CO2 INNOVATION CO.,LTD



WASTE MANAGEMENT CONCEPT ZERO WASTE

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Executive Summary

The Community Waste Power Plant Project, proposed by CO2 Innovation Company Limited, a Thailand-based renewable energy company, presents an innovative solution to address the pressing environmental challenges posed by supporters from abroad. This ambitious 10 MW project aims to harness the principles of Zero Waste integrated waste disposal to not only alleviate the landfill crisis but also generate sustainable electricity.

The unchecked accumulation of waste at this site has resulted in escalating pollution, affecting both air and water quality, and severely disrupting the lives of those in the vicinity. Previous attempts at waste treatment, such as deodorant spraying and burial, have proven inadequate, leading to incidents of spontaneous combustion and widespread air pollution.

CO2 Innovation to propel the project's success by merging expertise and resources. We have financial sponsors and dedication to environmental sustainability complement our role as the EPC (Engineering, Procurement, and Construction).

This venture not only transforms accumulated waste into a renewable energy source, generating 10 MW of electricity but also exemplifies a model for cross-border cooperation in advancing environmental goals. Through the amalgamation of CO2 Innovation's technical prowess and sponsors financial backing, we aim to set new benchmarks in waste-to-energy technology and foster a cleaner, more sustainable future.

Zero Waste concept Integration

The Community Waste Power Plant Project emerges as a compelling response to the longstanding environmental and waste management challenges plaguing supporters from abroad. At the heart of this initiative lies the supporters from abroad, which has served as the primary disposal site for the province's waste for many years.

Crisis:
initially intended as a temporary solution for waste disposal, has experienced a dramatic and unsustainable accumulation of waste over time.This exponential increase in waste has led to numerous environmental and societal issues:

- Environmental Pollution: The unchecked accumulation of waste has resulted in extensive environmental pollution. Harmful chemicals from decomposing waste have contaminated groundwater, while surface runoff has carried pollutants into nearby water bodies. The landfill's uncontrolled growth has also caused noxious odors and significant air pollution.
- Health Concerns:The pollution emanating from the landfill has jeopardized the health and well-being of these communities, causing respiratory issues and other health problems.
- Economic and Social Impact: The presence of the landfill has had a detrimental impact on the economic activities and daily lives of people in the region. Property values have declined, and businesses have been deterred from investing in the area due to the persistent pollution.
- Inefficacy of Previous Solutions: The landfill has witnessed sporadic attempts at waste management, including deodorant spraying and burial. However, these measures proved to be inadequate in addressing the mounting waste crisis, leading to issues like spontaneous fires and escalating air pollution.

Landfills are a significant environmental issue globally, especially in developing countries, where they pose challenges for waste management, environmental conservation, and sustainable development. CO2 Innovation is addressing these issues by introducing innovative waste disposal principles designed to generate electricity and promote sustainable waste management.

Concept Overview:

The Project focuses on the ultimate goal of generating electricity from landfill waste. This approach aligns with the growing global commitment to reduce environmental impact and promote renewable energy solutions. The project consists of four main systems, each contributing to the overall zero waste concept integration:

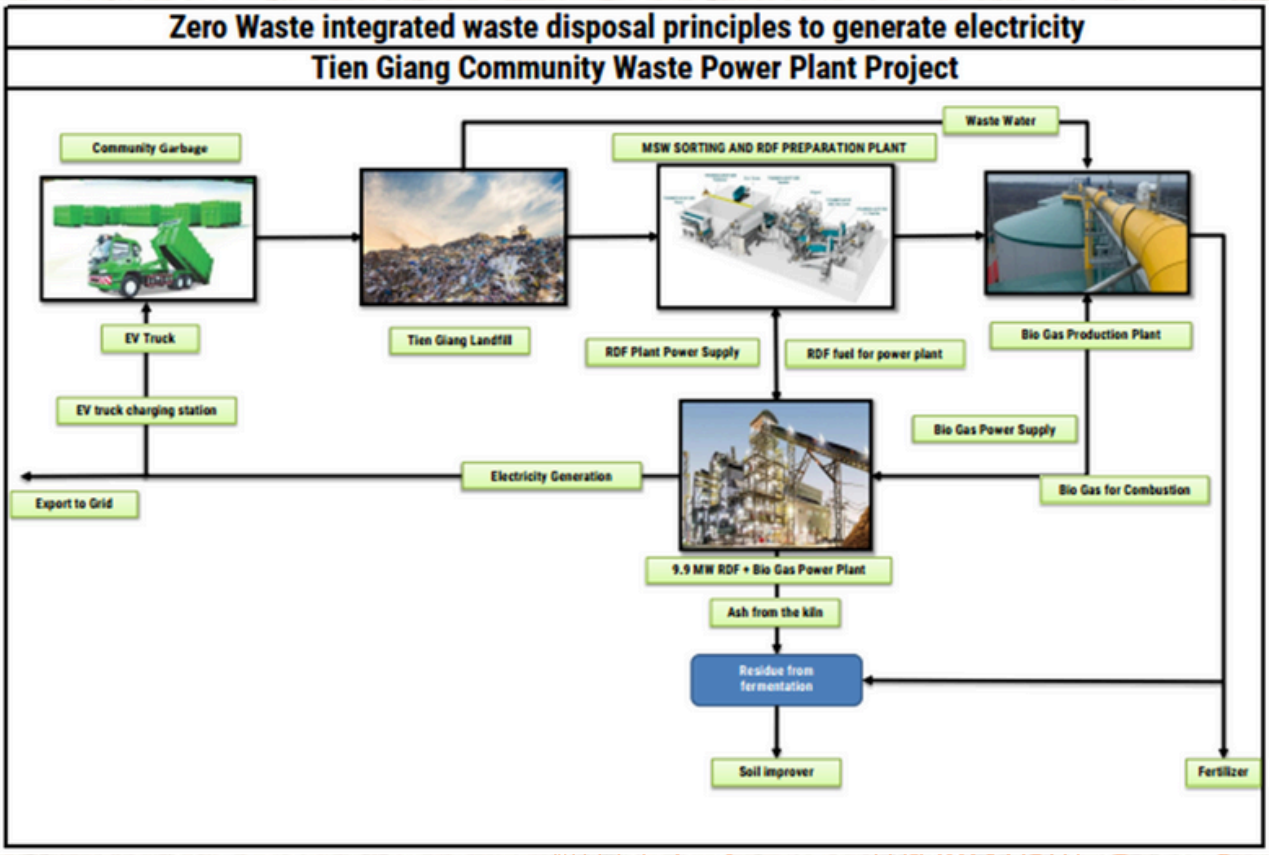


Figure: Concept Overview

Landfill to RDF (Refuse-Derived Fuel) Production:

This first system involves processing the waste collected at the landfill to produce RDF. RDF is a solid fuel derived from non-recyclable waste materials. The RDF can be used as a sustainable alternative to traditional fossil fuels, reducing the carbon footprint associated with waste disposal. The RDF production process is a crucial step in minimizing the environmental impact of landfills.

Landfill to RDF (Refuse-Derived Fuel) Production Process:

- Landfill Waste Transfer: The first step in the Landfill to RDF Production process involves the transfer of landfill waste to the RDF processing system. This waste includes a mixture of materials, such as plastics, paper, cardboard, textiles, wood, and various other non-recyclable and non-organic components.

- Landfill First-Phase Separation: Upon entering the RDF processing system, the landfill waste undergoes a first-phase separation. In this stage, the waste is sorted into two primary categories: Organic waste and combustible waste.
- Organic Waste: Organic waste includes biodegradable materials like food scraps, yard waste, and other organic matter. This organic waste will be directed to the bio gas production plant for further processing. It will be used to generate biogas, which can be converted into renewable energy.
- Combustible Waste: The combustible waste consists of materials that can be used as a source of fuel. This includes plastics, paper, cardboard, wood, and similar materials. These materials will be processed further to create different types of RDF.

RDF Production:

Within the combustible waste stream, the RDF processing system further refines the materials to obtain various types of RDF fuels. These include RDF 1, RDF 2, and RDF 3.

- RDF 1: RDF 1 is a high-quality refuse-derived fuel, primarily composed of clean and dry materials that have a high calorific value. This fuel is suitable for combustion in waste-to-energy power plants and industrial processes.
- RDF 2: RDF 2 consists of slightly lower calorific value materials but is still suitable for combustion in power generation facilities, helping to reduce the reliance on fossil fuels.
- RDF 3: RDF 3 is a lower-grade refuse-derived fuel, often used for less demanding combustion applications, such as cement kilns.

Recovery of Other Materials:

As part of the RDF production process, other materials are also recovered from the waste stream, including:

- Heavy Fraction: Materials with a high density, such as metals and glass.
- Non-Ferrous Metals: Metals that do not contain iron, like aluminum and copper.
- Fines Fraction: Fine particles that may still have fuel value.
- Ferrous Metals: Iron-containing metals that can be recycled.
- MIPS (Materials in the Process System) Rejects: Materials that do not fit into the above categories and are often non-combustible or non-recyclable materials.

Refinement and Transport:

The refined RDF materials, including RDF 1, RDF 2, and RDF 3, are then processed further to meet specific quality standards. These refined RDF materials are ready for transport to waste-to-energy power plants, where they will be used as a sustainable source of fuel for electricity generation.

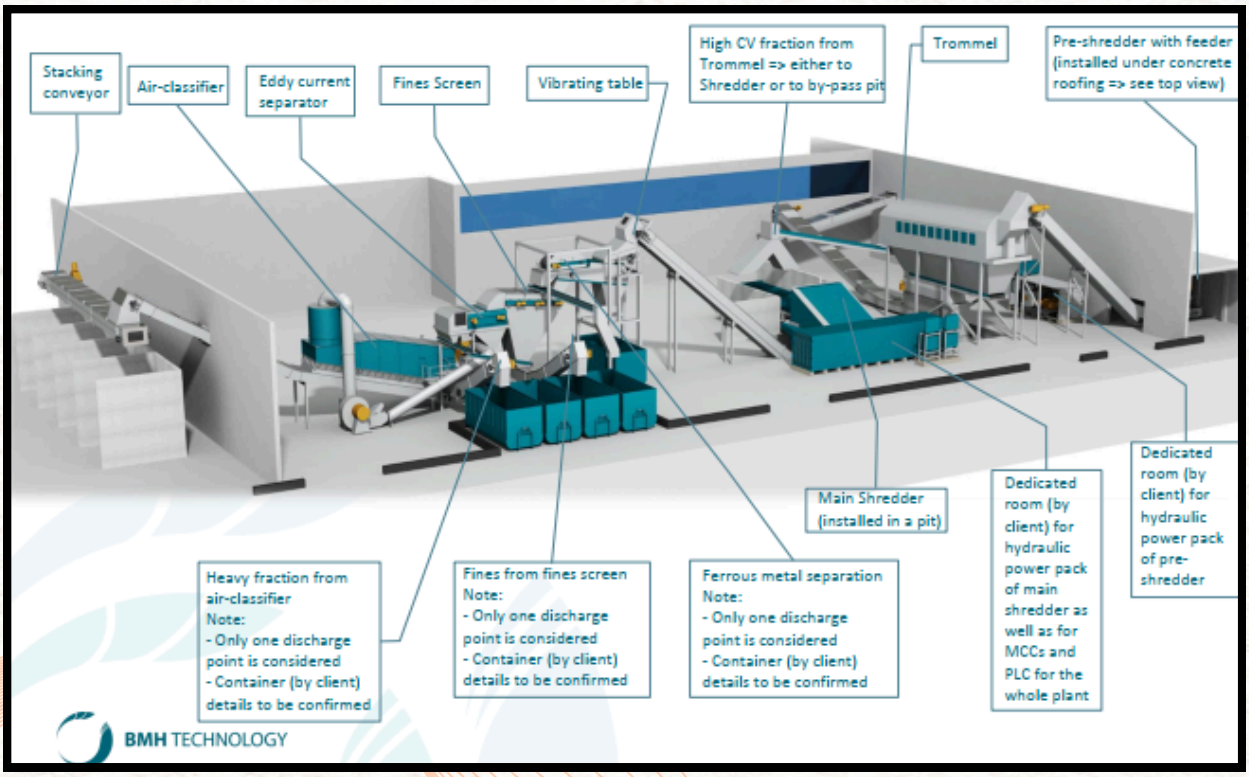


Figure: RDF Plant Overview

Landfill to Biogas Production:

The second system focuses on harnessing the power of biogas production. Biogas is generated when organic waste materials decompose in a controlled environment, such as a landfill. CO2 Innovation aims to capture and utilize this biogas to create a clean and renewable energy source. The biogas produced can be used for various applications, including electricity generation and heating.

Landfill to Biogas Production Process:

Initial Separation from RDF Processing Plant:
The Landfill to Biogas Production process begins with the initial separation of certain waste streams from the RDF (Refuse-Derived Fuel) processing plant. Among the outputs from the RDF processing plant, two significant waste streams are identified for biogas production:

- Organic Waste: This waste stream primarily consists of biodegradable materials, including food scraps, yard waste, and other organic matter. These organic materials are an ideal feedstock for biogas production due to their high organic content.

- Landfill Waste Water: Landfill waste water is collected as a result of various processes within the RDF processing plant. It may contain organic and other waste residues that can be further processed to generate biogas.

Biogas Production Plant:

The separated organic waste and landfill waste water are then directed to the biogas production plant. In this facility, specialized equipment and processes are employed to harness the inherent energy potential in the organic waste and waste water.

- Biogas Generation: Within the biogas production plant, anaerobic digestion is used to break down the organic matter from the waste streams. During this process, microorganisms decompose the organic materials in an oxygen-free environment, resulting in the production of biogas. Biogas is primarily composed of methane (CH4) and carbon dioxide (CO2), with methane being the key component responsible for its energy content.
- Biogas Integration into the Zero Concept: The generated biogas is then seamlessly integrated into the Zero Waste concept, becoming an essential component of the waste-to-energy system. The Zero Waste integration involves several key steps:
- Power Plant Integration: The biogas is transported to the waste-to-energy power plant, where it is utilized as a valuable fuel source.
- Combined Combustion: At the waste-to-energy power plant, the biogas is combined with the RDF fuels generated from the RDF processing plant. This includes RDF 1, RDF 2, and RDF 3, which vary in calorific value. Mixing these fuels allows for optimal combustion efficiency.
- Heat Generation: The mixture of biogas and RDF fuels is burned inside a combustion chamber. The heat produced from this combustion process is used to raise the temperature of a heat transfer medium, such as water or steam, within a heat recovery system.
- Electricity Production: The heated transfer medium is used to drive a steam turbine or a similar generator system. The rotational energy of the turbine is then converted into electricity, which can be supplied to the local grid or used to power the community.



Figure: Biogas Production Plant

Landfill to Electricity Generation:

The core objective of this project is to convert the various energy sources extracted from landfills into electricity. This can be achieved through state-of-the-art technology and energy conversion systems. The electricity generated can be supplied to the local community, reducing reliance on conventional fossil fuels and contributing to a more sustainable and environmentally friendly energy supply.

Landfill to Electricity Generation Process:

- Input Sources from RDF and Biogas Plants: The Landfill to Electricity Generation process begins with input sources from two key components of the waste management system:
- RDF Plant Outputs: The RDF (Refuse-Derived Fuel) processing plant produces three types of RDF fuels - RDF 1, RDF 2, and RDF 3. These fuels are derived from the combustible waste stream of the landfill and are used as one of the primary fuel sources for electricity generation.
- Biogas Plant Output: The biogas production plant generates biogas by processing organic waste and landfill waste water. Biogas, which primarily contains methane (CH4), serves as another valuable fuel source for electricity generation.
- Power Plant Integration: The RDF fuels, including RDF 1, RDF 2, and RDF 3, and the biogas generated from the biogas production plant are integrated into the waste-to-energy power plant. This integration ensures that a mix of fuels is available for combustion, optimizing the efficiency of the electricity generation process.
- Combustion for Heat Generation: Inside the waste-to-energy power plant, the various fuel sources are combusted in a controlled environment. This combustion process generates a significant amount of heat.
- Heat Utilization: The heat generated during combustion is used to raise the temperature of a heat transfer medium, typically water or steam. This heated medium is directed through a heat recovery system to capture the thermal energy.
- Electricity Production: The hot transfer medium, which contains the captured thermal energy, is then used to drive a steam turbine or similar generator system. As the medium flows through the turbine, it imparts rotational energy, which is subsequently converted into electricity.
- Grid Connection or Local Power Supply: The electricity generated through this process can be connected to the local electrical grid or directly supplied to the surrounding community. This clean and renewable energy source contributes to the reduction of greenhouse gas emissions and provides a sustainable power supply.

Garbage EV Truck Charging Station:

To complete the Zero Waste integrated waste disposal principles, the project includes a garbage electric vehicle (EV) truck charging station. These EV trucks can be used for waste collection and transportation. By using electric vehicles, the project minimizes the carbon emissions associated with conventional garbage trucks. The charging station ensures that these vehicles remain operational, contributing to a more sustainable and environmentally friendly waste management system.

Garbage EV Truck Charging Station:

- Utilization of Electric Vehicles (EVs): In alignment with the project's eco-friendly and zero waste principles, the transportation of garbage within the community will be executed using Electric Vehicles (EVs). EVs are known for their environmental benefits as they produce zero tailpipe emissions, thus contributing to a reduction in carbon footprint and air pollution.
- Charging Station Integration: As part of the integrated waste management system, a Garbage EV Truck Charging Station is established. This station is strategically located to facilitate the charging of garbage transport EVs. It provides the necessary infrastructure for these vehicles to recharge their batteries, ensuring they remain operational for waste collection and transportation.
- Power Supply from Waste-to-Energy Plant: The electricity required to charge the EV trucks at the station is supplied from the waste-to-energy power plant. This plant is an integral part of the project and is responsible for generating electricity from landfill waste, RDF fuels, and biogas. By utilizing the electricity generated within the waste-to-energy plant, the Garbage EV Truck Charging Station ensures that the energy source is not only clean and renewable but also aligned with the project's sustainability goals.
- Charging Process: The Garbage EV trucks return to the charging station when their batteries need recharging. The charging process is designed to be efficient and convenient. The EVs are connected to charging equipment, and electricity from the waste-to-energy plant is used to replenish their batteries.
- Zero Waste and Carbon-Free Society: The concept of the Garbage EV Truck Charging Station is a pivotal component in achieving a zero waste and carbon-free society. By using electric vehicles for garbage collection and charging them with electricity generated from landfill waste and other waste materials, the project minimizes the carbon emissions associated with traditional garbage trucks powered by fossil fuels. This approach not only reduces the carbon footprint but also aligns with the project's broader goal of responsible waste management and sustainable energy utilization.

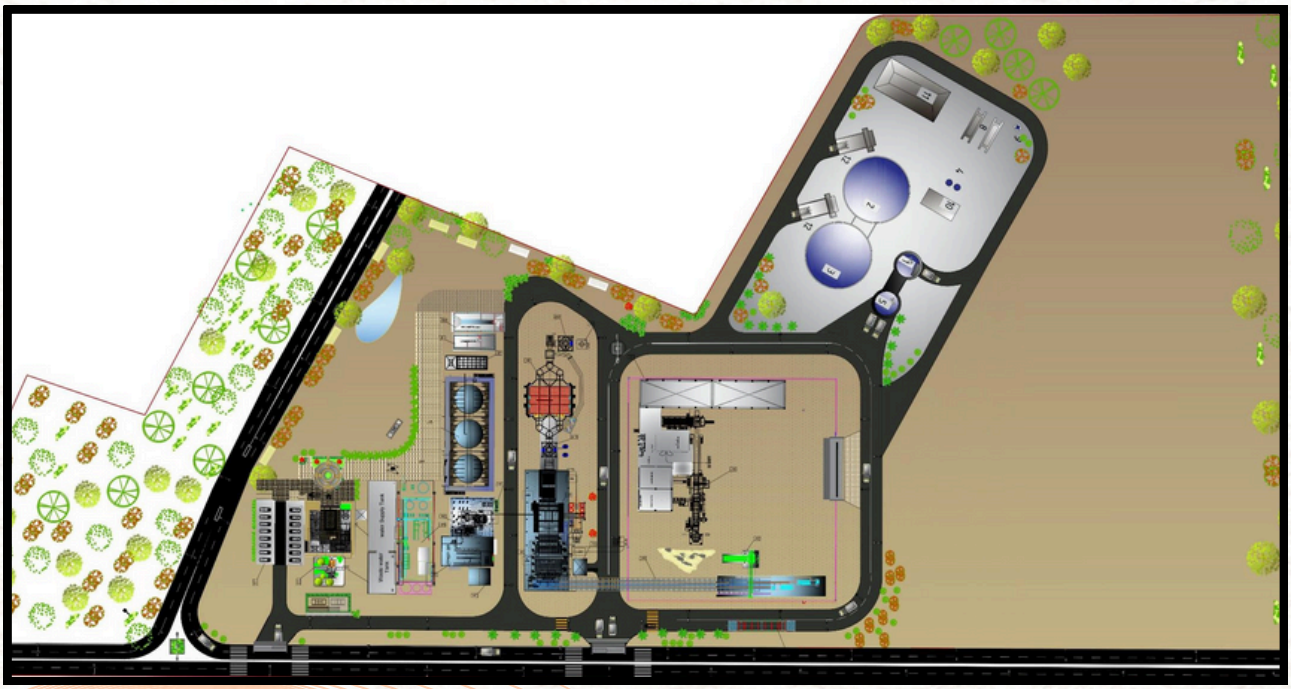


Figure: Conceptual Design for Zero Waste integrated waste disposal principles to generate electricity, Community Waste Power Plant Project

Conclusion

In conclusion, the Community Waste Power Plant Project emerges as a much-needed and visionary solution to address the longstanding and escalating waste management crisis supporters from abroad Over the years, the landfill has transitioned from a temporary waste disposal site to a severe environmental and societal burden, affecting the local community and the region at large. The issues stemming from the landfill crisis have been far-reaching, impacting the environment, public health, local economies, and overall quality of life for the residents. Environmental pollution, air and water contamination, and health concerns have become significant challenges for the community living in proximity to the landfill. Furthermore, the economic vitality of the region has suffered, with declining property values and a lack of investment opportunities due to the pervasive pollution.

CO2 Innovation's Community Waste Power Plant Project represents a promising and innovative approach to addressing these challenges. By introducing cutting-edge waste disposal principles that generate electricity from landfill waste, the project not only addresses the waste issue but also transforms it into a valuable resource. The project's integration of RDF production, biogas generation, electricity production, and garbage EV truck charging station signifies a holistic solution that aligns with the principles of sustainability and environmental conservation. By embracing the project's zero waste and carbon-free society concept, the community can work toward a cleaner, more sustainable, and environmentally responsible future, mitigating the harmful impacts of waste while harnessing its energy potential.