
harp
bio-digesters
BEYOND
COMPOSTING

Company Overview

2002 — Harp, EE company, Mfg. control systems for (MRF) equipment.

2014 — Shane Finnegan, founder/company director, established Harp Renewables Ltd

2017 — First bio digesters in UK and Ireland

2019 — Harp Renewables N. America

2019 — "All equity" funding from Susquehanna International Group – NO DEBT!

2022 — Harp Renewables Australia

2023 — Viably (formerly Komptech Americas) Master Distributor in N. America

Corporate social responsibility – Opportunity to reduce global warming

Food waste + Synthetic Fertilizers create >15% of all global GHG Emissions

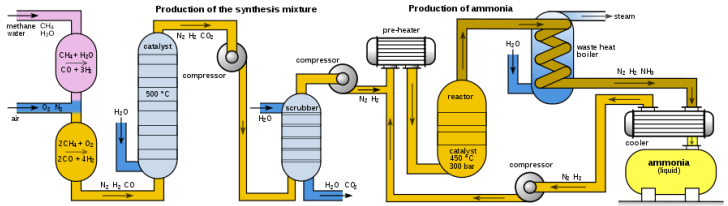
Food Waste
Generated Globally:

1.3 Billion Tons/Year

Emits 5+ Billion Tons CO2e/Year
= 10% global GHG emissions

Synthetic Nitrogen Fertilizer
Manufactured & Used Globally:

105 Million Tons/Year



Emits 3+ Billion Tons CO2e/Year
= 6% global GHG emissions

Source: UN Food and Agriculture Organization (FAO); U.S. Dept. of Agriculture (USDA);U.S. Environ. Protection Agency (EPA)
https://ourworldindata.org/food-waste-emissions

Do you know where your food waste is after 10PM?

LANDFILL

1 **75% of Food Waste is Landfilled**

Most Common Disposal

Transportation emissions/traffic congestion

Generates methane and CO_2 and NOx - Attracts vermin

Leachate poisons underground water sources.

COMPOSTING

2 **Only 5% is composted**

Not Enough Farms

Nutrient value very low – only 1.5% NPK

Process Takes 2-3 months

Attracts Vermin

No Meat or dairy product accepted

Many composters do not accept compostables

ANEAROBIC DIGESTION

3 **1% Sent to AD or Animal Feed**

Embryo Technology

In the U.S., less than 2% of food waste is anaerobically digested.

Technical and economic challenges include process instability, foaming, low buffer capacity, and high financial cost, prevent the wide use of food waste in AD systems.

ON-SITE ALTERNATIVES

DEHYDRATORS

1 **First introduced 2008**

Batch process only

- Dated Technology
- Requires storage of daily generated waste
- End-Product not stable, is not a compost and will rot and attract vermin if topically applied and rehydrated
- Energy use higher than other solutions
- Up to 85% reduction

LIQUID BIO DIGESTER

2 **Market entry 2010**

Continuous Feed

- Dated Technology
- Requires large amounts of hot and cold water
- Additional plumbing costs
- Must replace microbes bi-annually
- Breaks down waste sending Fat-Oil-Grease to sewers – coagulating/restricting pipe flow
- Banned in many States/Cities
- 100% reduction

HARP <u>WATERLESS</u> BIO DIGESTERS

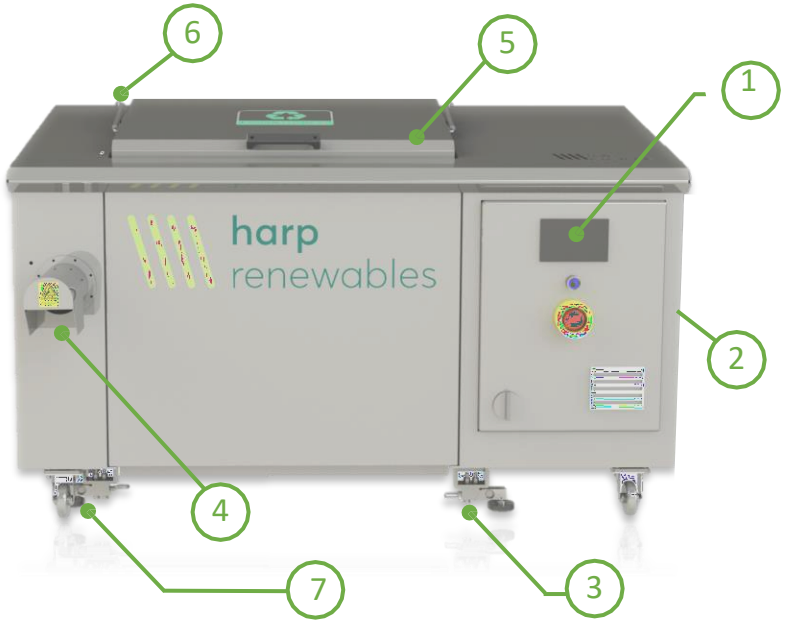
3 **Market Entry 2017 Europe**
Market Entry 2019 N. America

Continuous Feed - Innovative Tech

- No water used – nothing discharged to sewers
- Reduces mass/volume by up to 85%
- Over 150 systems installed at Fortune 100 Clients
- Meets and exceeds USCC emission requirements
- Produces certifiable valuable Fertilizer
- Computerized system w/remote access
- Provides waste reduction data
- Low energy usage
- GUARANTEED NO ODORS

Harp's Bio-Technology

WATERLESS – CONTINUOUS FEED – REDUCING -85% <24HRS.



Touch Screen Computerized Control

An easy-to-use on-board touch screen display shows the status, history and performance of the Bio-Digester. Harp engineers and clients can dial in remotely.

Active Carbon Filtration System

Harp's Filtration System treats all potential environmental pollutants by ensuring they are below 1 part per million

Load Cells for Automatic Waste Reporting

Door and Weight Sensors track and record times, dates, volumes and weights onto a downloadable CSV file

Programmed PAS100 Quality Control Auto Output

Quality Control parameters and safeguards are built into the system programming to ensure quality output every time

Safety hatch opener stops all motors when opened

Safety is #1 with Harp – Feeding the system – 3-4 times/day. Can be installed in or outdoors.

Automatic Door Hydraulic Lifter (Optional)

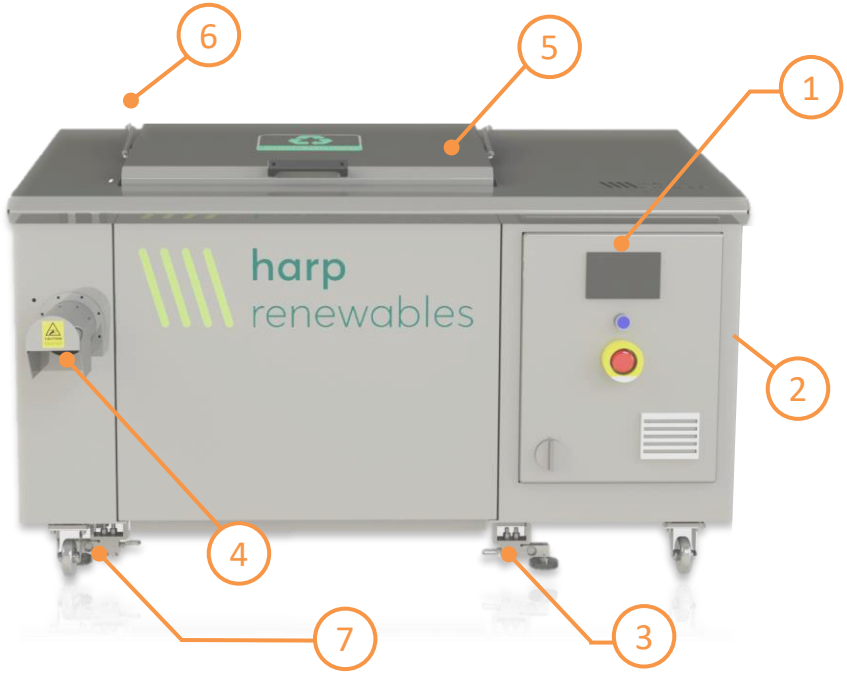
Bin Tipper and Automatic Hydraulic hatch opener means that a Harp Bio-Digester can be operated through a single push button

Lockable Caster Wheels

Every Bio-Digester are fitted with Lockable Caster Wheels for ease of installation, access and maintenance

Harp's Bio-Technology

Functions/Features



What happens inside?

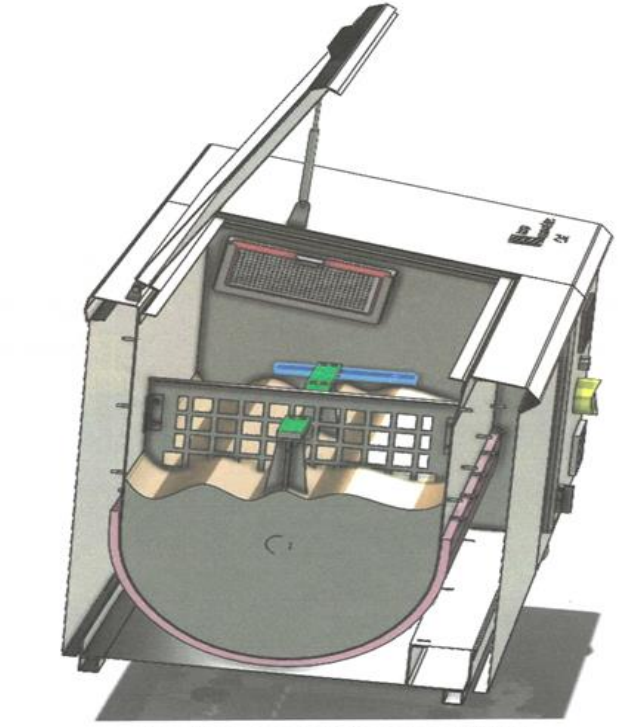


Figure 7: Fill level angle highlighted in blue on all machines

Any steam vapor created during the process is exhausted to the atmosphere through an activated carbon filter, without carbon dioxide (CO_2), nitrous oxide (NO_3) or volatile organic compounds (VOCs).

“Harp Renewables “Benefits”

1. On-Site Waste Reduction

- Continuous feed – batch or continuous discharge – No food waste storage overnight
- Reduces waste 75/85% less than 24 hrs.
- Destroys all pathogens – E. coli, Salmonella
- Guaranteed NO odors during process or discharge
- Constant re-generation of microbes - **No replenishment needed**
- One push button start
- Cloud recording waste & carbon footprint reductions
- Remote dial-in to diagnose/fix operational functions

2. Reduce Waste Collection

- Produces nutrient-rich slow acting/long lasting “stable” soil enhancement (Infusion Fertilizer)
- Replaces chemical fertilizer on client land
- Harp hauls excess fertilizer at no cost
- Mo. lease payments lower than hauling costs.
- Fitted with smart sensors and filtration systems to produce the lowest GHG emissions of any other approved process

3. Proprietary Technology

- No Fresh water used.
- No FOG, TSS or BOD to the sewer system
- Generates “certified” Bio-Fertilizer <24 hrs. Produces nutrient-rich (N/P/K) fertilizer
- Proprietary Thermophilic Microbial Enzyme blend generates 158F Temp.
- Generates lowest Environmental emissions of any approved organic process

Volume Reduction

Many secondary environmental benefits with financial payback

Ohio Dept. Agriculture “Organic Fertilizer”

Digestate Analysis

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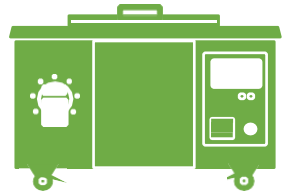
Physical Characteristics:
Data from >40 organic waste samples

- Moisture: 8% (Median Value)
- pH Level: 4.6 - 5.7 (5.15 Median Value)
- Consistency / Particle size: 87.7% <2 mm; 12.3% <4mm
- Organic Material: 85% (48% Organic Carbon)
- EC (Electrical Conductivity): 527.6 mS/m (Median Value)
- C/N Ratio: 21.5 :1 (Average Value)

Environmental Performance



Emissions Reductions Compared to Composting.

HARP digesters produce **49-61% less Global Warming Potential - GWP** then traditional composting methods [Ref] with **48% less Methane and 73% less Nitrous Oxide**. Awasthi et al., 2019, Ermolaev et al., 2019, Cao, Wang et al., 2019 and Ajmal et all., 2021

Built In Bio-Filter

Our stand-alone digesters are equipped with built in bio-filters, designed to capture and treat all emissions released during the decomposition of the organic waste. Our filtration units are designed to **remove up to 97-99% of all Volatile Organic Compounds - VOCs from the emissions**.

Our independently tested air quality and emission audit found <0.278 mg/m³ of VOCs and <0.5 mg/m³ Respiratory Dust, with **Ammonia levels <1ppm, Hydrogen Sulphides <0.1ppm, well below any national and international standards**.

This emission audit was carried out in accordance with standard MDHS 96

Air Quality Certificate of Analysis

SAL Reference: 621411
Customer Reference: HARP RENEWABLES

Filter+PUF IOM — Analysed as Filter+PUF IOM
Miscellaneous

					SAL Reference	621411 002	621411 004
					Customer Sample Reference	1. DIGESTOS FILTER+FOAM	2.BLANK FILTER+FOAM
					Test Sample	AR	AR
Determinand	Method	LOD	Units	Symbol			
Total inhalable dust	Grav (5 Dec)	0.10	mg	U		<0.10	<0.10

SAL Reference: 621411
Customer Reference: HARP RENEWABLES

Filter IOM — Analysed as Filter IOM
Miscellaneous

					SAL Reference	621411 001	621411 003
					Customer Sample Reference	1. DIGESTOS FILTER+FOAM	2.BLANK FILTER+FOAM
					Test Sample	AR	AR
Determinand	Method	LOD	Units	Symbol			
Respirable Dust	Grav (5 Dec)	0.05	mg	U		0.15	<0.05

SAL Reference: 621411
Customer Reference: HARP RENEWABLES

Tube (Charcoal 226-09) — Analysed as Tube (Charcoal 226-09)
Top 10 screen

					SAL Reference	621411 005	621411 006
					Customer Sample Reference	3. DIGESTOS VOC	4. BLANK VOC
					Test Sample	AR	AR
Determinand	Method	LOD	Units	Symbol			
Number of additional significant peaks	Calc			N		N.D.	N.D.
VOC (Total excluding targets)	GC/MS	1	µg	N		2	<1
Volatile Organic Compounds (Top 10 Screen)	GC/MS	10	µg	N		<10	<10

Click Here for More Details

End-Product

Registered as an official Bio fertilizer in the state of Ohio.

BIO-PRODUCTS & FERTILIZER
Ohio Commercial Fertilizer License

OHIO DEPARTMENT OF AGRICULTURE

Director Brian Baldridge
Division of Plant Health/Pesticide & Fertilizer Regulation
8995 E. Main St. Reynoldsburg,OH 43068-3399
614-728-6987 FAX 614-728-4235 www.agri.ohio.gov

COMMERCIAL FERTILIZER LICENSE Control # **116791** AGR 2891(11/04)

License Number: 111587 **License Expires:** 11/30/2023

Submitted By:
HARP RENEWABLES
3002 DOW AVE #134
TUSTIN CA 92780

Submitted For:
HARP RENEWABLES
ROBERT WEBBER
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TUSTIN, CA 92780

Beyond Composting

History of Successful System Installations and Use by Customers

Mermaid Key Shopping Mall
CX5-1,100lbs/day/Shredder

Bootstrap Compost Rhode Island CX10 - 2,200lbs/day

OC Fairgrounds Event Ctr.
CX10 - 2,200lbs/day

UK & Ireland Schools CX5
System off in summer
Fall startup w/out new bugs

23 Hospital Kitchens,
Montreal & Quebec
CX1-220lbs & CX2-440lbs/day
15 more just delivered

Loaves&Fishes Food Bank
San Jose, CA
CX5 1,100lbs/day

Peninsula Project & Chestnut Commons - The Bronx
Utica Crescent – Brooklyn
CX2-440lbs & CX5 1,100lbs/day

Capital Dock/Aramark- Ireland
Michael Faraday Managing Dir.
CX2 -440lbs/day

Harp's BioDigesters

Case Studies : CX2, Aramark

Project Description

The CX2 takes in food waste generated in the capital dock complex which is home to the Indeed head office, JP Morgan and of course the residents. With the help of their landscaping company, the End-Product is used around the complex in raised garden beds and shrubs, helping to displace their compost and bio fertilsier demands.

Testimonial

"We haven't sent any waste offsite since we installed the bio-digester in December. The bio-digester makes people think a bit more about what they are doing and keeps everyone focused on 'green' ways to process waste. The process has really been embraced by our tenants. They now unpackage their sent produce. As a result, not only are there no contaminated bins coming through, but we are creating added revenue by bailing our plastic. In preparation for a return to normal operations, we look forward to installing a second Harp bio-digester. We are delighted with this initiative which directly feeds into our People Planet Sustainable Strategy" **- Michael Farrell, Estate Manager at Capital Dock Aramark Properties**.

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Specifications

Waste Stream :

- General Food Waste
- Canteen Waste
- Compostable Packaging

Capacity :

285 Litres/Day
2000 Litres/Week
104,000 Litres/Year

Electricity Consumption (kWh)
11251.97 Kwh/Year

Specs :

Operations: Batch based
Power Supply: 3phase ~

Dimensions :
Height 1000mm
Width 800mm
Length 1700mm

Harp's BioDigesters

Case Studies :Hospital De Hull, Montreal

Testimonial

The Harp CX2 Bio Digester processes 440lbs. of food waste daily Installed in 2021
Client will provide references either email or phone.

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Waste Stream :

- Food Waste

Capacity :

440lbs./Day

6.6 Tons/Month
1.6Tons/Mo Fertilizer
Electricity Consumption (32kWh)
$17.09 Energy Cost/Ton

Specs :

Operations: Batch Based

Power Supply: 3phase ~ 208V/240V – 20Amp.

Dimensions :
Height 48”
Depth 49”
Length 75”

Harp's BioDigesters

Case Studies : CX50, Genuine Meats

Project Description

Genuine Meats in Wyoming, United States is a large Meat Factory. Our largest Unit, the CX50, was designed and commissioned for this site to deal with the factory's offcuts, bone, fats, tallow, offal etc. Designed with an integrated shredder, hopper and automatic feed system, the site processes over 5 US short Tonnes of waste per day into a nitrogen rich bio-fertilizer.

Testimonial

"We found Harp Renewables incredibly professional. In the past, fats, oils and grease from our waste had proven difficult to deal with. On site storage of this waste waiting for the hauler to pick up internals often causes foul odors and a complicated waste control system. With Harp's Bio-technology, expertise in enzymes and decomposition and fertilizer knowledge, they helped us turn a difficult problem into a solution that solved our rodent control, reduced our foul odors " - **Managing Director at Genuine Meats**

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Specifications

Waste Stream :

- Abattoir / Slaughterhouse waste

Capacity :

11,000Tons/Day

165Tons/Mo

41.2Tons/Mo Fertilizer production

Electricity Consumption
378.7 kWh/Day @
$0.12/kWh =
$1,382.33/Mo Energy Cost

Specs :

Operations : Continuous Feed and discharge operation

Power Supply : 3phase ~ 480V 160Amp

Dimensions: See Spec Sheet
Height -
Width -
Length -

Bio-Digester™ Product Line

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Click the image for specifications

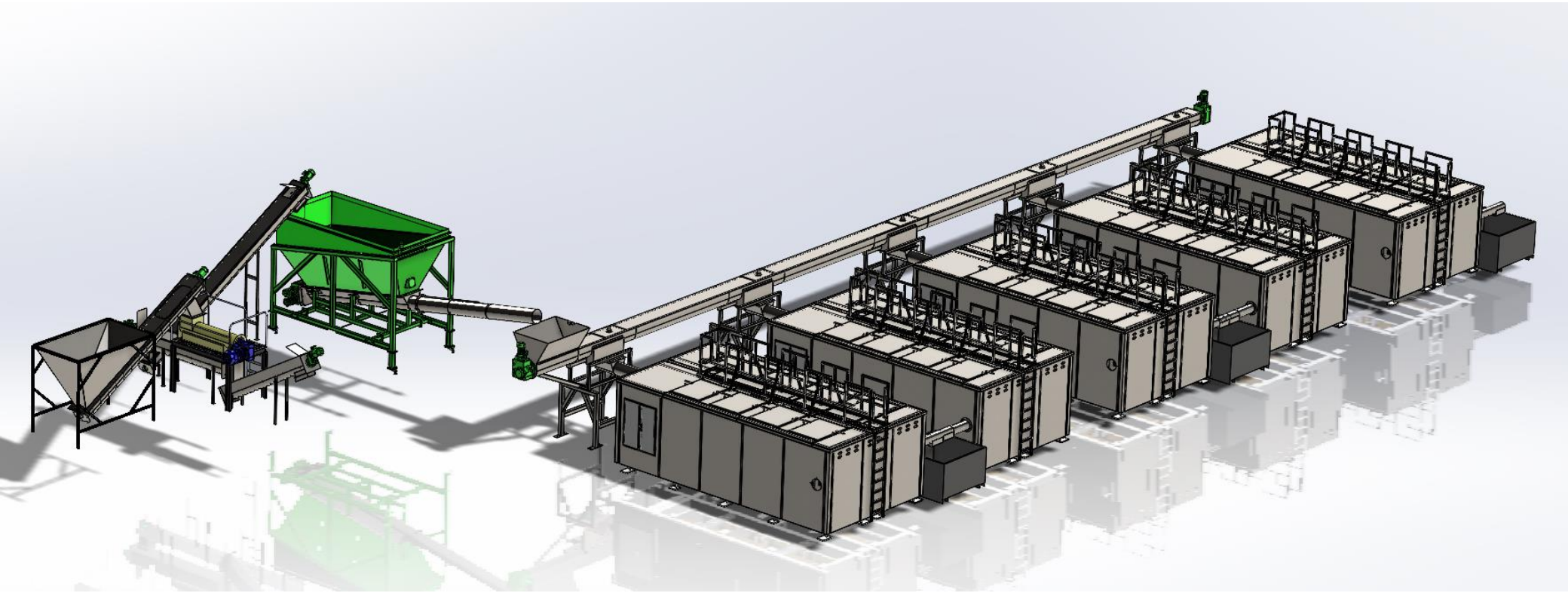





System	CX1	CX2	CX5	CX10	CX20	CX50
Daily Weight Input Capacity (Lbs./Day)	**220 Lbs.**	**440 Lbs.**	**1,100 Lbs. (1/2ton)**	**2,200 Lbs. (1/ton)**	**4,400 Lbs. (2/Tons)**	**11,000 Lbs. (5.5Ton**
Monthly Input Capacity [1] (Tons/Mo)	**3.3 Tons**	**6.6 Tons**	**16.5 Tons**	**33 Tons**	**66 Tons**	**165 Tons**
Monthly Bio-Product Production [2] (Tons/Mo)	**0.8 Tons**	**1.6 Tons**	**4.1 Tons**	**8.2 Tons**	**16.5 Tons**	**41.2 Tons**
Equipment Dimensions (Length x Depth x Height)	**4.4 x 3.6 x 3.9 Feet**	**6.25 x 4.1 x 4.0 Feet**	**12.8 x 5.6 x 5.0 Feet**	**16.4 x 5.8 x 6.1 Feet**	**18.5 x 7.1 x 7.0 Feet**	**21.5 x 16.4 x 11.0 Feet**
Daily Energy Consumption	**24.7 kWh/Day**	**33.79 kWh/Day**	**88.63 kWh/Day**	**139.63 kWh/Day**	**199.9 kWh/Day**	**378.72 kWh/Day**

[1] 30-day month
[2] Assumes 75% conversion; 25% residual material by weight

HARP FULLY AUTOMATED 27.5 Tons/Day



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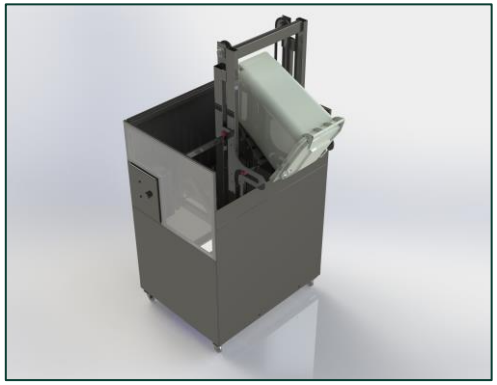
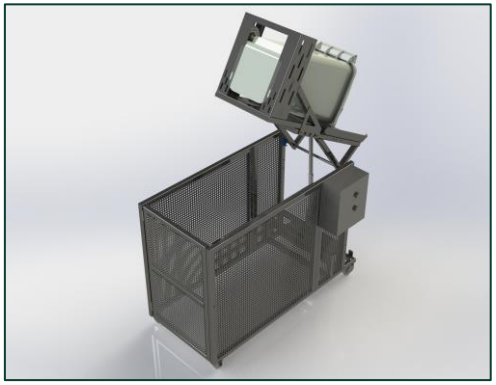
Harp Bio-digester Accessories

Bin Lifter and Tippers



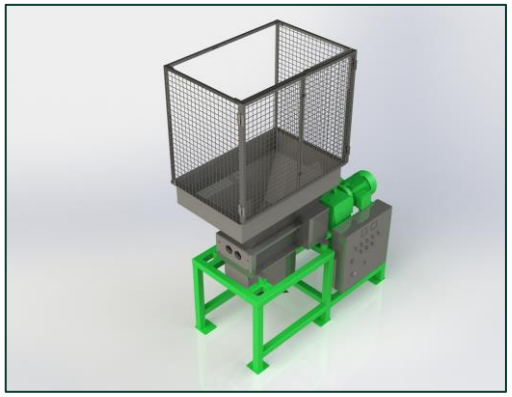
Bin Lifter



Bin Tipper

Auxiliary Health & Safety Units

Safety Platform

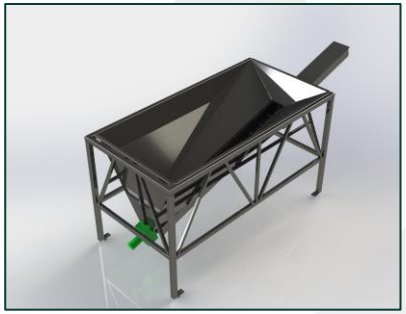


Shredder with Safety Cage

Hoppers Units

CX5 Hopper

CX10 Hopper



CX20/CX50 Hopper

Q & A