. Ash and slag treatment system
6. Waste leachate treatment system
7. Deodorization system
8. Electrical system
9. Control system

## III. Introduction of Typical Waste-to-Energy Power Plant Scheme




**Process system diagram of waste power station**

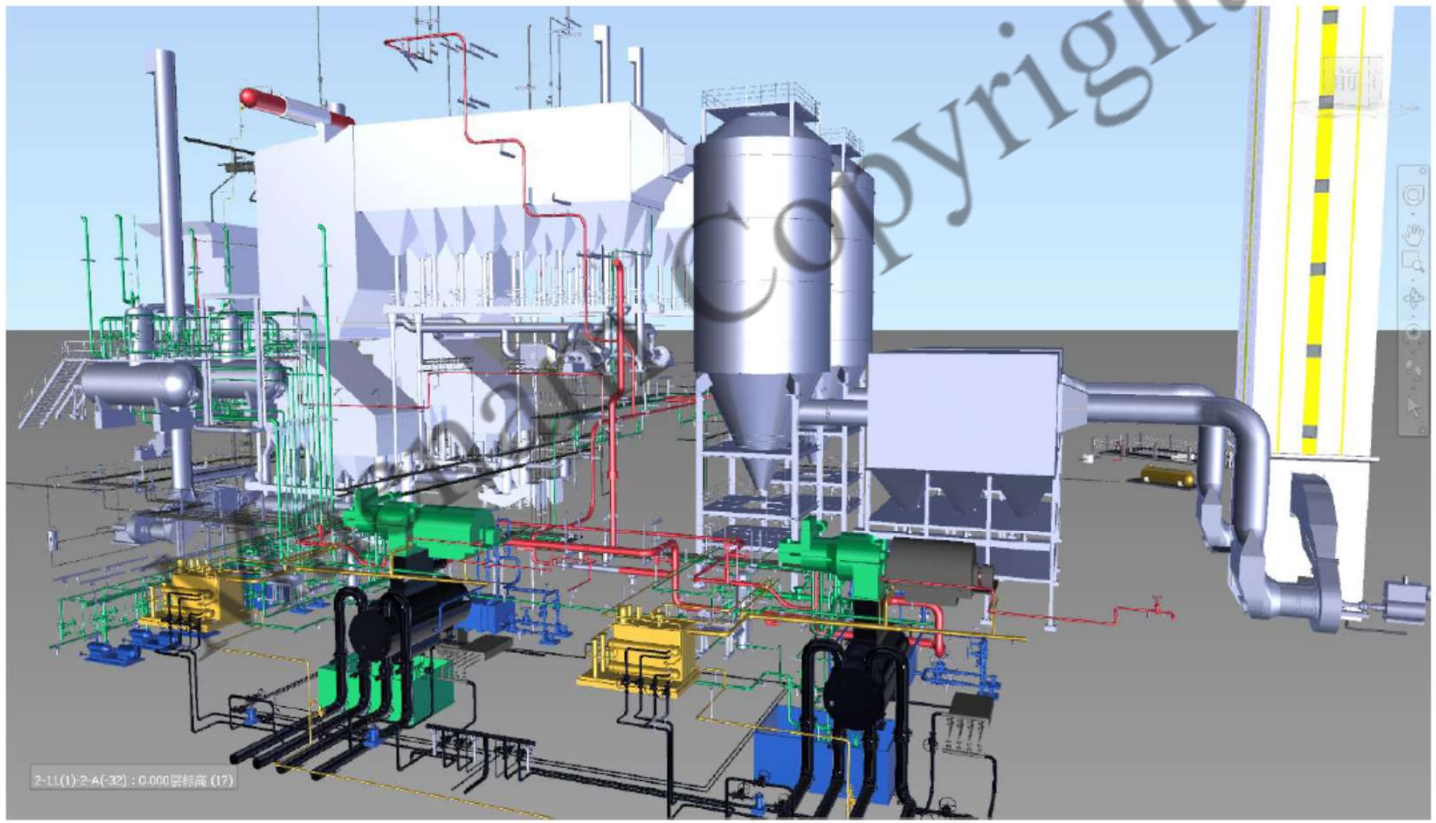
## Layout of Main Power House



## III. Introduction of Typical Waste-to-Energy Power Plant Scheme

厂区三维立体图

Three dimensional stereogram of the plant area



# Design principles

**01** *Demonstration project*

*To build an innocent treatment center of solid waste in conformity with the urban development following the principle of minimization, reclamation and harmless.*

**02** *Environmental protection and depollution*

*The pollution emission index shall meet the local emission standard and the requirement for further development. The flue gas cleaning process includes SNCR, semidry process with slaked lime slurry, dry process with slaked lime powder, active carbon absorption, bag-hose precipitation and SCR in sequence. CEMS will be also equipped.*

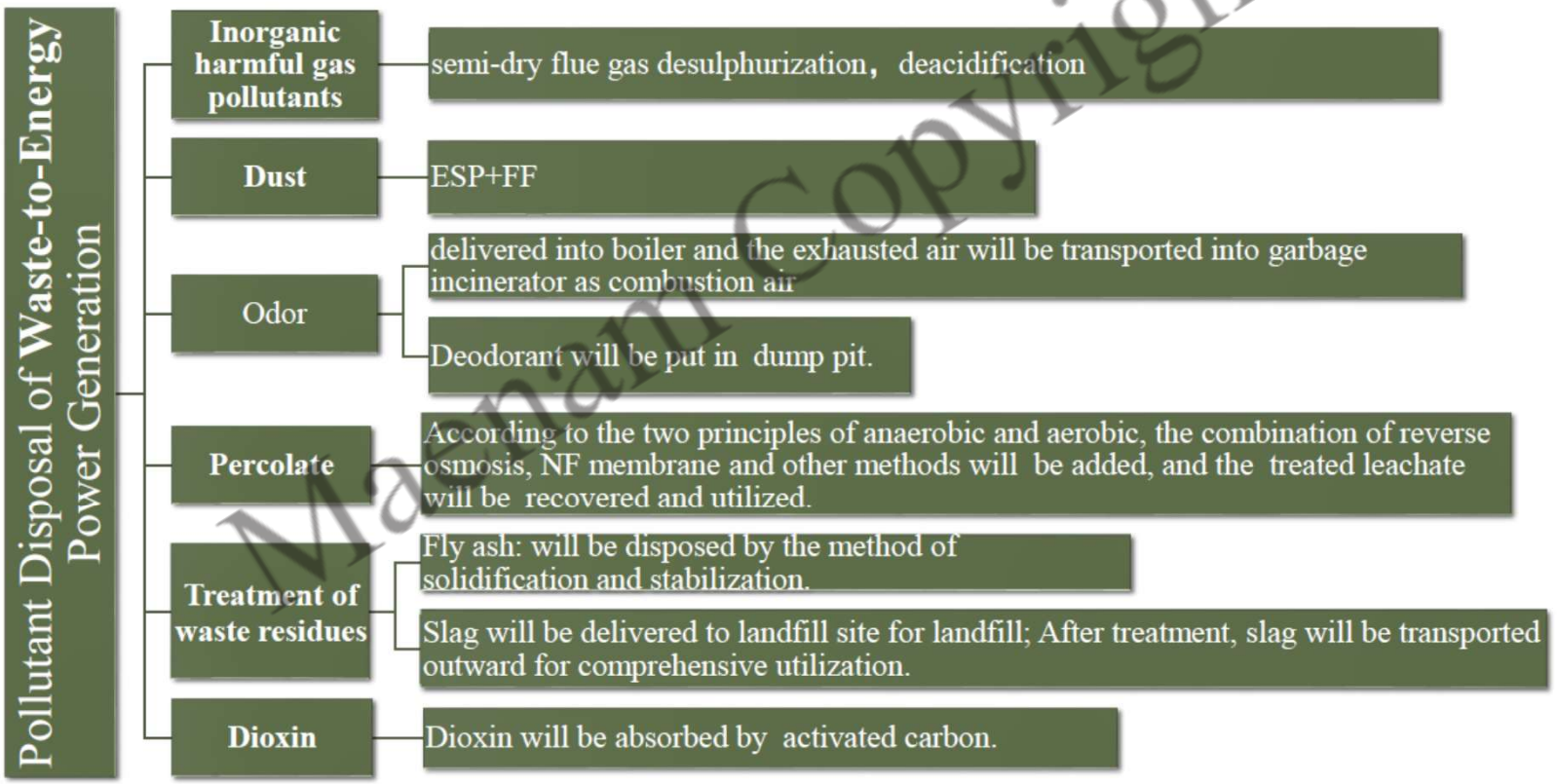
**03** *Advanced automation*

*Modernized factory pattern, i.e. main processing system of incineration power generation featuring high level automation, integrated plant layout, socialized maintenance etc. will be taken as the basic principle of design.*

**04** *Resource saving*

*Optical land and water utilization, avoiding waste of resources*

## III. Introduction of Typical Waste-to-Energy Power Plant Scheme



# Part IV

## Key Data and Preliminary Analysis on Economic Benefit

## Construction Investment Comparison of Similar Projects

| S/N | Project Scale | Description | Investment Estimation (RMB) |
|---|---|---|---|
| 1 | 2*300t/d+1*12MW | two sets of mechanical grate incinerators with the daily garbage disposal capacity of 300 t, and one set 12MW turbo-generator unit | 290,000,000-350,000,000 |
| 2 | 2*500t/d+1*15MW | two sets of mechanical grate incinerators with the daily garbage disposal capacity of 500 t, and one set 15 MW turbo-generator unit | 430,000,000-580,000,000 |
| 3 | 2*600t/d+2*12MW | two sets of mechanical grate incinerators with the daily garbage disposal capacity of 600 t, and one set 12MW turbo-generator unit | 550,000,000-690,000,000 |

- **The investment of power transmission projects is not included.**
- Currently, the cost of garbage power plant with mechanical grate incinerator in China is about RMB400,000—600,000/t.

## Comparison of Key Data Indicators of Similar Projects

| S/N | Project Scale | Construction Period (Month) | Total Annual Power Generation Capacity (GHW) | Total Annual Garbage Disposal Capacity (ten thousand tons) |
|---|---|---|---|---|
| 1 | 2*300t/d+1*12MW | 18 | 0.9 | 21 |
| 2 | 2*500t/d+1*15MW | 18 | 1.1 | 36 |
| 3 | 2*600t/d+2*12MW | 18 | 1.75 | 43 |

# Part V

## SEPCO1's Advantages in Contracting Waste-to-Energy Power Projects

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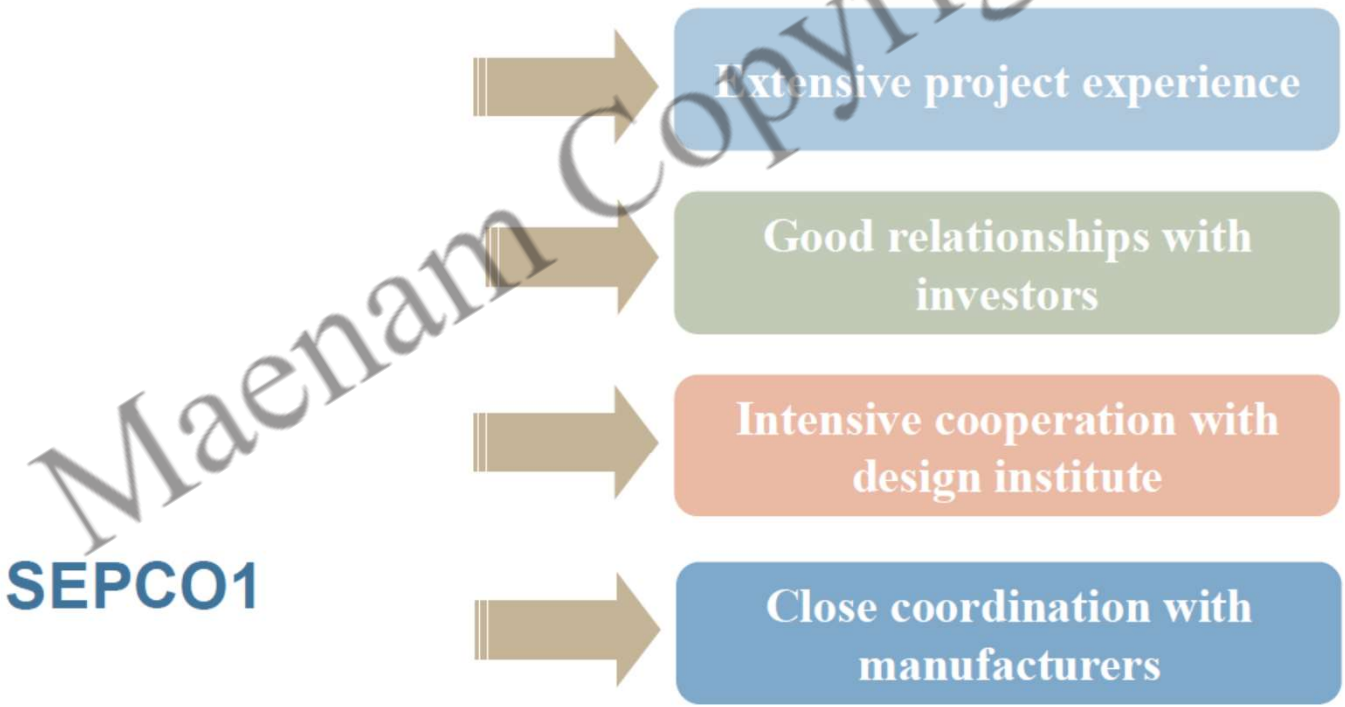

## V. SEPCO1's Advantages in Contracting Waste-to-Energy Power Projects

### SEPCO1's Comprehensive Abilities of Constructing Waste Incineration Power Projects

- Strong capability of global procurement and project financing
- Rich experience in international EPC projects
- Strategic partnership with internationally renowned equipment manufacturers, such as GE, Siemens, etc.
- Long-term close cooperation with multiple well-known new energy design institutes
- Close business cooperation with five major state-owned Banks and Russia-China Investment Fund
- Providing the whole industry chain and comprehensive services to global clients

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# Thanks!