

HEG

HUGHES ENERGY

Overview for Sullivan County

HUGHES ENERGY AND SULLIVAN COUNTY MITIGATING AN IMMEDIATE COUNTY DISPOSAL CRISIS

Sullivan County is shipping MSW to landfills, some are slated to close in the next few years. Local County tipping fees have increased up to 50% in the past 4 years. Sullivan County has a growing budget gap.

LANDFILL CAPACITY SHRINKING

New York State continues to close landfills. By 2024, there will be a deficit of over 2M tons per year in the Northeast (demand vs supply)*.

INCREASING REGULATIONS ON ORGANIC WASTE MANAGEMENT

The New York State Climate Leadership and Community Protection Act and Food Waste Recycling laws are two examples of increasing regulatory requirements on reducing methane emissions and source separating food waste.



TRANSFER STATION NON COMPLIANT

In the summer months, the current transfer station is NON COMPLIANT with DEC Regulations for MSW Processing in Summer

SULLIVAN COUNTY LOCKS IN SURETY FOR THE FUTURE

Hughes Energy provides Sullivan County surety on local waste recycling for the next 25 years. Connecticut towns are now sending half their waste 1,100 miles to Alabama after closing the last CT disposal option. Prices increased 30% in one year.

**<https://ir.casella.com/static-files/2e6634a5-2dae-46ac-8c3c-81daf876e709>*

THE PROBLEM

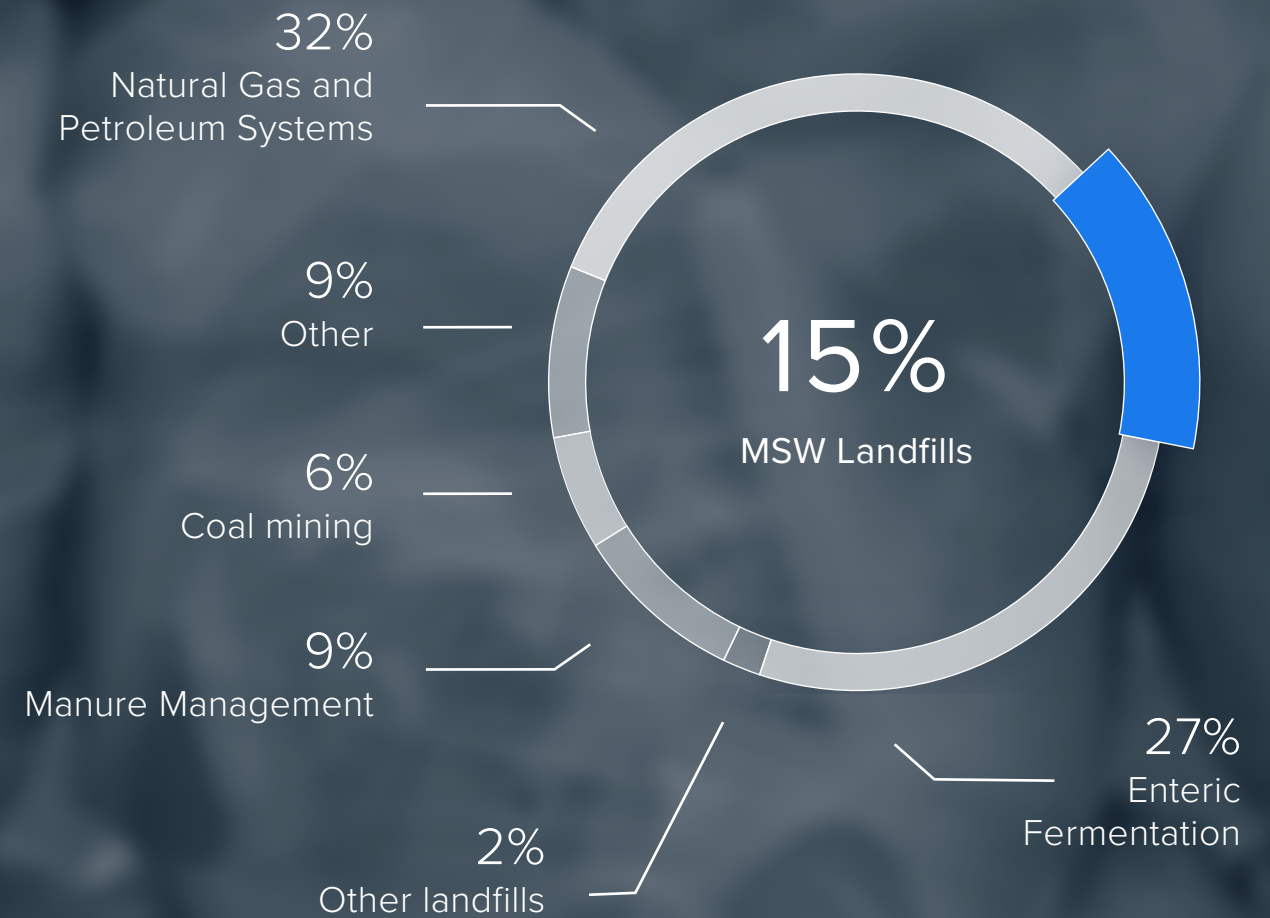
- 1 Municipal solid waste (MSW) landfills are the third-largest source of human-related methane emissions in the US. ⁽¹⁾

Although methane is shorter-lived in the atmosphere, it is 84x more potent than CO₂.

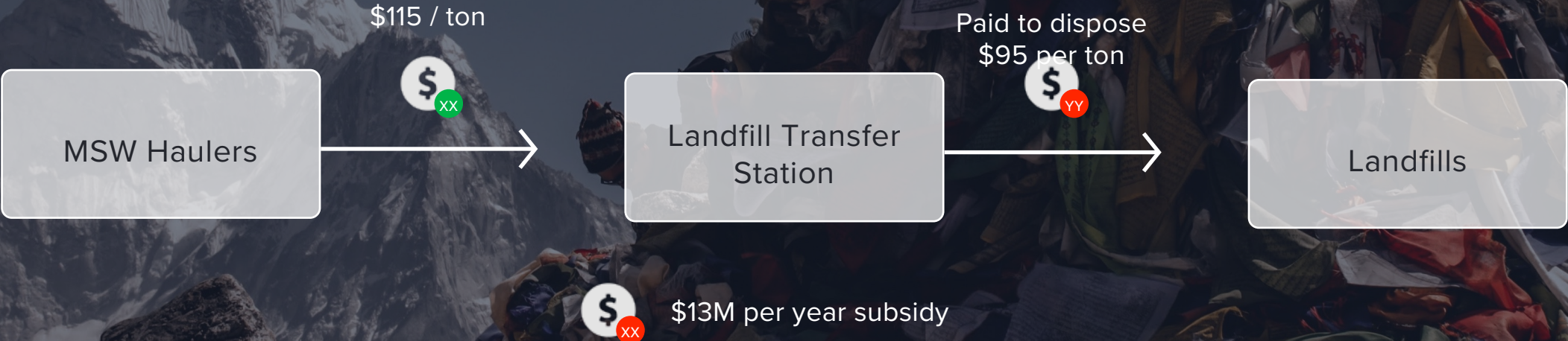
Sources:

1. EPA LANDFILL METHANE OUTREACH PROGRAM (LMOP)

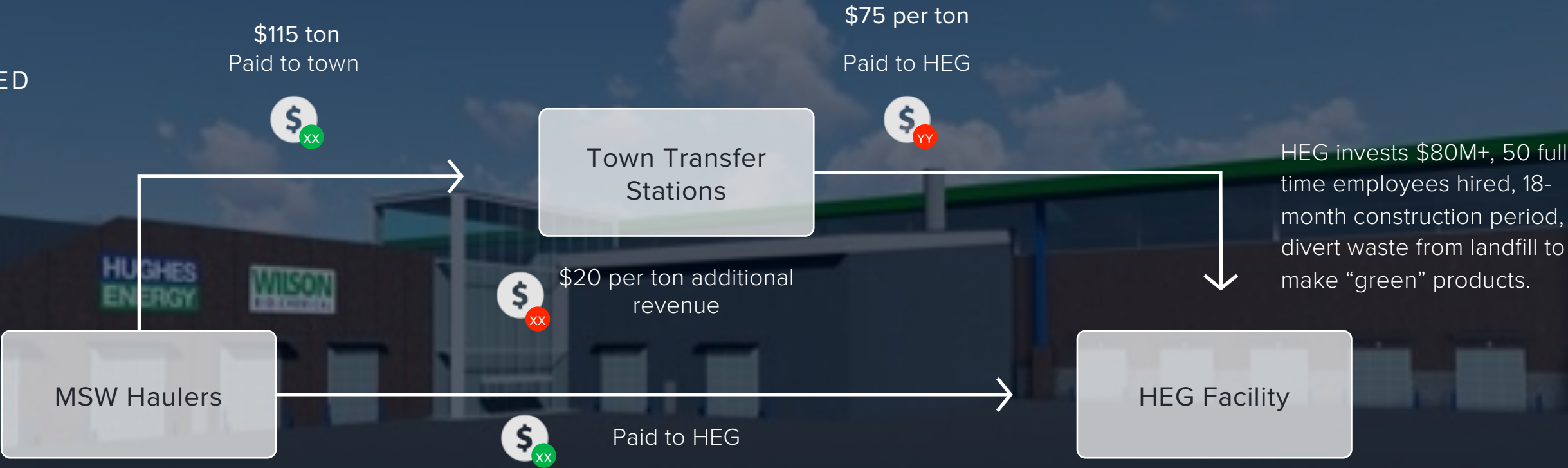
2020 U.S. METHANE EMISSIONS



CURRENT SULLIVAN COUNTY WASTE PROCESS



NEW PROPOSED PROCESS



ABOUT OUR COMPANY

Hughes Energy is a US green-tech company providing a low-carbon-intensity solution to waste.

Our autoclave system transforms organic waste into a homogenous fiber that can be used to create second generation bio-products and bio-fuels.

The organic waste arrives, is processed and our fiber generally leaves the building the same day (except nights, Sundays and holidays)



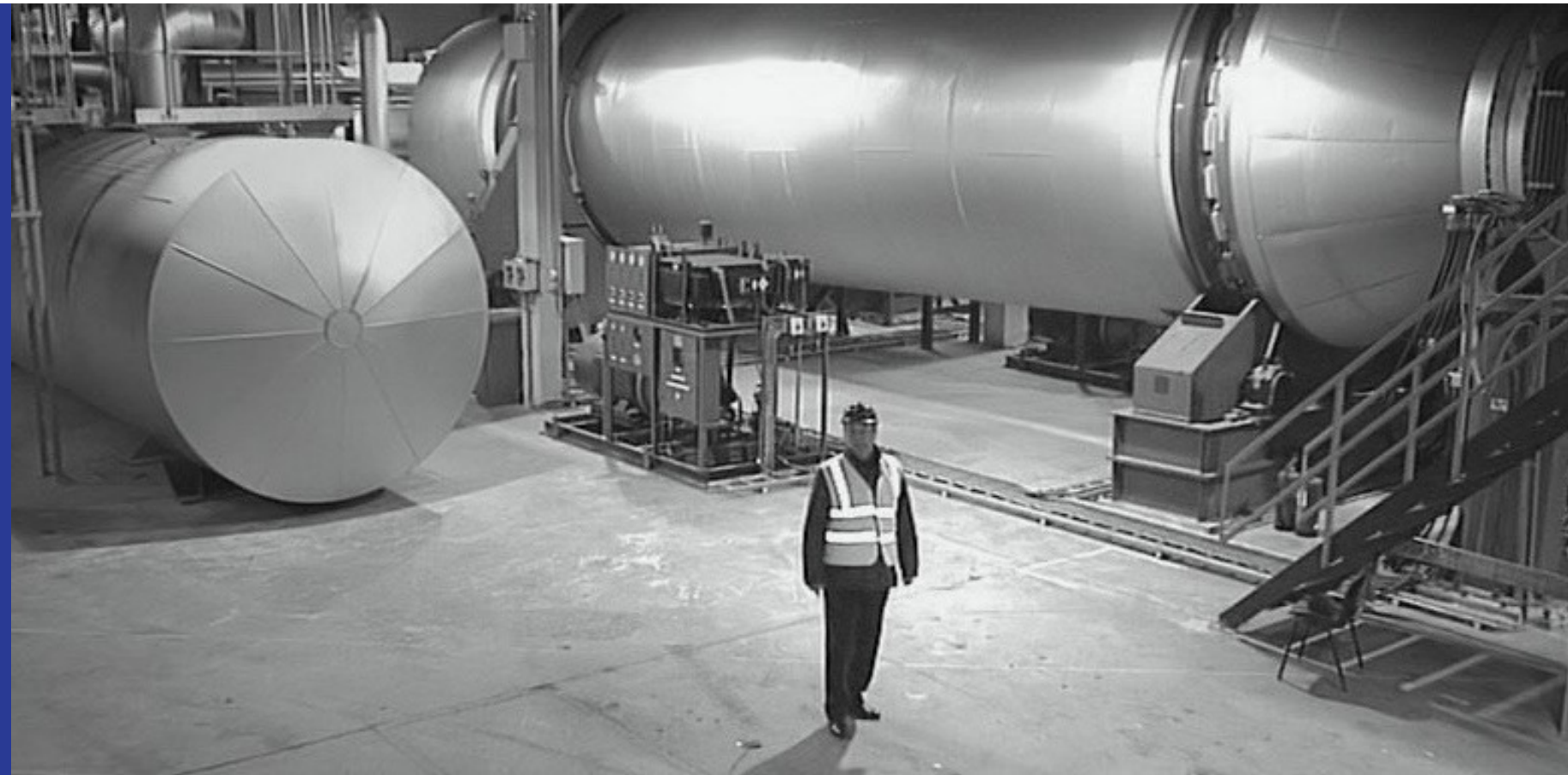
We are a fiber production company.

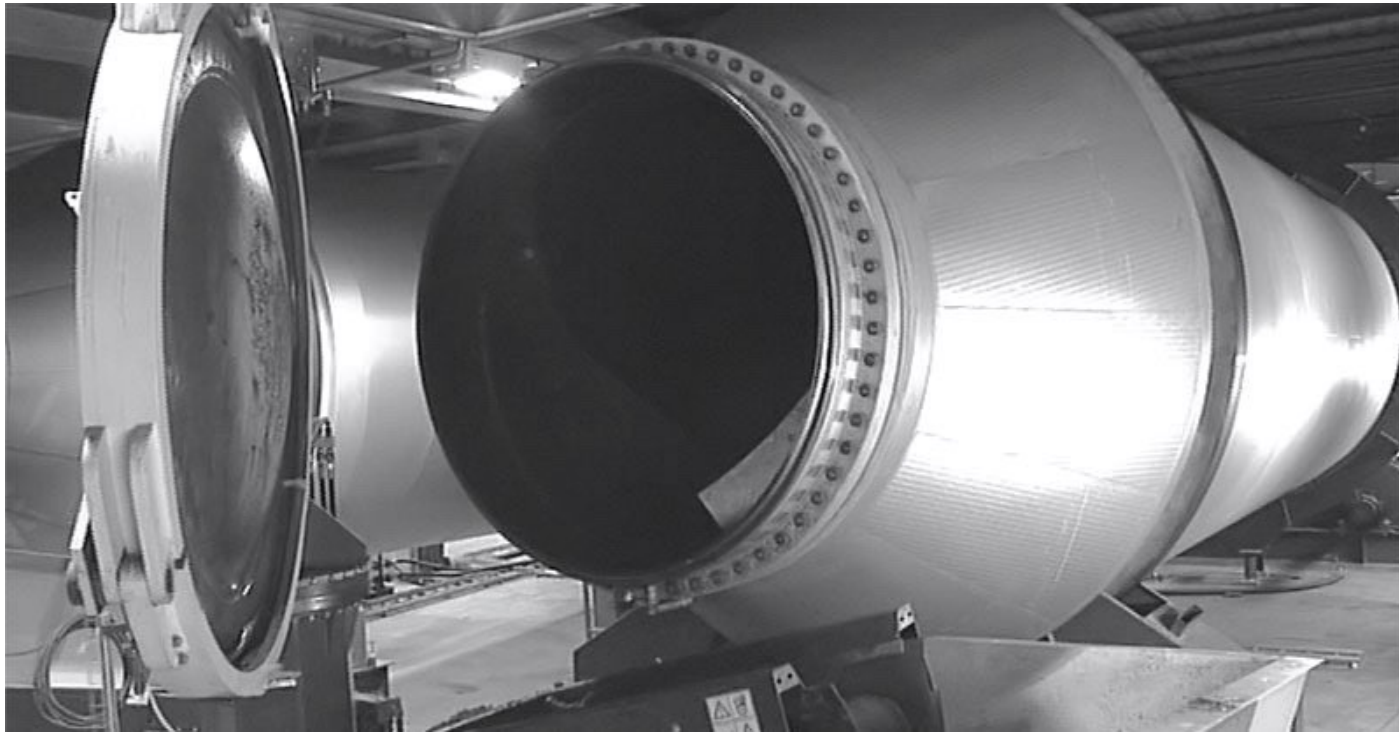
We use proven technology to recycle and transform unwanted organic materials into low-carbon-intensity second generation bio-products and bio-fuels.

The “non-incinerator”.

Each plant recycles up to 184,000 tons of organic waste per year through a fully indoor process of the application of steam. No incinerating, melting or burning of any waste - emissions very limited to natural-gas boiler emissions.

Offset up to
200K
TONS OF CO₂
PER YEAR





- **A completely indoor process**
All activity is conducted indoors, from waste delivery through to shipment of our fiber products
- **Odor does not escape the facility**
The building actually sucks air from outside (“under negative air pressure”), preventing odors from escaping out of the building
- **A closed system process**
The building **air emissions are 65% below** New York Guidelines for air permits and **82% below** US Guidelines.

The technology is a **closed system** which **recycles water and steam**, cleaning it for re-use.

WE CREATE GREEN PRODUCTS

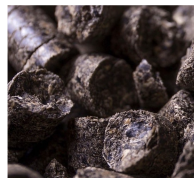
The Wilson Fibre® is a raw material used as feedstock in the creation of sustainable bio-products and bio-fuels.

Globally, our fiber is produced for:



Paper and Cardboard

The Wilson Fibre® makes excellent recycled paper/cardboard - reducing the use of trees. **This will be the product in New York State**



Pellets

In Europe, Wilson Pellets are made for co-firing with other solid fuels to reduce the reliance on virgin wood to burn in biomass power plants.



Sustainable Bio-Fuel

Wilson Fibre® is proven as a feedstock for the production of ethanol, acetone, butanol and hydrogen, among other platform chemicals and liquid bio-fuels.



Fiber produced in **Sullivan County** will be use to **produce recycled cardboard**, reducing the need for cutting down trees



OUR GREEN PRODUCTS

The Wilson Fibre® is a raw material used as feedstock in the creation of sustainable bio-products and bio-fuels.



Cardboard

The Wilson Fibre® makes excellent recycled cardboard



Sustainable Bio-Fuel

Ethanol for the production of Sustainable Aviation Fuel with Clariant, LanzaJet and Rolls Royce in the UK



Cardboard liner



Drink holder



CLARIANT

LanzaJet



Bio-ethanol

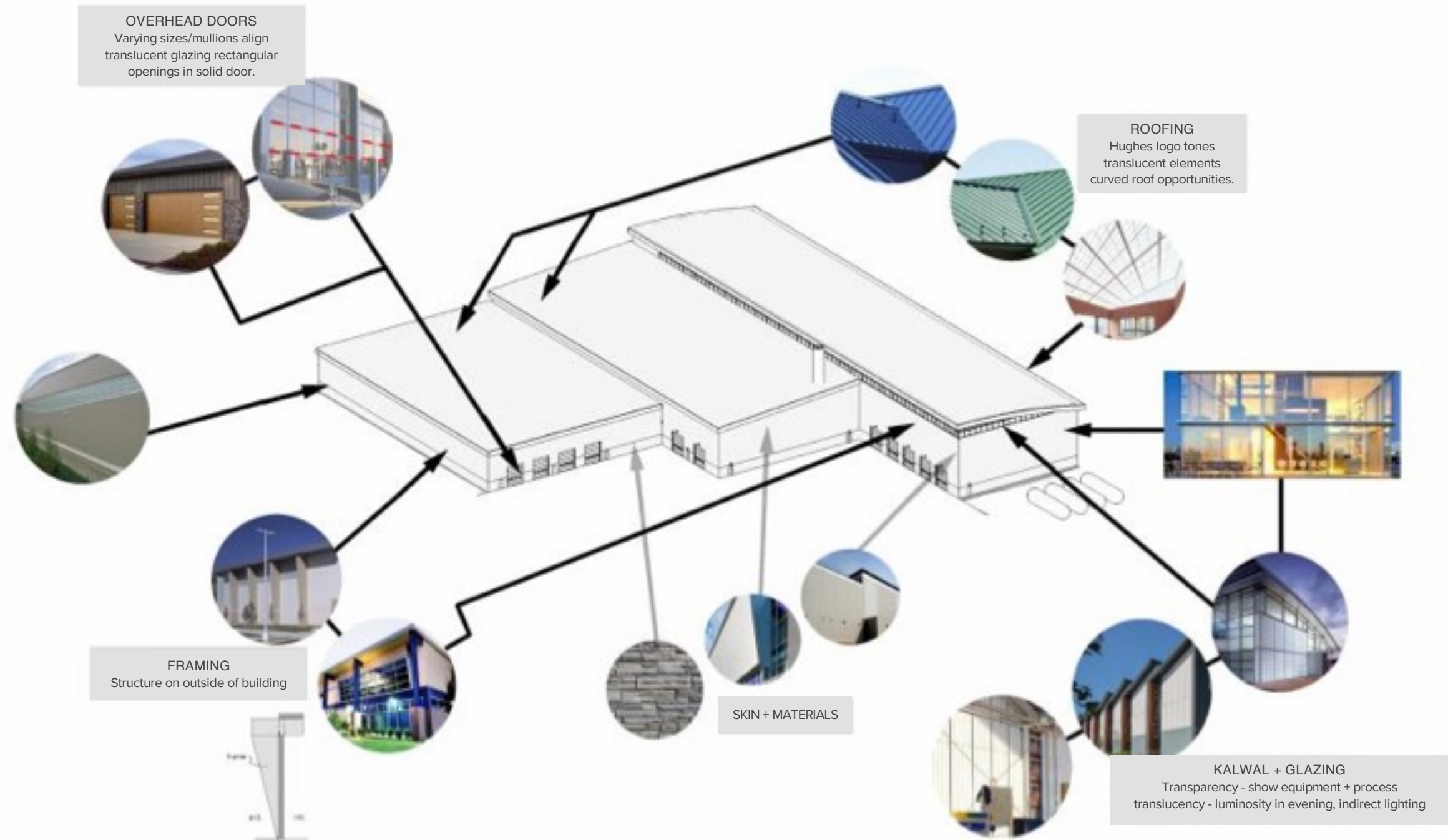
A 3D exploded view of a mobile crushing plant. The components shown include two white trucks with red wheels, a large grey hopper, a conveyor belt system, a large red cylindrical crusher, a red rectangular engine or motor unit, a blue metal frame, a yellow hopper, a yellow rectangular unit, and several grey cylindrical tanks. The Hughes Energy logo is visible in the top right corner.

- **Batch process** 1-ton
- All non-organic material sent to recycling bin. Further separation possible using automatic sorting systems, but not recommended at this scale
- Will make fiber using **local** food waste, agriculture waste and MSW
- Sullivan County will be a leader in NYS CLCPA and Food Waste laws

HUGHES ENERGY FACILITY

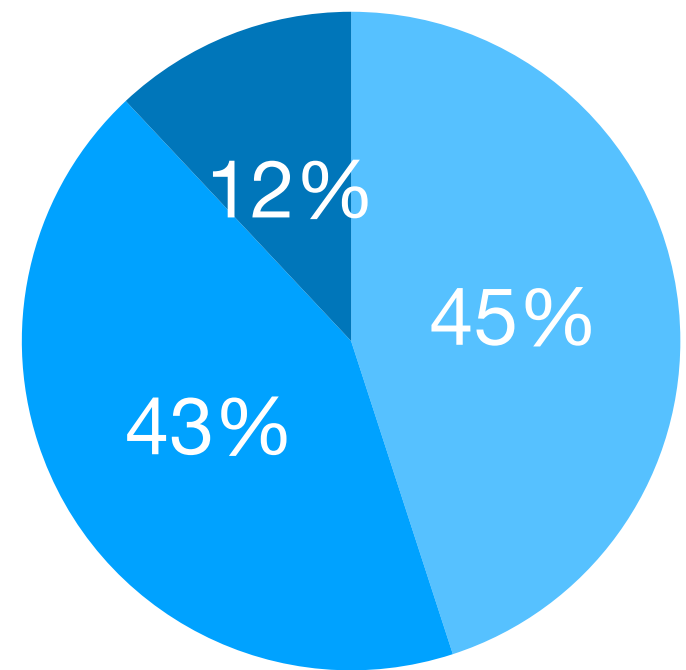


GREEN MATERIALS AND LOOK



INDUSTRIAL PROCESS DESCRIBED

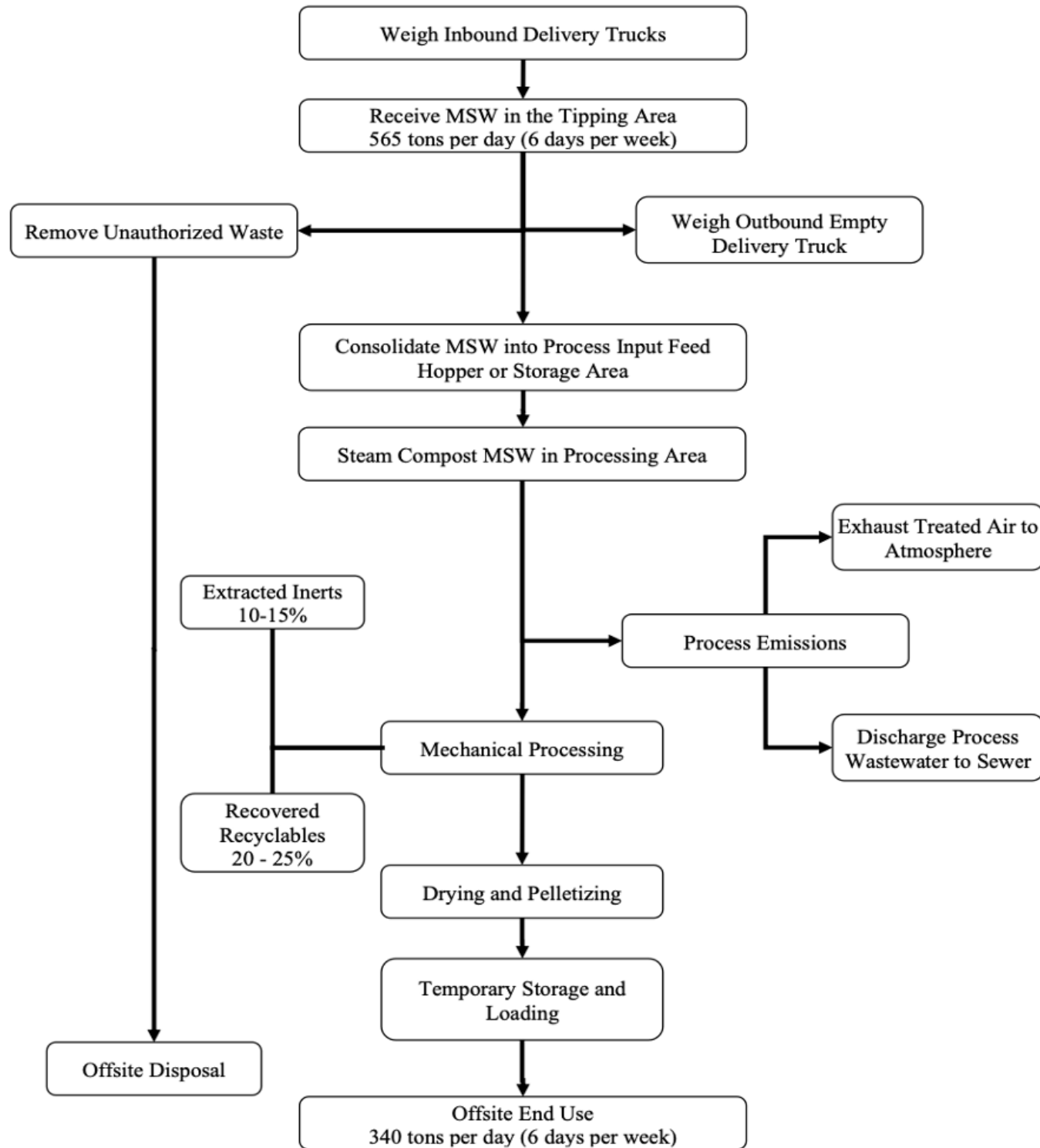
■ Fiber ■ Recyclables ■ Landfill



Approximate Disposition of Processed Material

1. Arrival of waste
Waste arrives in garbage trucks from **current customers** in the local community
2. Tipping floor
Trucks drive **inside the building** and dump the material onto a Tipping Floor
3. Waste is loaded
The waste is loaded onto a conveyor, which transports 22 tons of waste into the **autoclave** per batch
4. Autoclave process
The autoclave rotates for one hour under **160C and 70 PSI**. This **transforms** all food, paper, cardboard, yard waste into a homogenous fiber
5. Separation of material
A conveyor takes all material into a **separation system**, which removes all glass, plastics, metals and cans (sent to recyclers), and unwanted items like textiles, leather etc (sent to landfill)
6. Creation of fiber
All organics are all made into **fiber**, which is then prepared to ship to recycled cardboard manufacturer

PROCESS FLOW



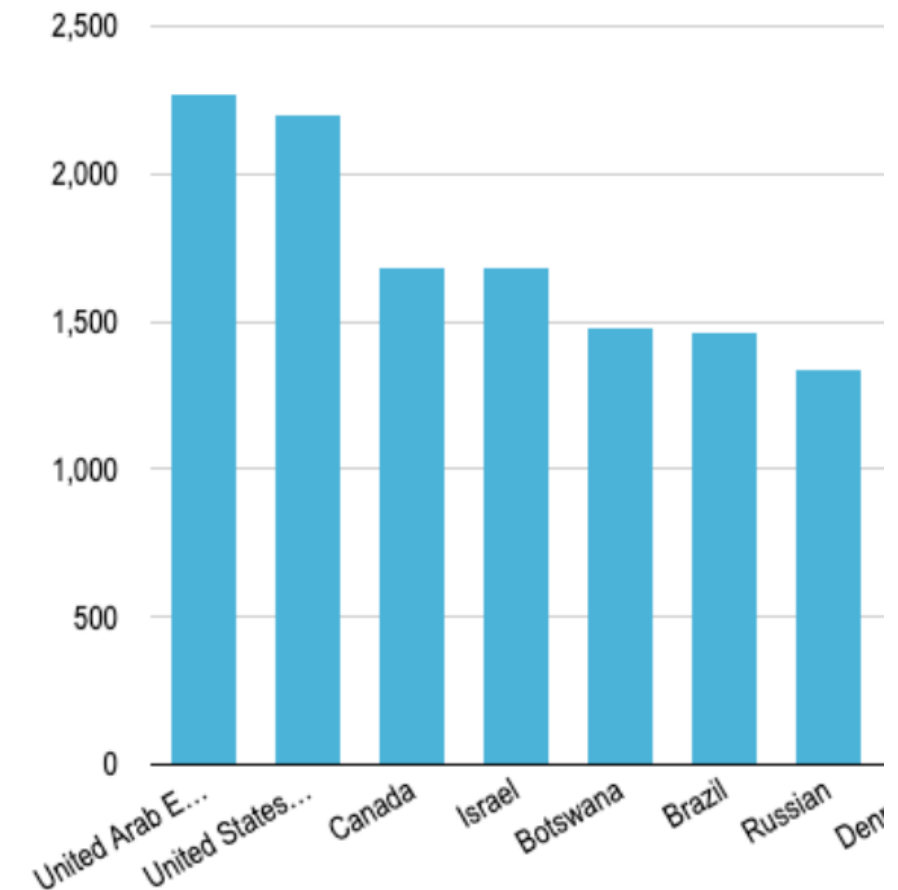
AIR EMISSIONS - COMPLETE PLANT OPERATION

ELEMENT (tons per year)	WILSON PLANT	THRESHOLD (required NYS DEC Air Permit)	THRESHOLD (required Federal Title V Air Permit)
Carbon Dioxide Equivalent (CO2e)	16,300	50,000	100,000
Oxides of Nitrogen	6.89 (included in CO2e)		
Sulfur Dioxide	0.08 (included in CO2e)		
Hazardous Air Pollutants	1.49	5	10
Particulate Matter (PM-2.5, PM-10)	4.99	50	100

HEG and DEC will monitor and report on air emissions.
Emissions are 65% below the threshold for applying for a NYS Air Permit;
HEG and DEC agree that the plant will apply for a permit to ensure reporting and compliance are maintained.

WATER USE

- The plant will use up to 22,000 gallons of water per day (what 200 Americans use per day*).
- The water is for the boilers to produce steam
- Water is recycled and cleaned within our system, but some steam evaporates or is absorbed during the process
- The water is cleaned through a proprietary system which includes advanced activated carbon filtration and reverse osmosis
- Waste Water is carried away from the site to the water treatment plant less than a quarter mile away from the site. The water treatment plant has reviewed water emissions and has no concerns with its makeup.



Water "Footprint" Per Person (in Gallons per Day)*

*Source: <https://www.watercalculator.org/footprint/water-footprints-by-country/>

PFOS / PFAS

Common Items with PFAS



FOOD PACKAGING
microwave popcorn
bags, sandwich
wrappers, takeout
containers, fast food
wrappers



HOUSEHOLD ITEMS
makeup, floss, waxes,
paints, stains



STAIN-RESISTANT
carpets, rugs, and
furniture



**NONSTICK
COOKWARE**



OUTDOOR GEAR
with a "durable water
repellent" coating



FIREFIGHTING FOAM

- PFAS and PFOS are known as “Forever Chemicals” which have been identified and are of increasing concern globally. These Forever Chemicals are **present throughout the environment** and in our waste
- Within the Wilson Process, PFAS and PFOS are concentrated in the water which is cleaned and recycled in the system.
- A state of the art activated carbon filtration system and reverse osmosis system is used in the Wilson System
- A 2021 University of North Carolina study concluded that activated carbon filtration **removes 97-99%** of PFAS/PFOS in water*, **
- Activated carbon filters in the Wilson System are removed for **safe processing, reactivation and recycling** in a specialized facility

PFOS / PFAS LIMITS - STATES **LEADING THE WAY**

State / Agency**	PFAS Limit (parts per billion)	PFOS Limit (parts per billion)	Wilson Fiber Analysis* (Parts per billion)
PA (soil, residences)	4.4	4.4	<.09
PA (soil, not a residence)	64	64	<.09
ME (use of fiber for products)	2.5	5.2	<.09
MA (Soil)	0.3 to 2.0	0.3 to 2.0	<.09

* Source: October 2022 Report from SOCOTEC UK. <https://www.socotec.co.uk/>

* ** Sources: Maine DEP website, MA DEP website, PA DEP website.

PLANT OPERATIONS BY THE NUMBERS



- Up to 184,000 tons per year of waste processed = amount produced by 200,000 Americans
- Divert 90% of waste from landfill
- 200,000 tons per year CO2e offset = offsets the amount produced annually by 12,800 Americans; also the amount absorbed by 4,000 mature trees
- 22,000 gallons of water used per day = amount used by 200 Americans
- 1200KW per hour of electricity used = amount consumed by 770 Americans

OUR IMPACT IN SULLIVAN COUNTY - \$85M INVESTMENT

Sullivan County can become a **PIONEER** in the future of organic recycling, taking a problem and turning it into products. The waste revolution is happening globally, and Sullivan County can be in the forefront

- ✓ 50 full-time jobs with opportunity for training, development; 250 Construction jobs for 18 mos
- ✓ Avoid \$13M cost, which would climb substantially over time
- ✓ Surety for long term disposal
- ✓ Significant number of visitor delegations
- ✓ Hughes vests three annual local scholarships of \$5,000 / Programs developed with BOCES

ABOUT AUTOCLAVING ORGANICS



MSW Autoclaves Operating in 2022

USA - 5 (GA, TN, OR)

UK - 4

Italy, Poland, Spain

- Autoclaves were invented in the 1880s to sterilize medical instruments.
- In the 1940s, in Alabama, the first known use of a large autoclave in MSW processing.
- There are over 12 operators of steam autoclaves in organic waste and MSW processing in 2022
- Tens of thousands of industrial autoclaves operate in the US every day in the concrete, tire, defense, aircraft and composite materials industries.



A worker walks past a giant autoclave, which provides superheated pressure needed in the construction of the new 777X composite wing at the Boeing 777X Composite Wing Center in Everett, Washington. Stephen Brashear/Getty Images

LIST OF MAJOR MSW AUTOCLAVES

Company Name	Project Location	Year built	Years operational	Notes
Wilson System (Thermsave)	UK	1998	3	Proof of concept
Wilson System (Davies Bros.)	UK	2001	5	Landfill reached capacity and closed
Wastaway	Tennessee (US)	2003	operating	
Burcell	Georgia (US)	2005	operating	Series of demonstrator plants
Sterecycle	UK	2008	4	Closed due to poor maintenance leading to fatality
Wilson System (Limerick)*	Ireland	2008	4	UK waste company purchased system – site approved, construction on hold
Graphite	UK	2009	4	Company went out of business
Salinas Valley Waste Authority	California (US)	2010	8	Contract completed

Company Name	Project Location	Year built	Years operational	Notes
Georgia Pacific Paper	Georgia (US)	2013	operating	proof of concept / test facility
Bioelektra	Poland	2014	operating	
Wilson System	UK	2016	operating	Fiber for an anaerobic digester
Wilson System (BDC)	UK	2016	operating	Used for customer trials and R&D throughout Europe
Shanks **	UK	2016	operating	Dirty MRF
FaterSmart (Proctor and Gamble)	Italy	2017	operating	
Burcell	Georgia (US)	2018	operating	Commercial waste transfer station
AeroThermal	UK	2018	operating	
Georgia Pacific Paper (Juno)***	Oregon (US)	2021	operating	Toledo production center

** Shanks Video: <https://www.machinexrecycling.com/video/shanks-wakefield-two-systems-rdf-mrf/>

* Wilson System Limerick Video: <https://www.youtube.com/watch?v=HLsrIJSFORc>

*** Juno System Video: <https://www.youtube.com/watch?v=qVGKjYzgWcQ>



Wilson Autoclave Plants – expanded list (industry listed after each location)

- Remediation Technologies - Waste processing.
- Davies Brothers Waste - Waste processing.
- Limerick - Waste processing.
- Wilson Bio-Chemical – Waste processing trials facility.
- Pinderfields Hospital – Sterilization.
- British Biotechnology – Sterilization.
- Victor Achter – Yarn textile conditioning.
- Intex Yarns – Yarn textile conditioning.
- Aristoc Hosiery – Hosiery forming.
- Walkers Crisps – Food processing.
- Campbells Foods – Food canning.
- Nestle – Pet food pouching.
- Pedigree Petfoods (Mars) – Pet food pouching.
- Butchers Petfoods – Pet food pouching.
- Dunlop Rubber – Rubber curing.
- Tarmac, Hams Hall – Concrete block curing.

Wilson Non-Autoclave Steam Process Plants installed

British Steel – Steam storage design and installation.
British Aerospace – Steam generation, process and space heating design and installation.
British Nuclear Fuels – Process pipework systems. Design.
Forgemasters Steels – Steam generation and steam storage design and installation.
Courtaulds Chemicals (Amtico) – Product manufacture – Steam storage design and installation
Courtaulds Textiles – Process pipework systems design and installation.
Brintons Carpets – Textile dyehouse design + installation. Steam generation and steam storage.
Victor Achter – Textile dyehouse design and installation. Steam generation and steam storage.
Haggas (Brook Taverner) – Textile dyehouse- Steam storage design and installation.
Mackenzie's (Harris Tweed) -Textile dyehouse upgrade/optimization. Design and installation.
Altamira Colours – Textile dyehouse design + installation. Steam generation and steam storage.
Fruit of the Loom – Textile dyehouse- steam storage design and installation.
Edward Hall - Textile bleachery design and installation. Steam storage.
Tuscarora - Polystyrene moulding – Steam storage design and installation.
Tuscarora 2 – Polystyrene moulding plant design + installation. Steam generation and storage.
SCA Packaging – Polystyrene moulding – Steam storage design and installation.
CWS Creamery – Creamery – Steam storage design and installation.
Eden Vale – Creamery – Steam storage design and installation.
Fenland Foods – Process plant design + installation. Steam generation and steam storage.
Invergordon Grain (Whisky) Distillery – Steam storage design and installation.
Tetley's Brewery - Process plant design and installation. Steam storage.
Black Sheep Brewery - Process plant design and installation. Steam generation.
Spirax Sarco – Steam specialist component manufacture - Steam storage design.