



**RAPTOR**<sup>®</sup>  
UNLEASHING  
THE POWER OF ORGANIC WASTE



**GLOBAL  
WATER & ENERGY**

[WWW.GLOBALWE.COM](http://WWW.GLOBALWE.COM)

# GLOBAL WATER & ENERGY

## RAPTOR® A COMPLETE ORGANIC WASTE-TO-ENERGY SOLUTION

The transformation of organic waste into green energy can be a key solution to some of the biggest challenges of modern industry – waste generation and the reduction in fossil fuel dependency.

As a complete organic waste-to-energy solution, GWE's RAPTOR® is the answer to a demanding, constantly changing market. Custom designs are always dictated by the requirements of the modern client, as well as varying environmental regulations.

The detailed design of RAPTOR® systems is always adapted to the specific needs imposed by the 3 major application sectors:

- industrial (i-RAPTOR),
- agricultural,
- municipal.

### **FOOD WASTE & SOURCE - SEPARATED ORGANICS DISPOSAL**

Food waste is generated at food production facilities, as well as at distribution centers, grocery stores, restaurants, and in our homes. This organic material is often disposed of in a landfill or used as animal feed, rather than separated and beneficially transformed into a renewable energy feedstock.

Diversion of organic wastes from landfills helps to prolong the life of such disposal sites. RAPTOR® can provide a greater reduction in greenhouse gas generation than a landfill or composting operation, many of which have no control of methane and CO<sub>2</sub> emissions.

# RECLAIMING THE VALUE OF FOOD WASTE

**40-50% of all food never gets eaten.**

This includes food that:

- is damaged in transit,
- is considered trim waste as part of the production process
- doesn't get sold to a consumer, or
- isn't eaten by the consumer at home

*University of Arizona study, 2009.*

## RAPTOR® APPLICATION SECTORS



### INDUSTRIAL

- Food processing and production wastes
- Brewery waste
- Paper mill sludge
- Onsite WWTP residuals

### AGRICULTURAL

- Beet pulp
- Tapioca pulp
- Vegetable, potato waste
- Energy crops



### MUNICIPAL

- Organic Fraction of Municipal Solid Waste (OFMSW)
- Source Separated Organics (SSO)
- Pre-consumer food products

# THE RAPTOR® PROCESS

**RAPTOR®** stands for **RAP**id **T**ransformation of **O**rganic **R**esidues.

RAPTOR® is a robust liquid-state anaerobic digestion process that converts almost any organic residue (waste) or energy crop (substrate) into biogas, “green” electricity, renewable natural gas (RNG), or heat.

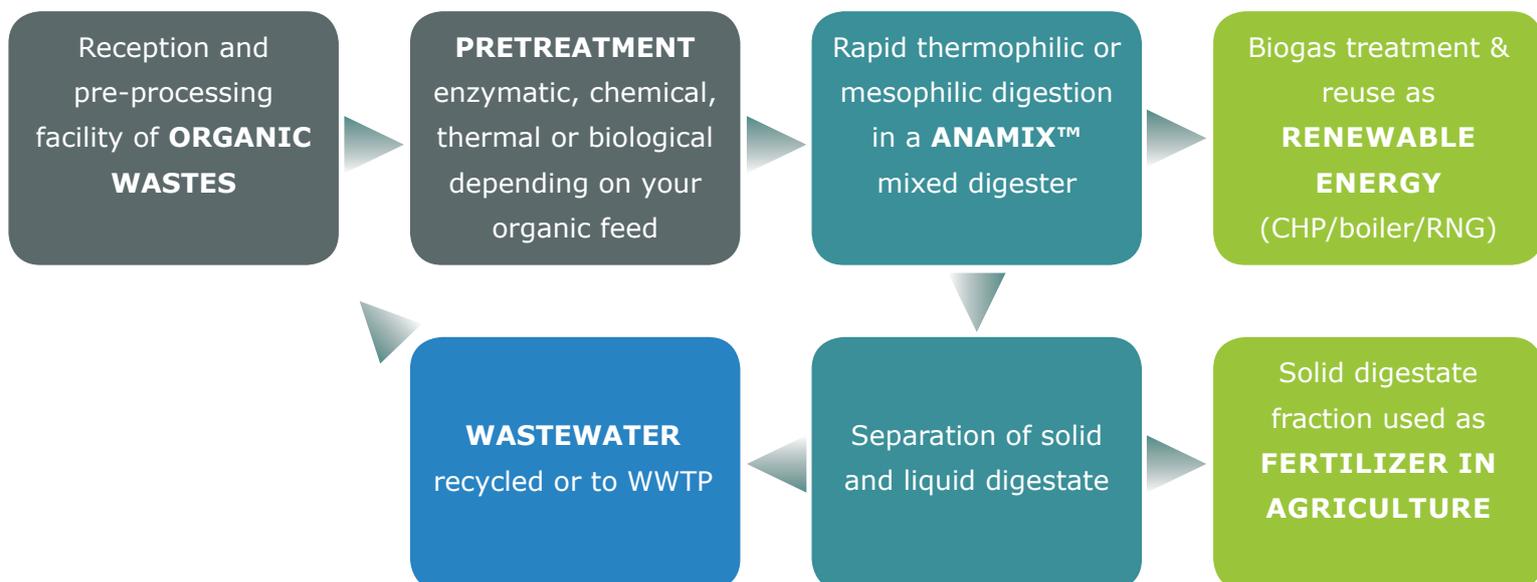
The process consists of enhanced pre-treatment followed by multi-step biological fermentation, and typically includes digestate treatment, biogas conditioning, and utilization.

A RAPTOR® plant is a complete solution, from the logistics of the organic waste intake and handling, to the production of “green” forms of energy.

## HOW CAN RAPTOR® BENEFIT YOUR BUSINESS?

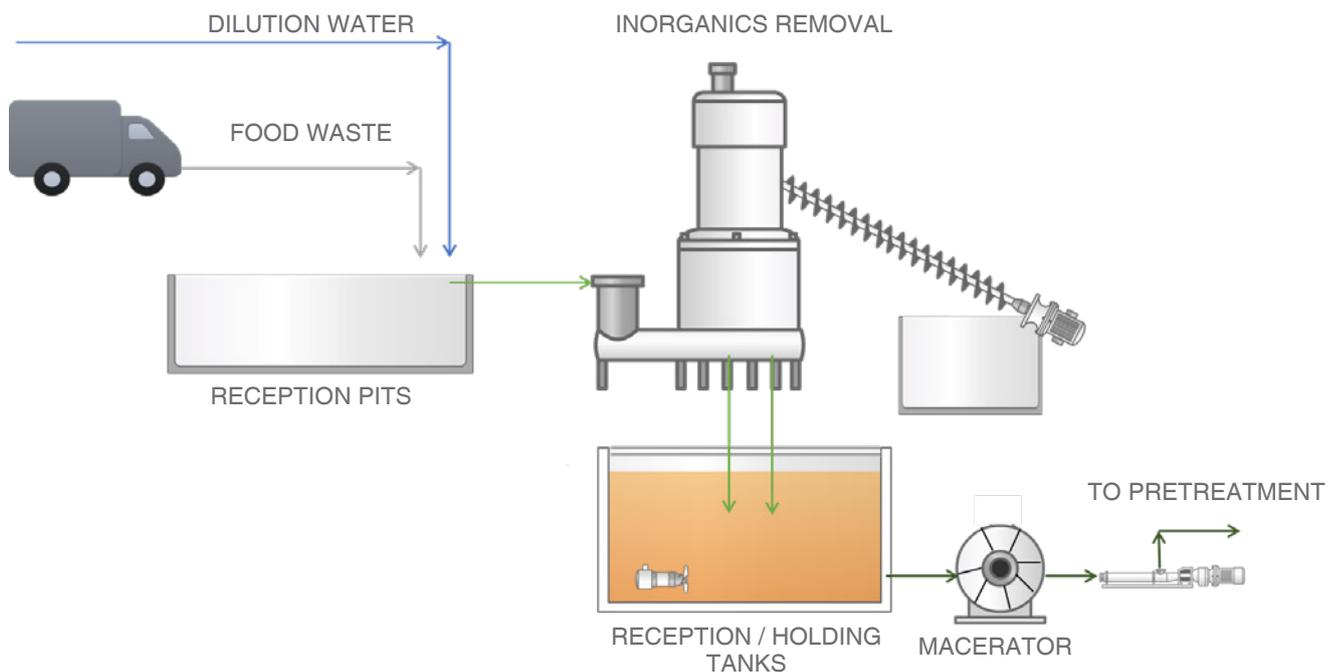
- RAPTOR® is a complete solution, including the waste reception facilities, pre-processing, digestate treatment, biogas conditioning and utilization, rather than just an anaerobic digestion system;
- Designs are optimized for your application and specific organic waste streams;
- The organic feedstocks can be modified due to flexible and adaptable process application;
- Solid digestate can be sold as an agricultural fertilizer or compost, for additional return on investment;
- RAPTOR® effectively transforms your waste into profitable products: biogas & biofertilizer.

**FIGURE 1. THE RAPTOR® PROCESS BLOCK SCHEME**



# PRETREATMENT TAILORED TO YOUR APPLICATION

## EXAMPLE OF A RAW ORGANIC WASTE RECEPTION SYSTEM



## CUSTOM-MADE SOLUTIONS INCREASE THE DIGESTION SPEED AND EFFICIENCY OF YOUR PLANT.

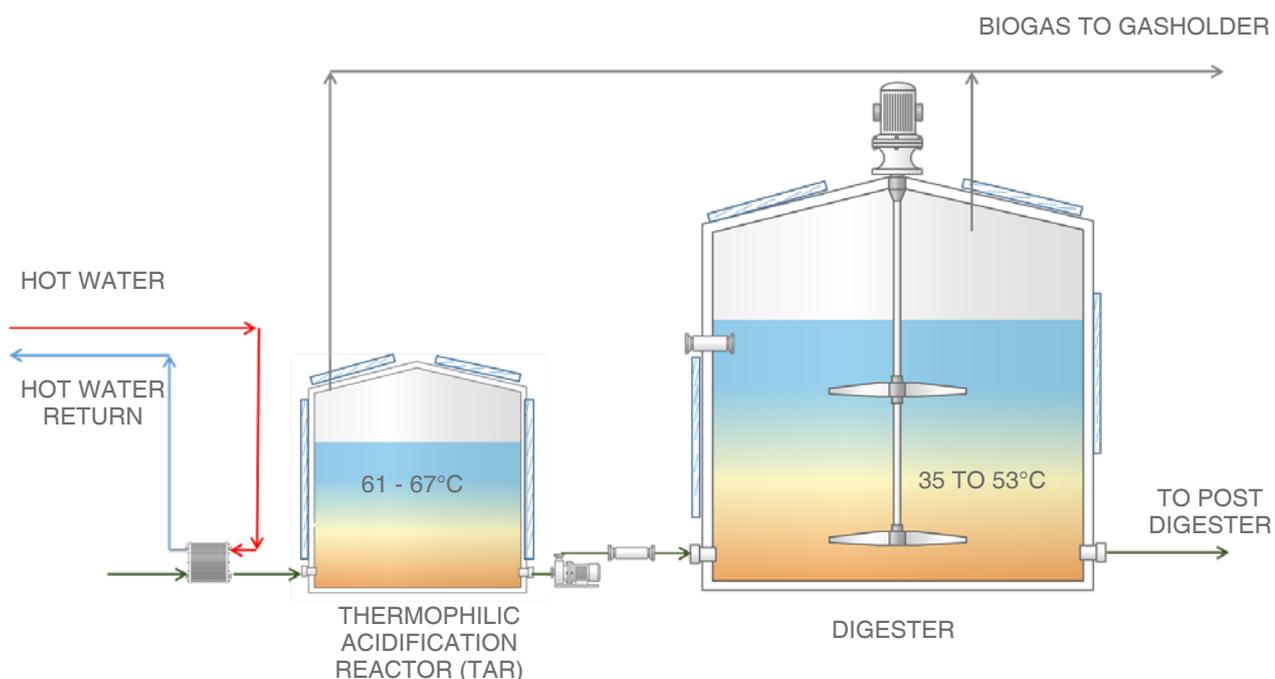
Organic feedstocks require proper pretreatment to obtain the highest possible conversion efficiency of waste material into biogas within the digestion stage.

Your RAPTOR® plant can include one or more pretreatment steps chosen by GWE based on the composition of your raw organic wastes.

**ENZYMATIC  
CHEMICAL  
THERMAL  
BIOLOGICAL  
MECHANICAL**

# RAPID ANAEROBIC DIGESTION

## TWO STAGE DIGESTION SYSTEM - EXAMPLE



**ONLY PROVEN, RESILIENT, AND ROBUST ANAEROBIC TECHNOLOGIES ARE UTILIZED AND APPLICABLE TO NEARLY ANY FEEDSTOCK.**

The biological digestion step, just like the entire plant, is customized to meet each customer's needs. The biological reactors are always fully insulated and heated externally as dictated by the geographical location of the installation.

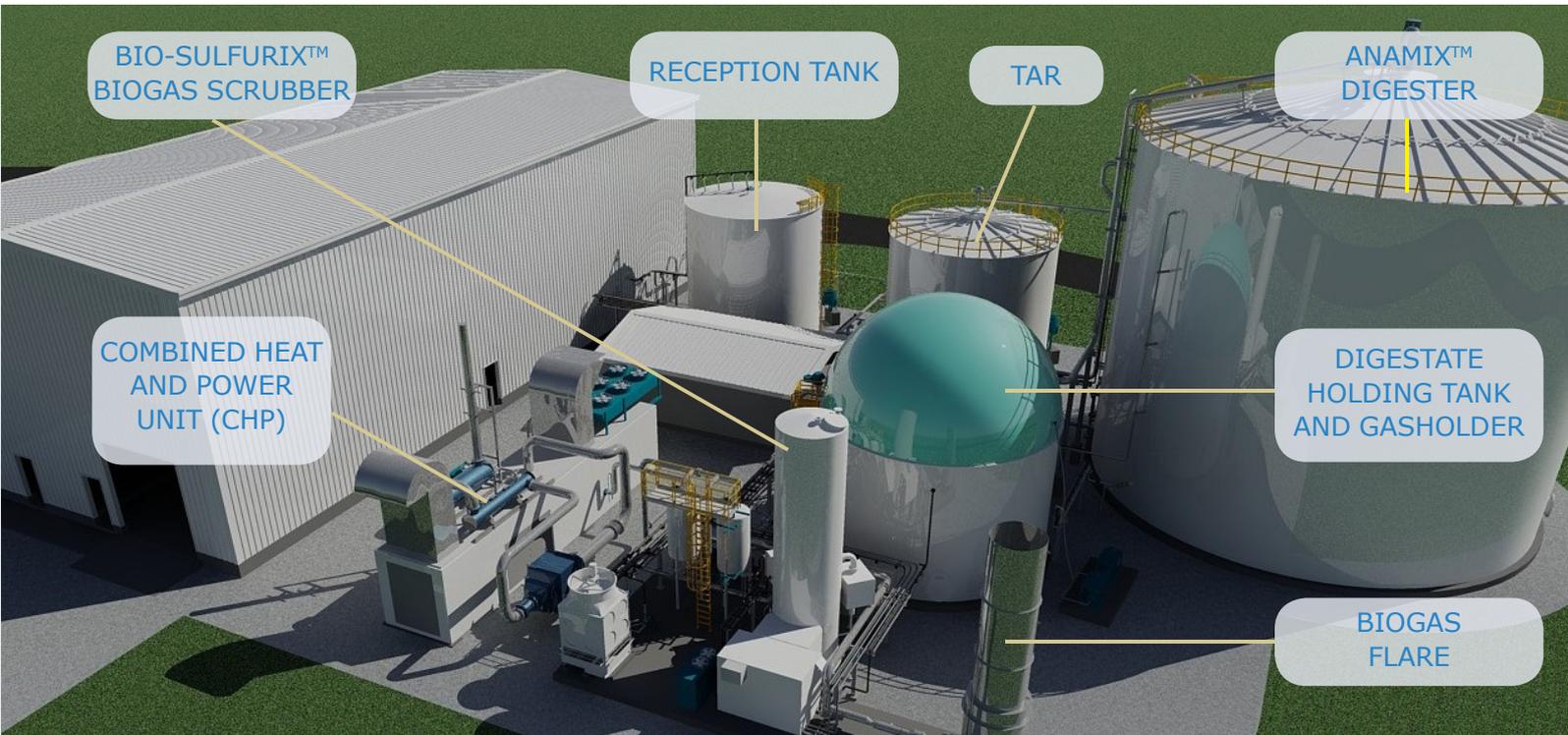
The heart of the anaerobic digestion step is our ANAMIX™ technology- a Continuously Stirred-Tank Reactor (CSTR) type of anaerobic system.

The ANAMIX™ is designed to maximize the contact between the biomass and the waste, to optimize digestion performance.

Depending on the type and characteristics of the organic waste applied as feedstock, waste conversion rates 50% higher (or more) than competitors systems, can often be obtained in RAPTOR® plants.

# BIOGAS CONDITIONING AND UTILIZATION

## GREEN POWER AND RNG FROM THE RAPTOR® PROCESS



### PROVEN TECHNOLOGY FOR SAFE AND UNINTERRUPTED RENEWABLE ENERGY DELIVERY TO YOUR PRODUCTION PLANT OR END USER.

Typical biogas contains 60-85% methane and is a valuable source of energy. Besides methane, the gaseous fraction can contain various concentrations of carbon dioxide, hydrogen sulfide, nitrogen and other gases, and is fully saturated with moisture.

To protect against the deterioration of or damage to, the overall gas utilization system, the biogas should be dried, and various impurities must be sufficiently removed before it can be used as a fuel in electrical power generators, fuel cells, boilers and/or as a vehicle fuel.

Our scrubbing and drying processes remove sulfur and humidity from the biogas at a low operating cost.

Our biogas handling systems start at the anaerobic digester and continue all the way through the delivery of renewable energy in the form of:

- hot water,
- steam,
- electricity.

**PROJECT  
OVERVIEW**

Reference:	Quantum Biopower, CT, USA
Feedstock:	Mixed food waste
Plant Capacity:	40,000 tonnes waste/year
Organic load:	24 t/d COD
Biogas production:	11,800 Nm <sup>3</sup> /d (417,000 ft <sup>3</sup> /d)



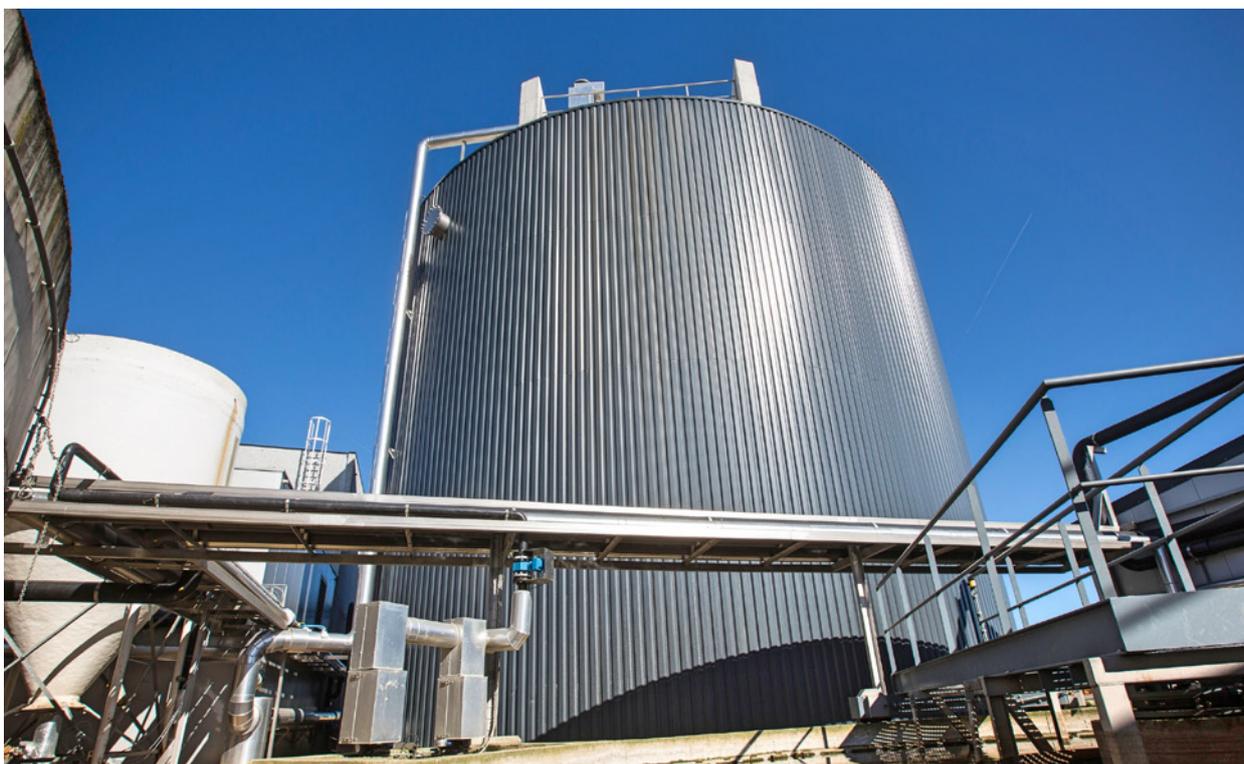
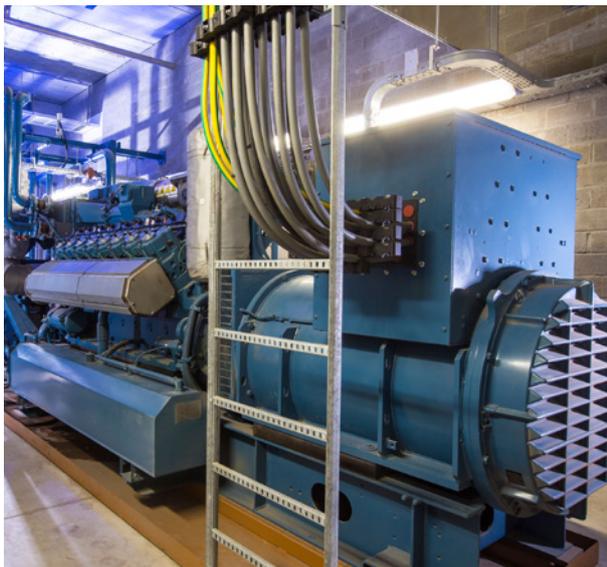
PROJECT  
OVERVIEW

Reference:	Stormfisher Environmental, Canada
Feedstock:	Mixed organic waste
Plant Capacity:	65,770 tonnes waste/year
Organic load:	65 t/d COD
Biogas production:	27,800 Nm <sup>3</sup> /d (982,000 ft <sup>3</sup> /d)



PROJECT  
OVERVIEW

Reference:	REMO - FRIT, Belgium
Feedstock:	Potato processing waste
Plant Capacity:	40,000 tonnes waste/year
Organic load:	24 t/d COD
Biogas production:	18,000 Nm <sup>3</sup> /d (636,000 ft <sup>3</sup> /d)



PROJECT  
OVERVIEW

Reference:	Organic Power, Puerto Rico
Feedstock:	Napier grass, mixed organic waste
Plant Capacity:	87,660 tonnes waste/year
Organic load:	45 t/d COD
Biogas production:	21,100 Nm <sup>3</sup> /d (742,000 ft <sup>3</sup> /d)



# GLOBAL PRESENCE

**Global Water & Energy, a member of the Global Water Engineering Group of Companies, operates globally through local offices in Belgium, Germany, Hong Kong, Netherlands, Philippines, Thailand, and the USA.**

**Moreover, GWE has extended network of qualified local partners in more than 20 countries.**



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**OVER 400 PROJECTS IN 64 COUNTRIES**



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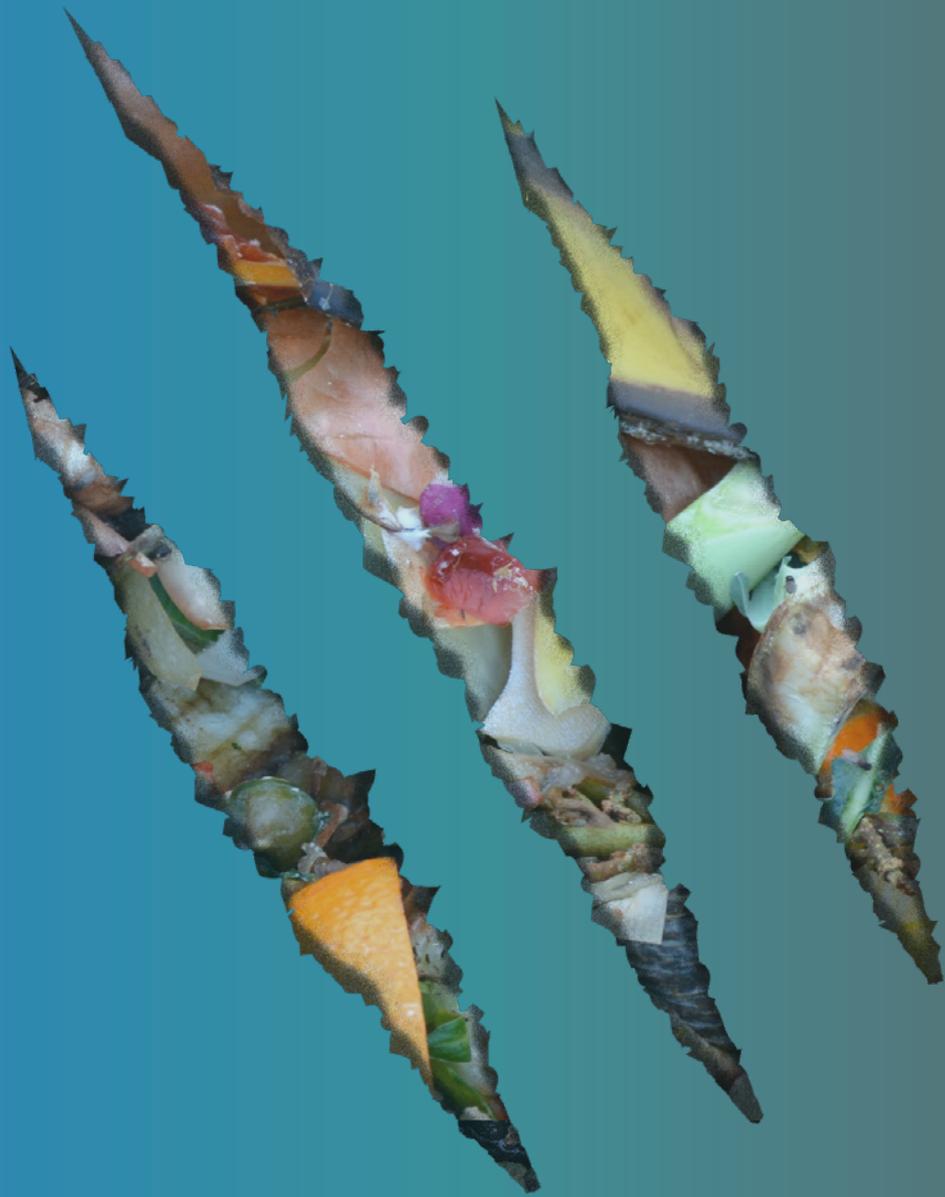
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MORE THAN 800 MW OF GREEN ENERGY PRODUCED YEARLY



# RAPTOR®

ICHEME ENERGY AWARD 2014 WINNER

