Waste EXPO®

an event by Waste360™

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wasteexpo.com

William Heller

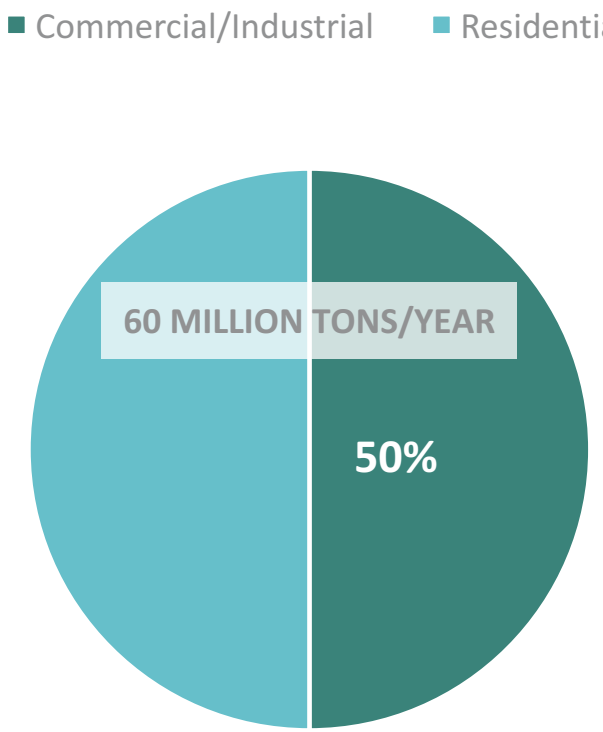
Chief Executive, **Organic Waste Logistics**

Is your food waste recycling costing too much?

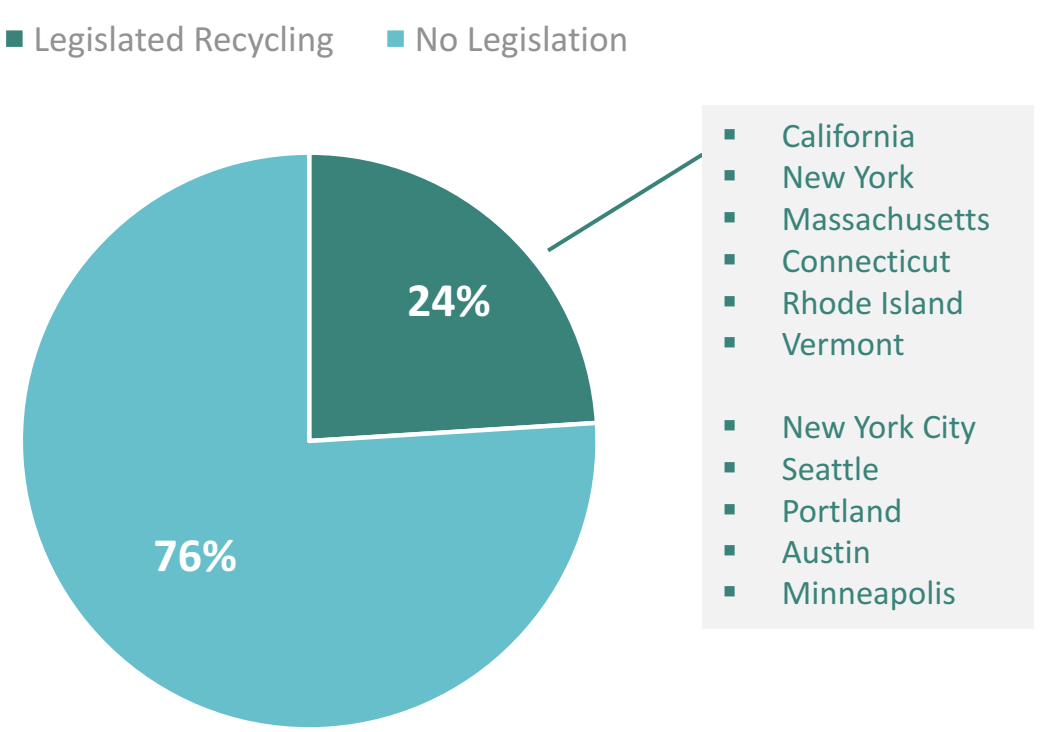
A new solution using waste water treatment capacity

Movement toward mandatory food waste recycling

Total US Food Waste



Portion of US Commercial Food Waste Subject to Legislation



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Conventional wisdom: “Food Waste Diversion = Composting”

Open windrow composting is cheap and capacity does exist

BUT…

- Capacity is quickly being filled
- Costs are rising (tipping fees routinely $75-100/ton)
- New permits for (open windrow) composting difficult/unachievable in many markets
- Blending green waste w/food limits capacity and has significant operational issues

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Existing options for food waste recycling

Composting via CASP/IVC

- High cost/ton
- Permitting issues
- Technical issues
- Lower ranking in ‘Food Waste Hierarchy’

Food waste dedicated Anaerobic Digestion (AD)

- High investment and operational costs
- Contamination/de-packaging issues
- Permitting issues

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Unused recycling capacity at waste water treatment (WWTPs)

1200 WWTPs in US have AD units

- Currently 20% (240) of those plants co-digest food waste (largely FOG - fats, oils, greases). Food waste capacity of ±10mm tons

- Other WWTPs with AD have +10mm tons of available capacity (plant capacity built to peak day demand - wettest day)

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Slow progress on co-digestion

- WWTPs are liquid processing facilities, so don't want "raw" food waste that requires manual handling
- Food waste contamination levels are too high - necessitating de-packaging
- WWTPs run to tight tolerances on chemistry & biology (e.g. COD, Sulphur, Salt, Nitrogen, Ph)

Need food waste feedstock to resemble FOG

- ✓ liquid
- ✓ high energy content
- ✓ low contamination
- ✓ easy to test for chemical/biological fit

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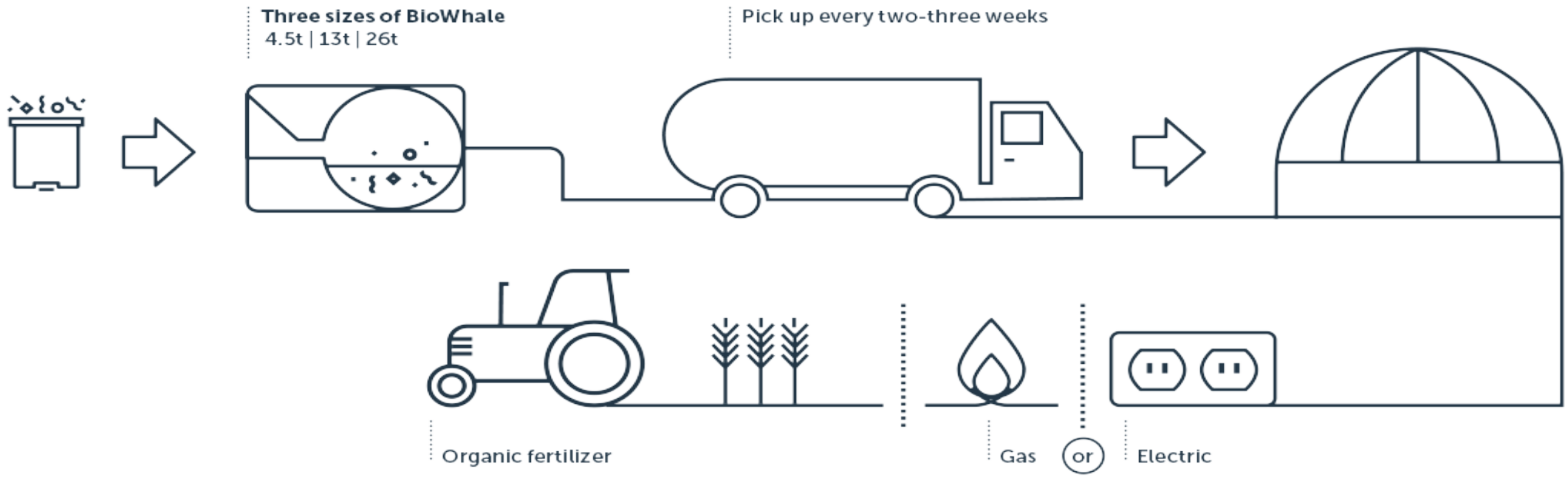
Overview of Organic Waste Logistics (OWL) solution

Food waste — Store in BioWhale — Automated dispatch — AD/Waste Waster Treatment Plants



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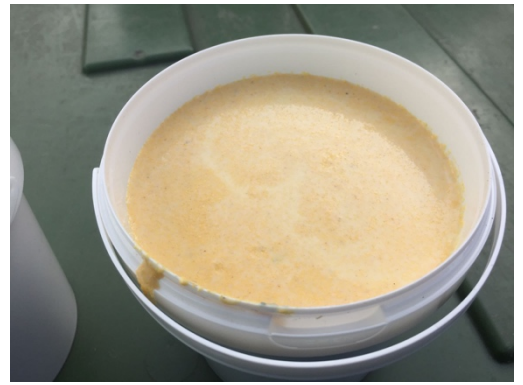
BioWhale converts food waste into liquid BioSoup



Food waste is macerated and partially hydrolized under vacuum, transforming into liquid 'BioSoup'

Tank is monitored online, and when full, quickly emptied via vacuum truck.

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Multiple ways of loading can be accommodated

No liners are needed when manually loading via easy-to-handle caddies.

Large bins/toters can be loaded using a variety of bin lifters

Customized external hopper can move waste from production to BioWhale

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Variety of sizes to suit customer needs

Compact

The Compact BioWhale has a small footprint, and can occupy space vacated by bins that are no longer required with the OWL System

Standard

Standard BioWhales can hold up to 13 tons and is generally used in hospitality locations

Large

The Large BioWhale can hold up to 26 tons and is generally used in food manufacturing locations.

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Case Study #1 - Recycling at major UK shopping center

Customer Background:

- Large number of restaurants (35+) generating in excess of 1.5 tons of unavoidable food waste/day
- Owner is committed to CSR and aiming for zero waste
- Previous experience with food segregation, but still utilising plastic liners
- Installed digesters, but removed in less than one year
- Installed OWL's system in 2017

Standard BioWhale with customized external hopper

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Case Study #1 - Benefits to the customer

Greener — Cheaper — No Risk — Flexible — Socially Responsible

- Increased food waste segregation, supporting 50% increase in food waste recovery
- General waste reduced significantly, as dry waste recycling increased.
- Food waste recycling costs reduced by one third.
- Overall cost of waste management significantly reduced.
- Food waste truck removals reduced from 300 to 30 /year.
- Improved safety and hygiene due to reduced handling requirements.
- Won highest award, Golden Green Apple (2018) for Environmental Best Practice.

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Case Study #2 - Recycling to AD at food manufacturer

Customer Background:

- Large meat products manufacturing plant in Midlands
- Daily food removals via skips
- Waste bins required refrigeration due to odour
- Under pressure from customers to improve hygiene issues
- Motivated to reduce high waste management costs
- Installed OWL's system in mid-2017

One of the UK's largest food manufacturing facilities

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Case Study #2 - Benefits to the customer

Greener — Cheaper — No Risk — Flexible — Socially Responsible

- Cost of food waste disposal reduced by over 50%
- Additional savings from elimination of the need to refrigerate food waste
- Further savings from sale of high-energy-yielding waste.
- Eliminated waste spillage and odours, resolving pest and vermin issues.
- Food waste truck removals reduced 365/year to 50/year.
- Customers pleased with response to hygiene issues.

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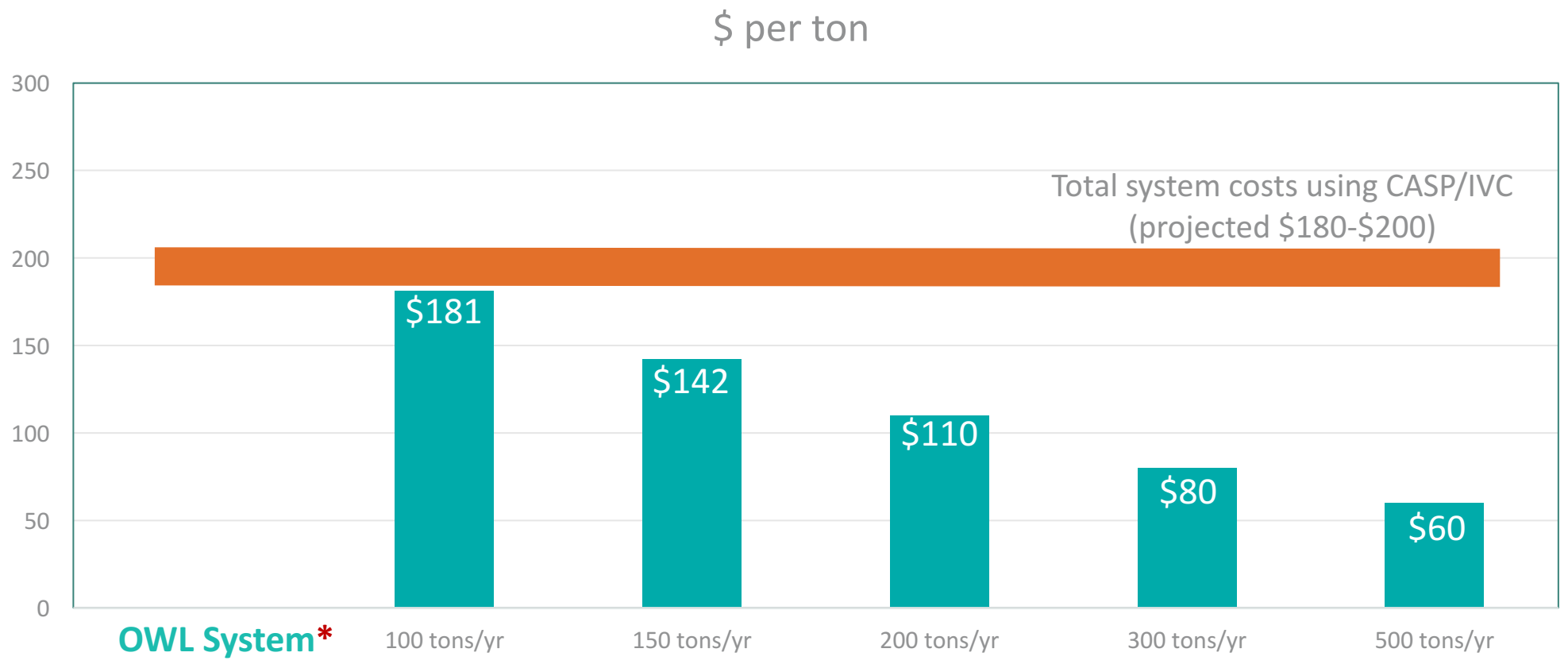
Composting versus OWL – system cost comparison



*At $0/ton tipping fee at the WWTP

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Co-Digestion Opportunity at WWTPs - California Example

Food waste converted to R-CNG for Transportation:

- 1 ton food waste yields ±3.5 mmBtu biomethane
- 1 mmbtu methane worth ±$4.00 at wholesale
- Food waste to R-CNG receives 11.2 RINs per mmBtu (EPA - RFS2)
- RIN traded values are currently ±0.50 mmBtu
- California LCFS certificate is currently worth in excess of £15 mmBtu

1 ton of food waste =	$14	Methane
	$21	RIN
	$52	LCFS
	$87	**per ton**

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Conclusions

- Mandatory (commercial) food waste recycling will continue to grow while cheap open-windrow composting is quickly disappearing
- New composting (CASP and IVS) is expensive and difficult to permit
- There is significant co-digestion capacity at WWTPs and the economics of co-digestion are attractive
- Key to co-digestion is high quality feedstock

✓ clean/contaminant free
✓ liquid (send down FOG pipe)
✓ high energy content

OWL system can provide WWTPs high quality food waste feedstock at a total system cost that is well below that of composting and new AD Plants

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