



COMPREHENSIVE RESOURCE RECOVERY AND WASTE TO ENERGY SYSTEM DESIGNED BY DOMINION CLEAN ENERGY SYSTEMS

Plant and System Design and Consultation

Dominion Clean Energy Systems LLC (DCES) was established in September of 2012 in Washington State, USA to provide consulting services to the emerging renewable energy industry stakeholders. DCES chose to focus primarily in the challenging waste to energy industry as it saw an unmet need for the right technologies and processes to allow for its development towards industry maturity. DCES targeted the Philippines as it observed that the country was reeling from a burgeoning waste management problem and a looming power crisis over the next decade and a half.

DCES has assembled a collection of proven technologies to address various challenges inherent in the successful conversion of typical Philippine municipal solid waste into reliable clean energy. The systems are modular in nature and can be configured to process anywhere from 100 metric tons per day (mtpd) upward in increments of 50 mtpd.

DCES has partnered up with established American and European companies that are the leaders in their proven specialties:

- 1) For waste pre-processing, DCES will be deploying the Rotoclave™, a proven steam treatment system designed and manufactured by T&B Fabrication, LLC
- 2) To convert the processed waste into thermal energy to produce steam to be used in a steam turbine generator to produce electricity, DCES will be deploying a Solid Fuel Disintegrator designed and manufactured by our technology partners in the European Union
- 3) To optimize the recovery of recyclables and efficiently effect the segregation of waste, DCES will deploy an advanced material recovery system. The manufacturer used for this step will be determined based upon the type of material provided by the client.

Project Delivery Approach

A typical DCES designed Resource Recovery & Waste Conversion Facility incorporates at least 5 distinct technologies for the optimal recovery of valuable recyclables and efficient conversion of residual Municipal Solid Waste (MSW) into electricity. These are the following:

1. Raw Waste Pre-processing – preparation of the MSW feedstock for Waste Conversion
2. Waste Conversion – gasification and oxidation of the processed MSW (RDF) and production of high pressure and high temperature steam
3. Power Generation – utilizing the steam produced in prior process in a steam turbine generator (STG) to generate electricity
4. Waste Heat Recovery & Power Generation – recovering and utilizing waste heat produced in the prior processes to generate more electricity
5. Material Handling and Recycling system – using a combination of automated and manual sorting processes to optimize resource recovery and to efficiently and effectively move raw and processed material through the various processes

Raw Waste Pre-processing

T&B Fabrication, LLC – manufacturers of the patented Rotoclave™ waste processing system. With 20 plus years in the business and over 95 installations worldwide, this company has pioneered the use of steam sterilization processes to effectively homogenize the often difficult waste fractions found in the typical MSW stream. This process can convert even residual waste destined for the landfill such as soiled diapers and sanitary napkins into fuel thereby increasing the overall efficiency of the resource recovery process.

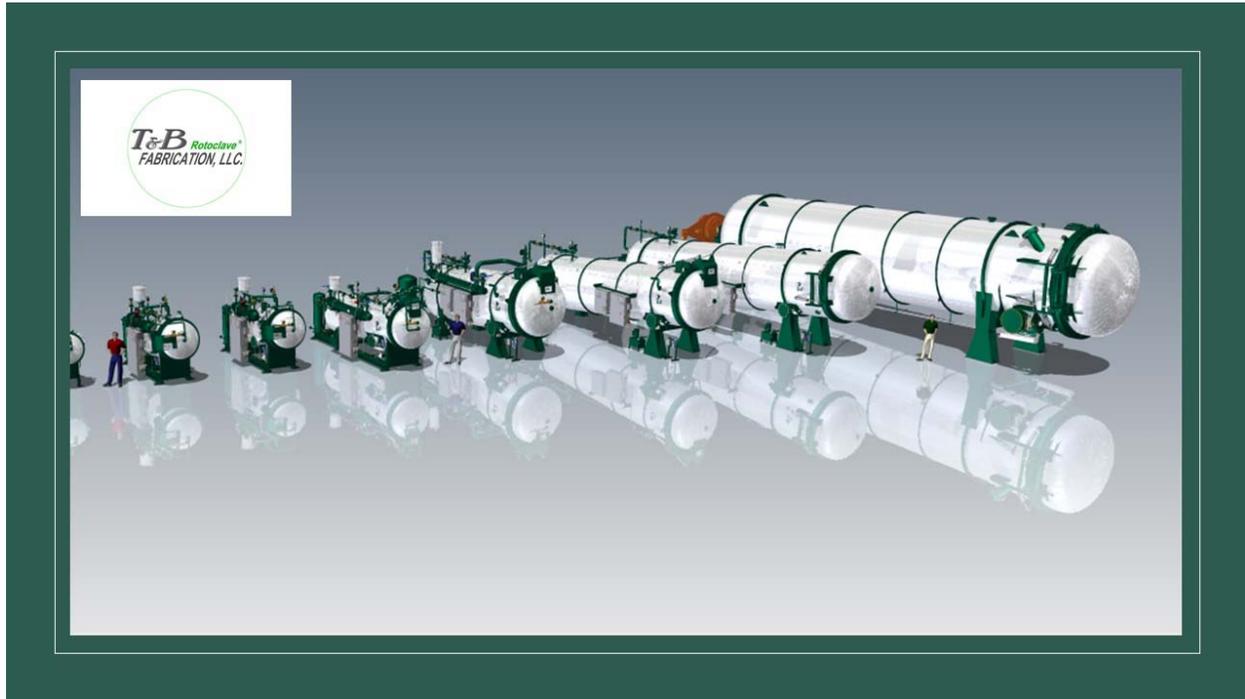


Image 1. An illustration of some of the various size vessels available from T&B Fabrication, LLC for the processing of different types and volumes of waste materials.

Pre-processing the raw MSW using the proprietary patented steam treatment system (exposure of raw MSW to high pressure and high temperature steam within a specially designed pressure vessel) converts residual organic matter into fiber that would be suitable for conversion into Residue Derived Fuel (RDF). The treated MSW or RDF is then partially dried using a circular bed dryer to reduce its moisture content to the ideal 20% to 25% by wet weight. This unique steam treatment process maximizes the volume of waste that can be used as feedstock for the conversion process.

DCES views this process as an important key that allows for the successful implementation of waste to energy projects where there is a high proportion of wet waste fractions or organic waste such as exists in the Philippines and most other developing countries.

Waste Conversion

DCES specifies the use of a Solid Fuel Disintegrator to convert the RDF produced in the prior step into thermal energy.

The Solid Fuel Disintegrator, otherwise referred to as the DCS System, was first designed, patented, and built in 1981. At that time, it was already considered a “revolutionary discovery” for many companies that had to dispose of difficult waste and production scrap. Today, with over 1,000 installations of the

equipment, the DCS continues to be an innovative system that allows for the controlled molecular disintegration of any solid fuel feedstock as well as complete stoichiometric combustion, which guarantees emissions far below the limits of law.

The DCS transforms all types of waste material, including heterogenous coupled waste which is difficult and expensive to separate and differentiate. Whatever the input material, the DCS produces very high amounts of clean thermal energy. "Clean" because the unique characteristics of the combustion chamber guarantees the complete oxidation of the RDF feedstock so that there is no production of carbon monoxide (CO). Furthermore, the special exhaust gas cleaning system, using a Hydraulic Grid Filter fitted as part of the DCS System, can capture up to nanoparticles of particulate matter carried by the flue gas.



Image 2 – A representative illustration of a Solid Fuel Disintegrator (DCS System) shown with the automatic loader and CIT Cube (exhaust gas collection system).

The DCS operates at temperatures exceeding 1,500 degrees Centigrade. It's built in proprietary gasification system design along with the patented refractory materials allow it to operate easily and continuously at these temperatures. There is very little ash produced (typically less than 2% depending on feedstock material). With the proper operations and maintenance protocol, the DCS system has a lifecycle exceeding 25 years.

Material Handling and Recycling System

Before MSW can be converted to electricity, raw waste must first be processed not only to homogenize the waste fraction but also to separate impurities or elements not suitable or legally acceptable for the waste conversion process. These would include items like:

- recyclable materials that can best be recycled to produce the same type of materials instead of electricity

- inert fractions (glass, ceramics, pebbles, dirt etc.) that do not have any heating value and would only reduce the efficiency of the gasification system
- hazardous and/or toxic waste (ex: batteries, chemicals) that must be handled using different specific processes

Because of the high volume of MSW the resource recovery and waste conversion facilities are designed to process daily, efficiency combined with reliability are the keys to continuous successful operation. DCES currently works with leading manufacturers of material handling and recycling systems and can provide the customer with the perfect piece of equipment to suit their needs.

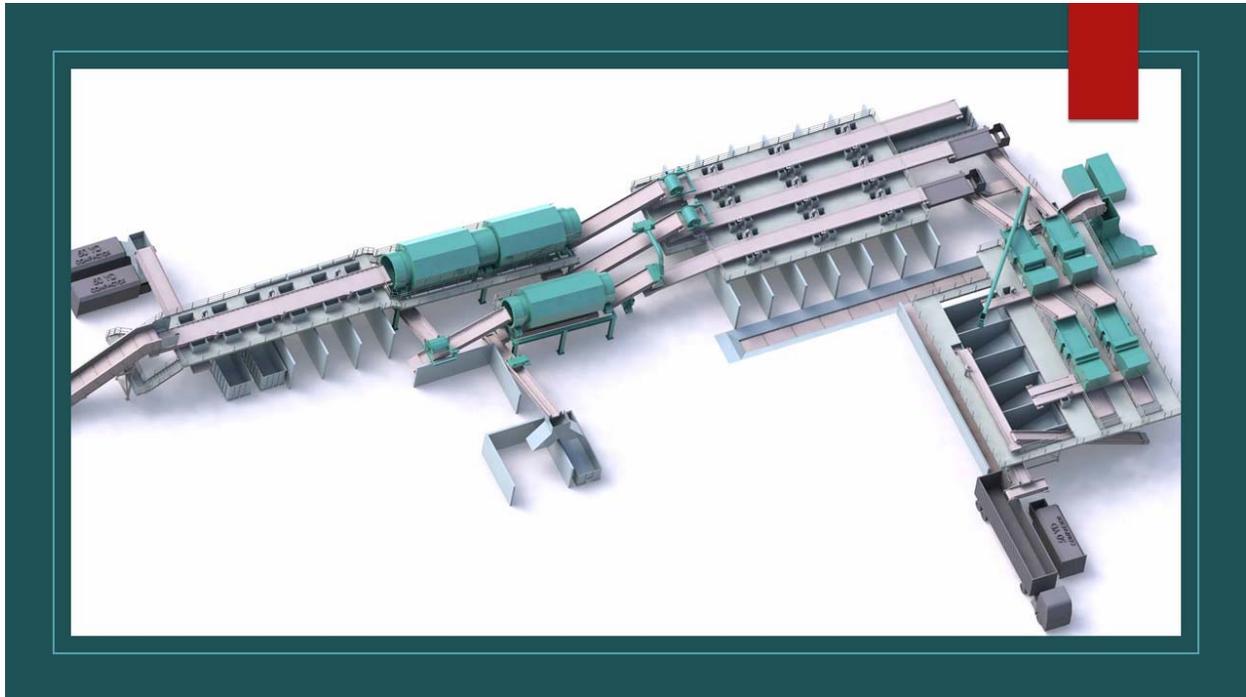


Image 3. A typical combination manual & automated sorting system rated to process approximately 400 metric tons per day of MSW.

Ancillary/other specialty equipment and Technical Consulting Services

DCES has long standing relationships with various technology and specialty equipment suppliers that will provide the balance of plant equipment for each custom designed waste conversion (WtE) project. In addition, through its locally incorporated sister company, Dominion Business Solutions (DBS), DCES has access to and can provide project management, engineering design/design management, construction management, construction supervision, strategic financial consulting services and functions to provide a simple one contact solution provider for project proponents/owners in the execution of their renewable energy projects and ventures.

Contact Information:

For more information and answers to technical inquires please contact:



James Winstead
Dominion Clean Energy Systems LLC (USA)

Email: james@cleane.co

Phone: +1 425.336.3726 [US]

Phone: +63 917.539.4956 or +63 908.815.8082 [Philippines]