Earthcare, LLC
820 Schubert Road
Bethel, PA 19507

February 19, 2025

Delegate Dana Stein
301 Lowe House Office Building
6 Bladen Street
Annapolis, MD 21401

Delegate Stein,

I am writing in support of House Bill 909.

For several decades, the EPA, state environmental regulators, and independent environmental scientists have been studying the impact of land-applied biosolids. As reported in *Nature* in 2022, the EPA has identified 726 chemicals and "structure-based classes" in the biosolids it has tested, including pesticides and drugs (and their associated metabolites), cosmetics, flame retardants, polychlorinated biphenyls (PCBs), polybrominated biphenyl ethers (PBDEs), dioxins, and dibenzofurans. Some chemicals are sent as liquid waste into local waterways, while others settle into the biosolids.

The low temperatures that are used to produce biosolids from sewage sludge are inadequate to destroy these contaminants, especially PFAS. The EPA acknowledges there is no safe level of PFAS exposure for human health. Yet no federal agency has yet implemented a program to assist farmers plagued by PFAS on their land or to establish guidelines for PFAS in food.

As you are probably aware, some farms have gone out of business because of the PFAS found in their milk, produce and other farm products, and lawsuits regarding PFAS contamination are too numerous to count. According to the EPA, 41 public water systems in Maryland have tested positive for PFAS, including in Middletown in Frederick County. Middletown is a beautiful agricultural area, so no one can claim that the PFAS found in their ground water and drinking water came from any source other than the land application of municipal biosolids.

In September 2017, the EPA's Chesapeake Bay Program approved high-temperature gasification (MTT4) as a technology for converting animal manure to carbon-rich and nutrient-rich by-product called biochar. This technology is now being operated on an industrial scale to process the municipal sewage sludge (pre-biosolids) in southeastern Pennsylvania, and it can easily be implemented throughout Maryland.

Each gasifier can process more than 50,000 dewatered wet tons of sewage sludge per year, and two, three, or four gasifiers can be installed and operated 24/7 in the same building to process 100,000, 150,000 or 200,000 dewatered wet tons of sewage sludge per year by two employees per shift.

The petroleum companies claimed that there was not an alternative to tetraethyl lead in gasoline, but by the mid-1990s, they had figured out a way to change their formulation. The biosolids haulers will argue that the limit of 1 microgram per kilogram of PFAS in HB-909 will force them to truck all biosolids to landfills. That is certainly an alternative to the land application of biosolids on farms. Although it is difficult to clean leachate to the point that it can be safely discharged into streams or groundwater, it can and is being done at some large landfills.

The ideal legislation would be a total ban on the land application of biosolids, but in the interim, House Bill 909 is a good starting point. If you have any questions, I am always available via cell phone, and I would be pleased to testify next Wednesday afternoon.

Regards,

Peter Thomas

Peter Thomas
Earthcare, LLC and Earthcare Solutions, LLC
434-989-1417 (Cell)
pthomas@manuregy.com

FEATURE

Off to a Solid Start

As utilities are rethinking biosolids management, emerging biochar-producing technologies are gaining ground

Mohammad Abu-Orf, Micah Blate, Derya Dursun, and Paul Knowles

For water resource recovery facilities (WRRFs), deciding on a sustainable biosolids management strategy is more challenging than ever. The rising costs of processing, hauling, and beneficial use have made land application a burden on utilities. This is coupled with the presence of per- and polyfluoroalkyl substances (PFAS) and potential regulations that may require PFAS-destruction technologies. Also, sustainable practices are emerging that require WRRFs to reduce greenhouse gas emissions (GHGe).

As utilities are evaluating new biosolids management solutions, gasification and pyrolysis (G/P) are rising to the top of the list. Both technologies offer significant reduction in mass and volume of biosolids — and therefore, considerable reduction in beneficial use costs — which makes the overall economics favorable compared to conventional technologies. G/P produces biochar that has no detectable PFAS, which protects utilities from any future land-application regulations. Also, the biochar is considered a carbon sink because it captures and stores carbon dioxide, reducing overall GHGe.

This article discusses G/P technologies, the biochar they produce, and their PFAS-destruction potential. It also looks at costs, beneficial use, GHGe, and specific decision-making criteria, drawing on results from studies that evaluate G/P technologies holistically.

Gasification and Pyrolysis

The authors of this article have worked on biosolids management planning projects in several municipalities of various sizes, ranging from the Town of Windsor, California, which treats 8,700 m^3/d (2.3 mgd), to New York City, which operates 14 WRRFs that treat more than 3.8 million m^3/d (1,000 mgd) in aggregate. At both ends of the spectrum, there is a growing trend of utilities choosing biochar-producing technologies in favor of conventional stabilization technologies.

Pyrolysis operates at temperatures ranging from 200°C to 590°C (390°F to 1,100°F) with no oxygen supply, and gasification operates at higher temperatures ranging from 590°C to 980°C (1,100°F to 1,800°F) with a limited amount of oxygen. Because the equipment and operations and maintenance (O&M) requirements of the two technologies are similar, in this article the authors refer to G/P as a single process.

Although G/P requires dried product greater than 75% total solids, it does not necessarily need stabilization (*e.g.*, anaerobic digestion). It produces pyrogas or syngas that has 30% of the heat content of that produced from anaerobic digestion. The syngas usually is oxidized at high temperatures to generate energy that is used

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Of these options, the district chose to evaluate thermal drying and biodrying on a life-cycle cost basis. (The other technologies, due to increased mass and volume of generated biosolids, did not meet potential land-application restrictions or increased land-application costs.) The results showed that the 20-year net present value of all alternatives ranges from USD $33 million to $37 million (see Table 2, below). Although some alternatives have higher capital costs, others have high O&M costs. Overall, the cost of all alternatives for the district's sustainable biosolids management is anticipated to be within the same range.

The district is moving forward with some form of drying (thermal or biodry) followed by pyrolysis, which would produce small amounts of BDB. This option would eliminate the need for (and cost of) land application beneficial use and comply with upcoming PFAS regulations. Facility design is under way.

Anne Arundel County, Maryland. Anne Arundel County Department of Public Works (DPW) operates seven WRRFs with a projected total solids production of 34 dry Mg/d (37 dry ton/d).

The generated solids are managed by a third-party contractor that converts 75% of the solids to Class B biosolids using lime stabilization, and the remainder is converted to Class A compost.

Realizing that the current practice is not sustainable, the county evaluated alternatives that would meet its financial, environmental, and future regulatory needs. It shortlisted four technologies, including anaerobic digestion, thermal drying, pyrolysis, and autothermal thermophilic aerobic digestion. The project generated 64 alternatives of the top four shortlisted technologies and analyzed three potential regional facility locations using a multifacility planning tool. Each alternative was ranked relative to the most cost-effective option: G/P at the Patuxent WRRF.

The tool clearly indicated that the most beneficial technologies would be G/P and mesophilic anaerobic digestion plus thermal drying, so they were included in a detailed cost comparison (see Figure 4, p. 43). In a 20-year life cycle, G/P would result in a payback period of half this time, if practicing mesophilic anaerobic digestion plus thermal drying. Accordingly, the final recommendation is that pyrolysis or gasification be selected as the regional biosolids processing technology.

Middlesex County Utilities Authority, New Jersey. The authority operates both the WRRF and the adjacent landfill. Primary and waste activated sludges are dewatered and then thermally dried using thin-film drying technology to 50% to 60% dry solids. The WRRF then further pasteurizes the solids with lime stabilization, producing a Class A dried product that is disposed of at the landfill and used for daily cover operation. Aware of the existing landfill capacity and its high operating cost, the authority evaluated two technologies for reducing the mass and volume of its biosolids, advanced anaerobic digestion and G/P either alone or combined with advanced anaerobic digestion.

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20-year NPV (USD $ million)	$33.3	$37.0	$34.5	$36.8
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Building requirement	Enclosed building	Enclosed building	Canopy	Canopy
Land-application area requirement (ac)	100-170	100-170	100-170	None
Projected long-term beneficial use/disposal options	No	No	No	Yes

Source: Windsor (California) Water District

EQ = Exceptional Quality.

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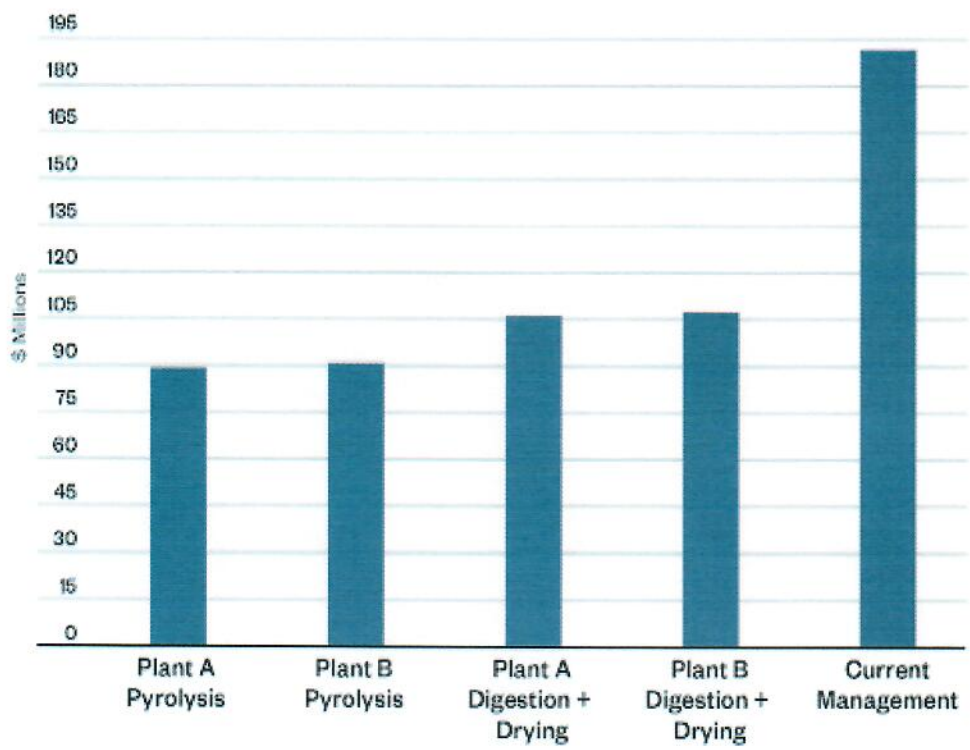

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Evaluation results showed that implementing G/P alone offers the authority the greatest cost savings compared to the current practice. The authority decided to move forward with implementing advanced anaerobic digestion to realize the anticipated savings and implement the G/P technologies as they become more mature.

End Use and Market Assessment

An important aspect of selecting a solidsprocessing technology is the end use of the biosolids product and the viability of the local market. According to the current *U.S. Biochar Market Analysis Report* published by Grandview Research, the market for biochar from nonbiosolids sources is well-established for its use as a soil amendment, adsorbent, building materials, fuel, energy storage, and anaerobic digestion additives. However, the market for BDB — which has similar beneficial uses as nonbiosolids biochar — is just developing.

In the 2018 critical review, "Biochar from Biosolids Pyrolysis"in the *International Journal of Environmental Research and Public Health*, Paz-Ferreiro and colleagues concluded that very limited work exists regarding the use of biosolids biochar to improve agronomic performance. Given that pyrolysis is being considered increasingly for sustainable biosolids management, the researchers highlighted the need to better understand the soil– biochar–plant interaction. Long-term stability of BDB in soil and the long-term fate of nutrients and pollutants need to be further understood.

A recent market assessment by environmental consulting firm Material Matters (Elizabethtown, Pennsylvania) considered various products for the Stamford (Connecticut) Water Pollution Control Facility, which currently produces Class A dried pellets from undigested solids (see Table 3, below). Products considered in the assessment included BDB; incineration ash; dried product from digested and undigested, Class A and Class B cake biosolids; and compost. When the consultant weighted and scored the city's top criteria, BDB scored the highest among all products.

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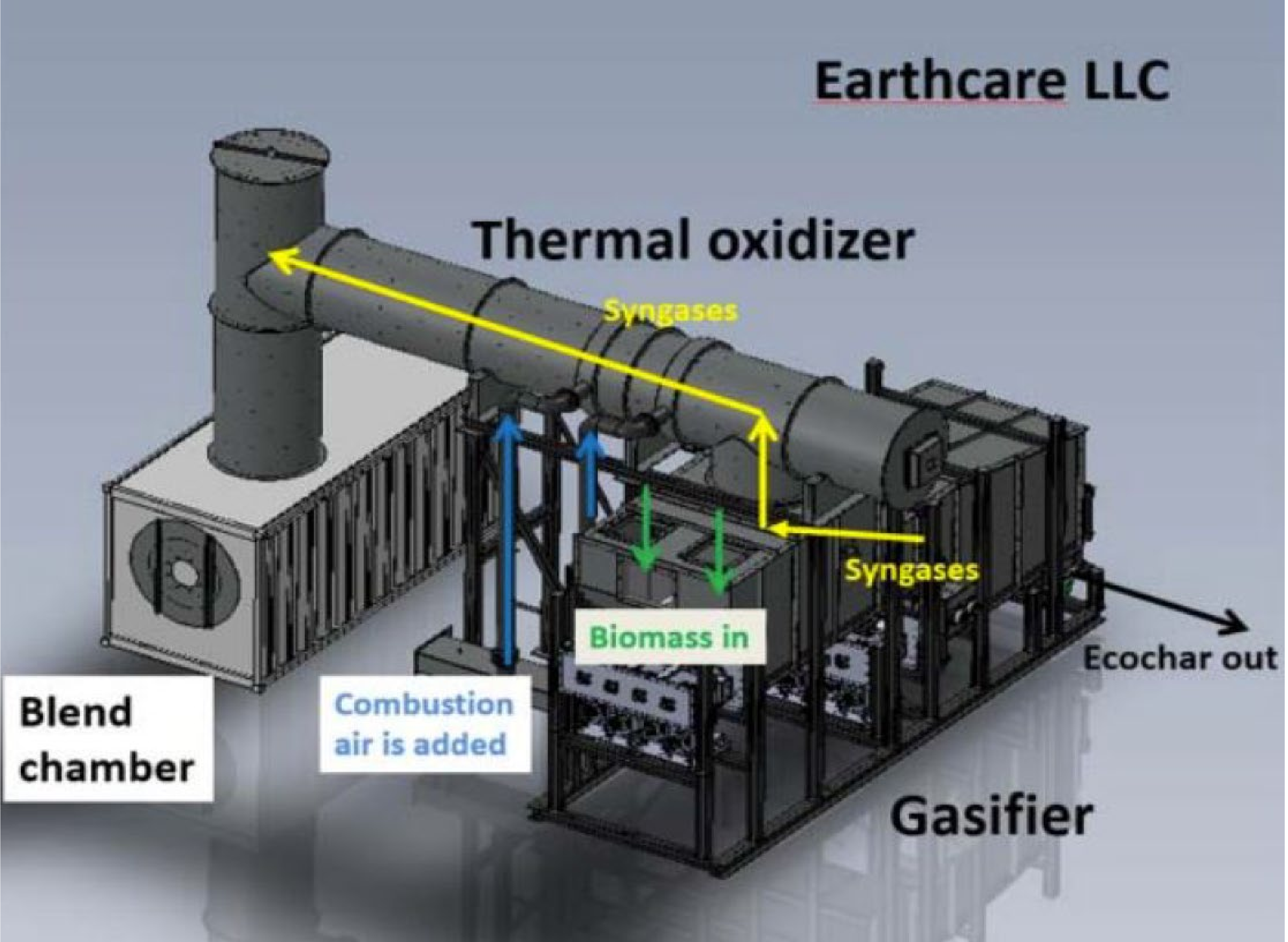
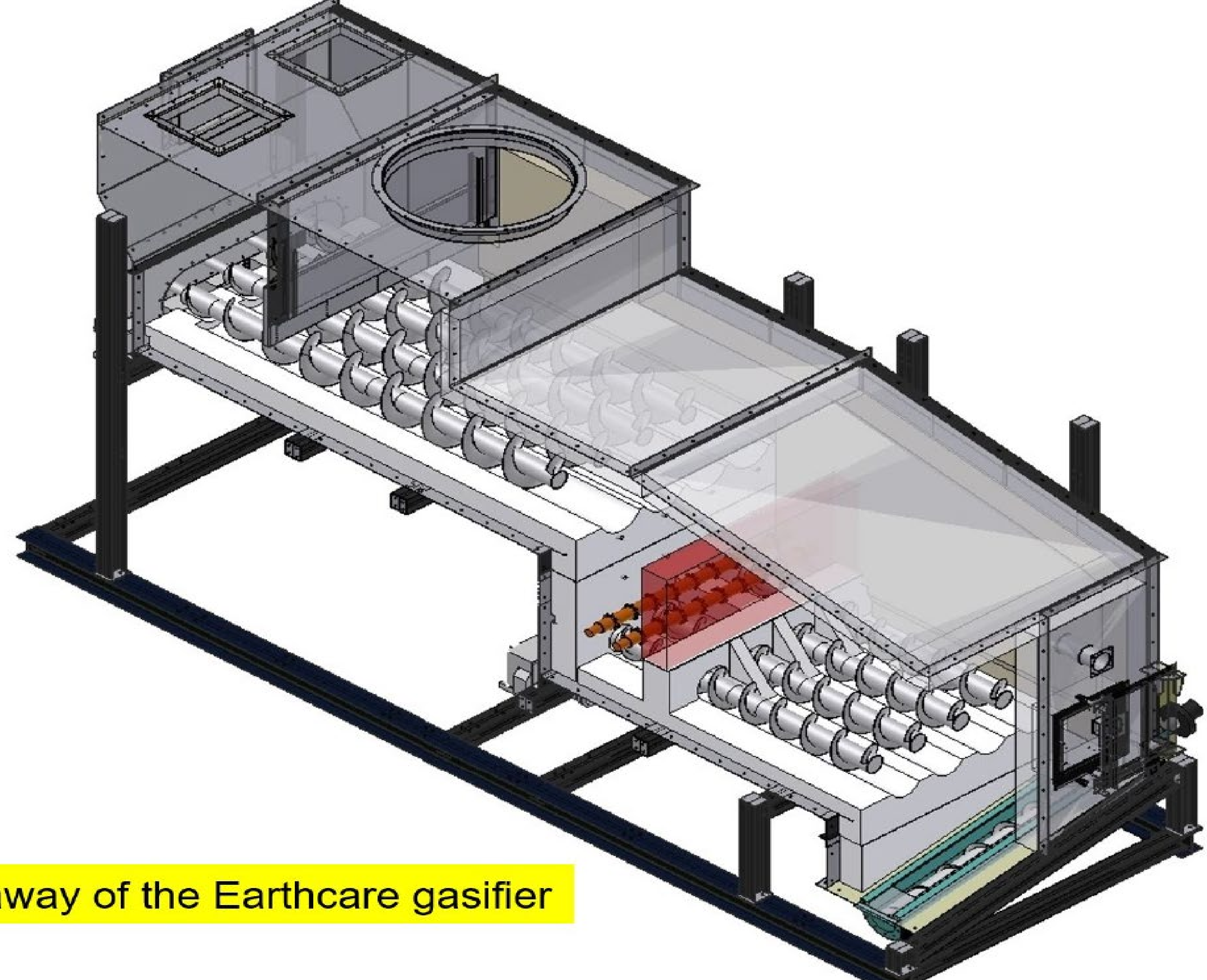
Earthcare’s sewage sludge gasifier in Berks County, PA

Triple-pass rotary drum dryer that evaporates 5 tons of water per hour.



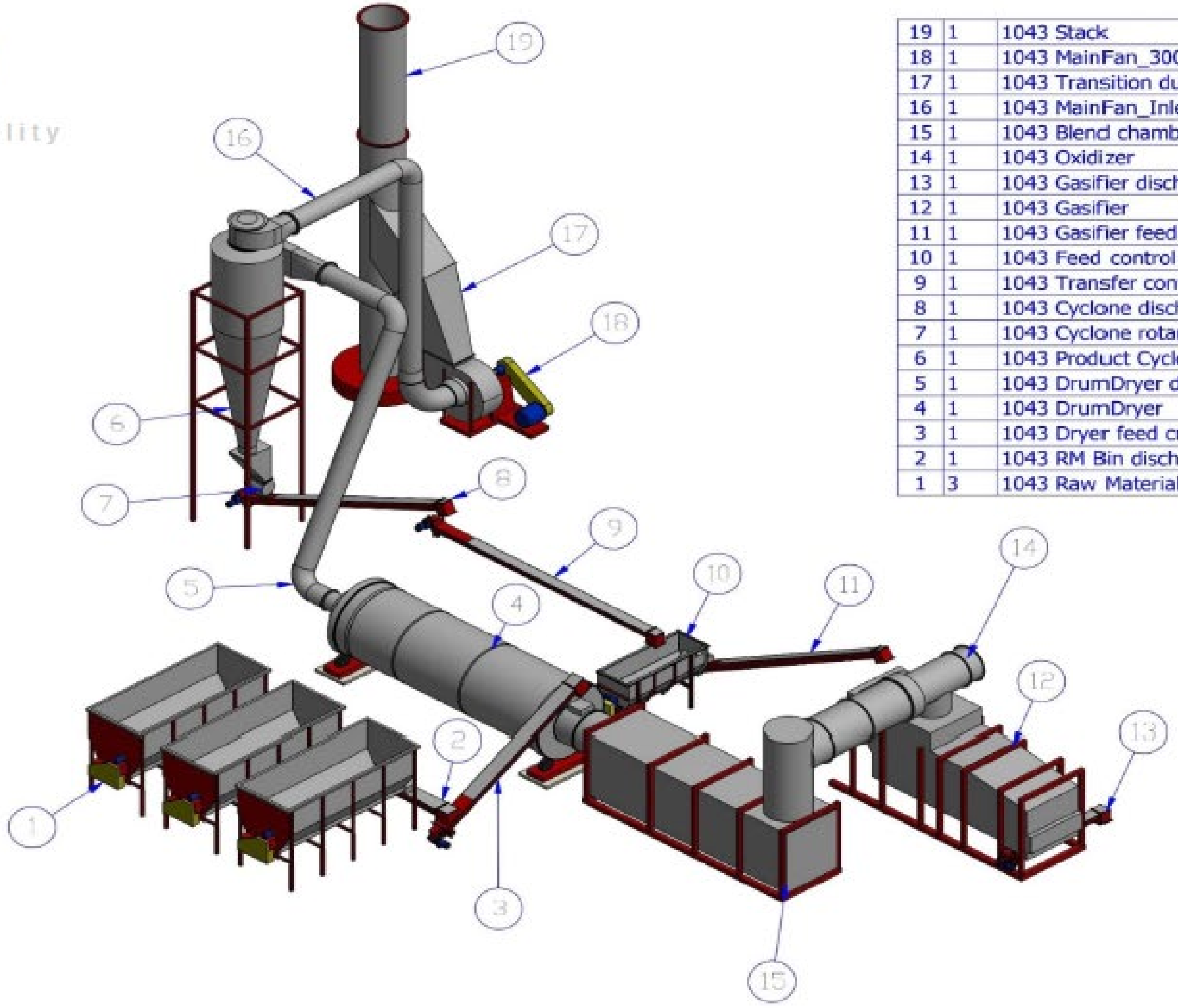
Processes ~150 dewatered wet tons of sewage sludge per day or ~54,000 tons per year. Two, three, or four can be installed and operated side-by-side in the same bldg.



Cutaway of the Earthcare gasifier

Earthcare System

Organics Processing Facility



19	1	1043 Stack
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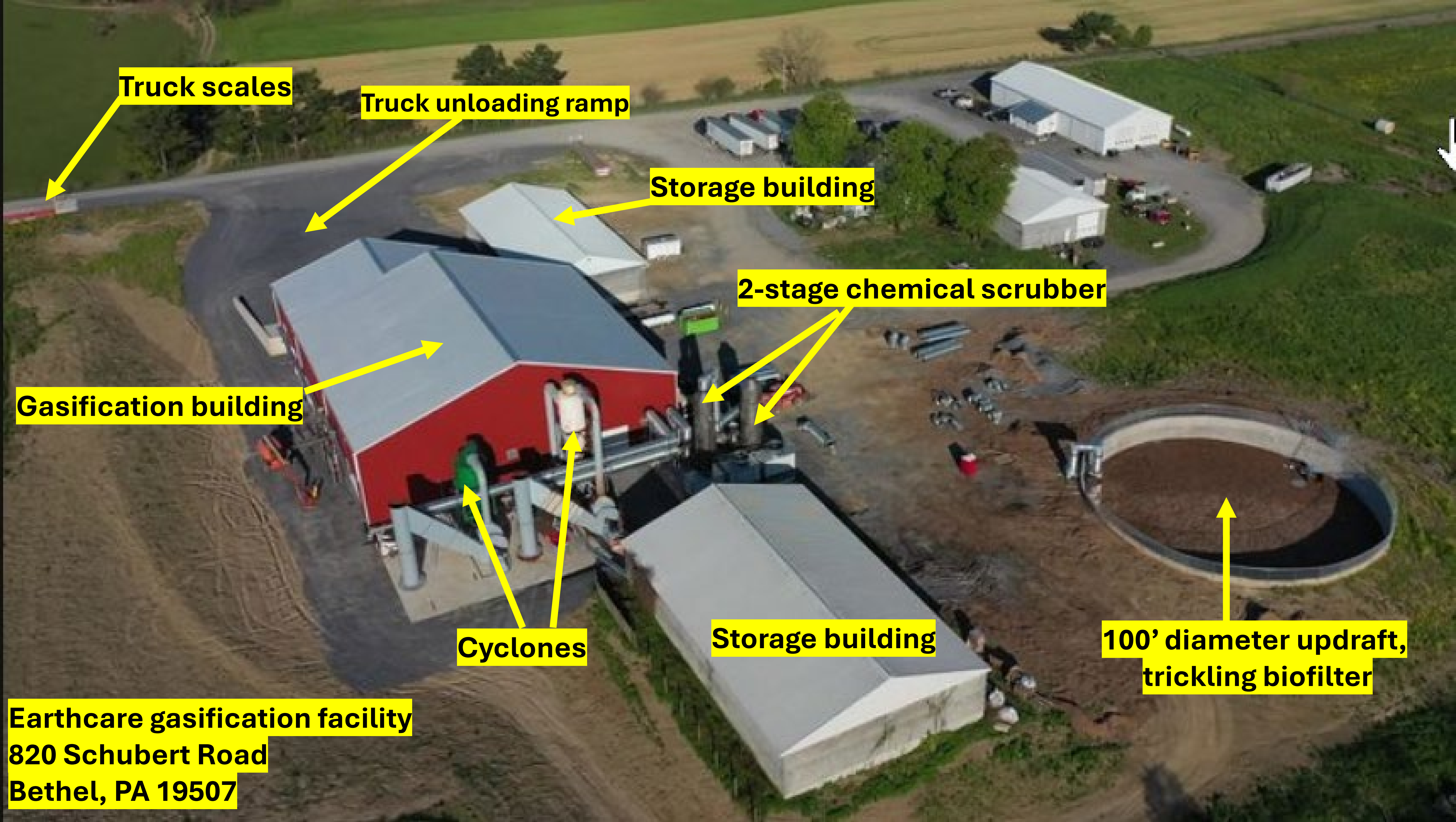
1	3	1043 Raw Material Bin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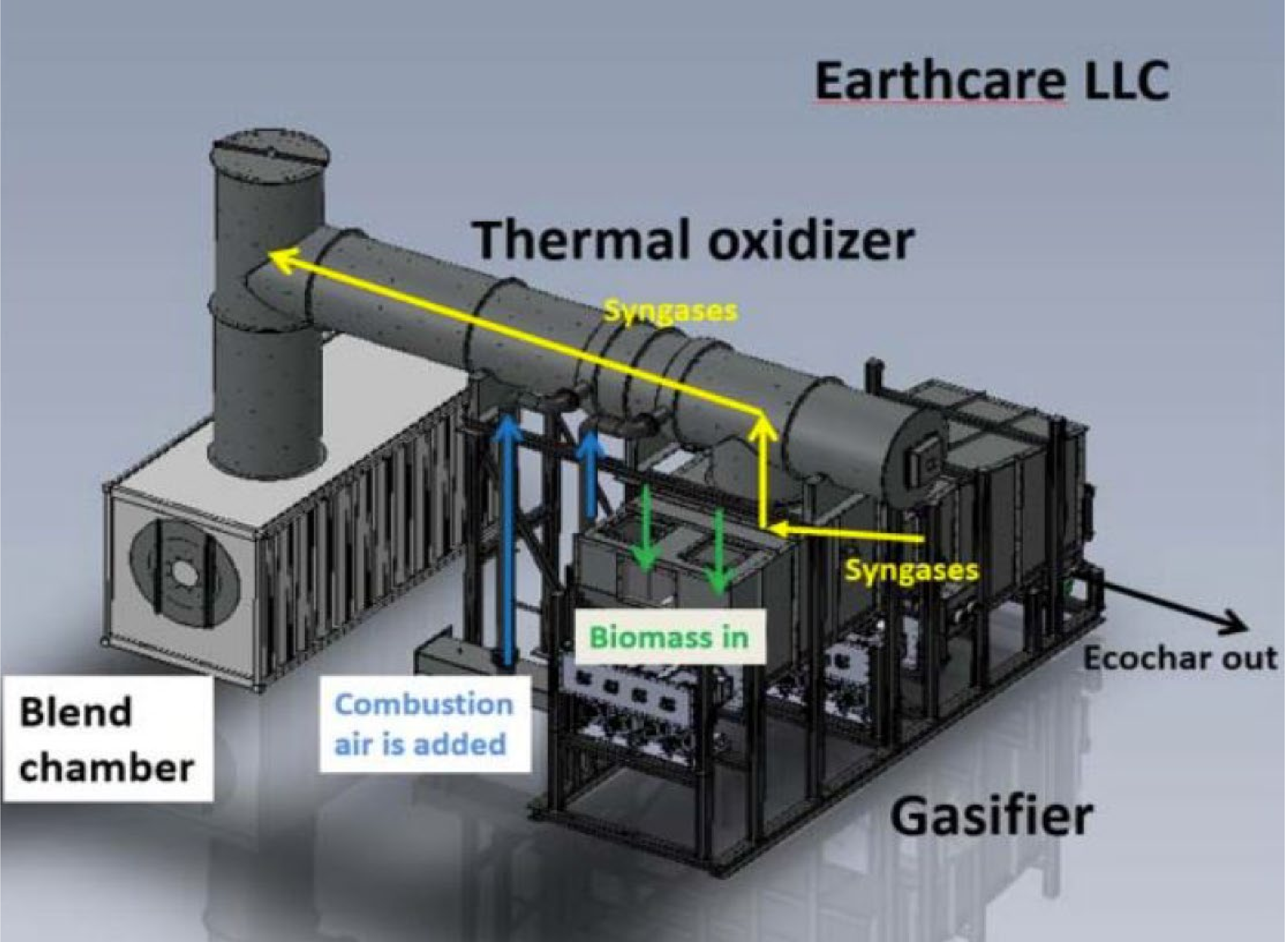

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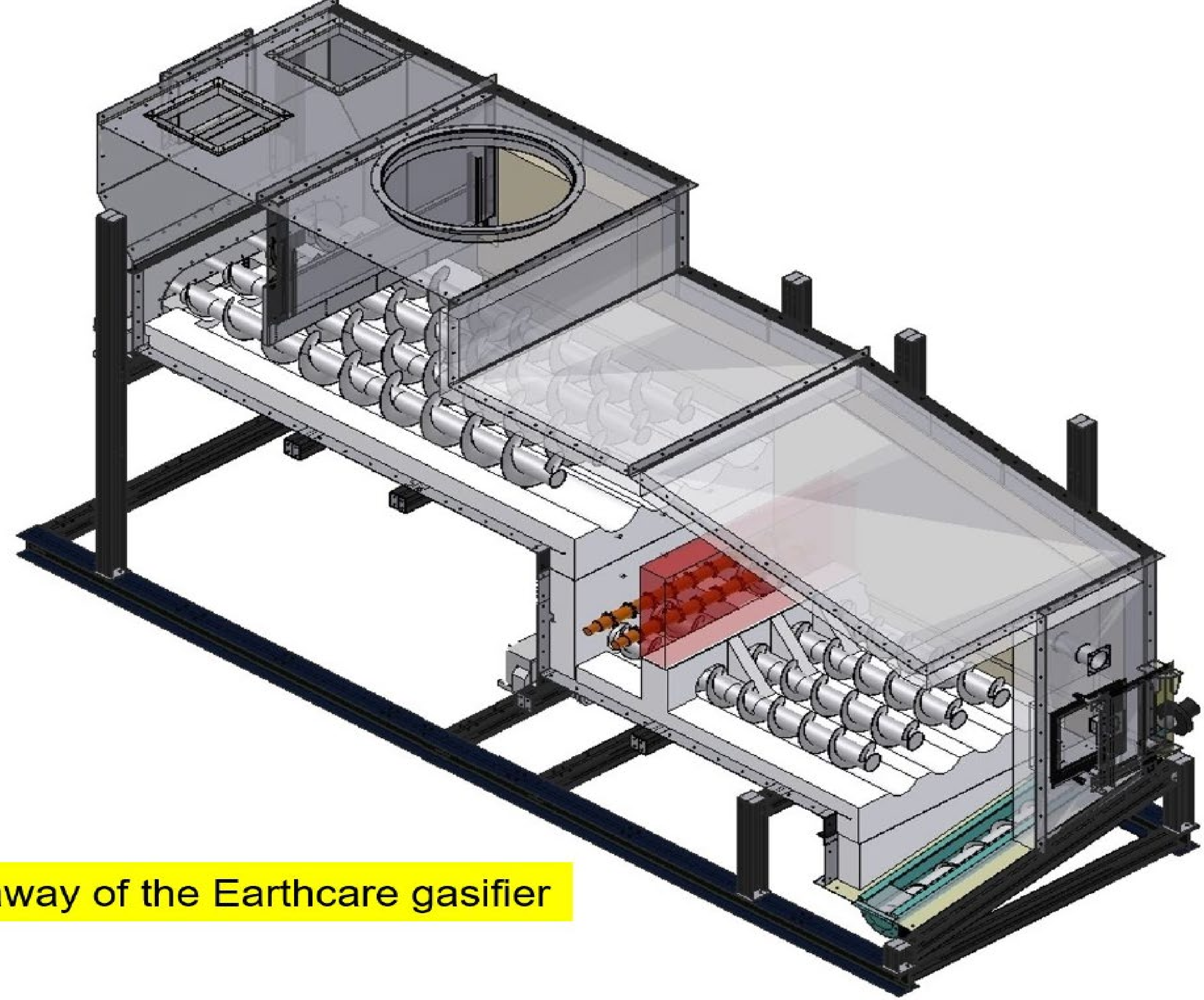

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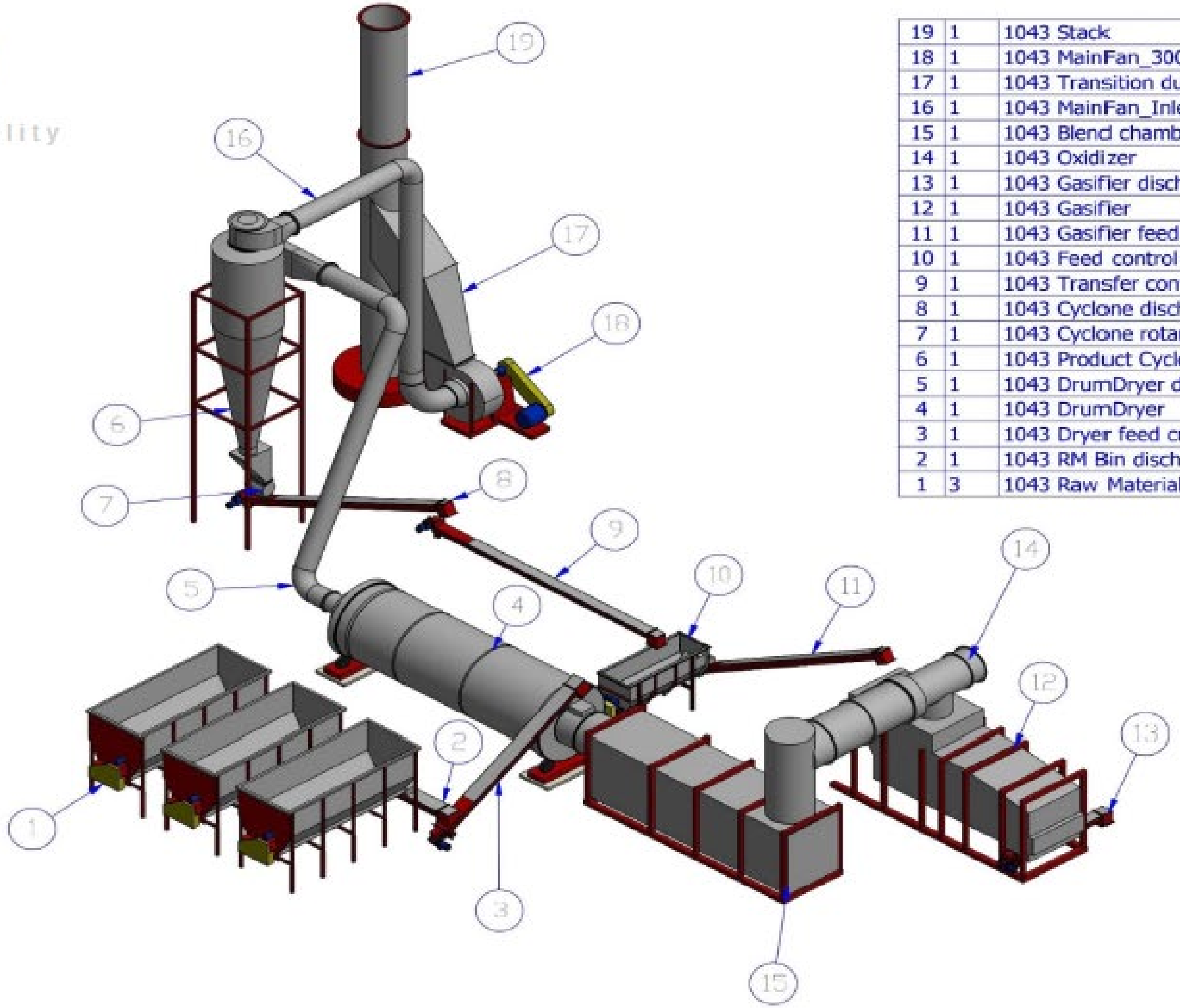

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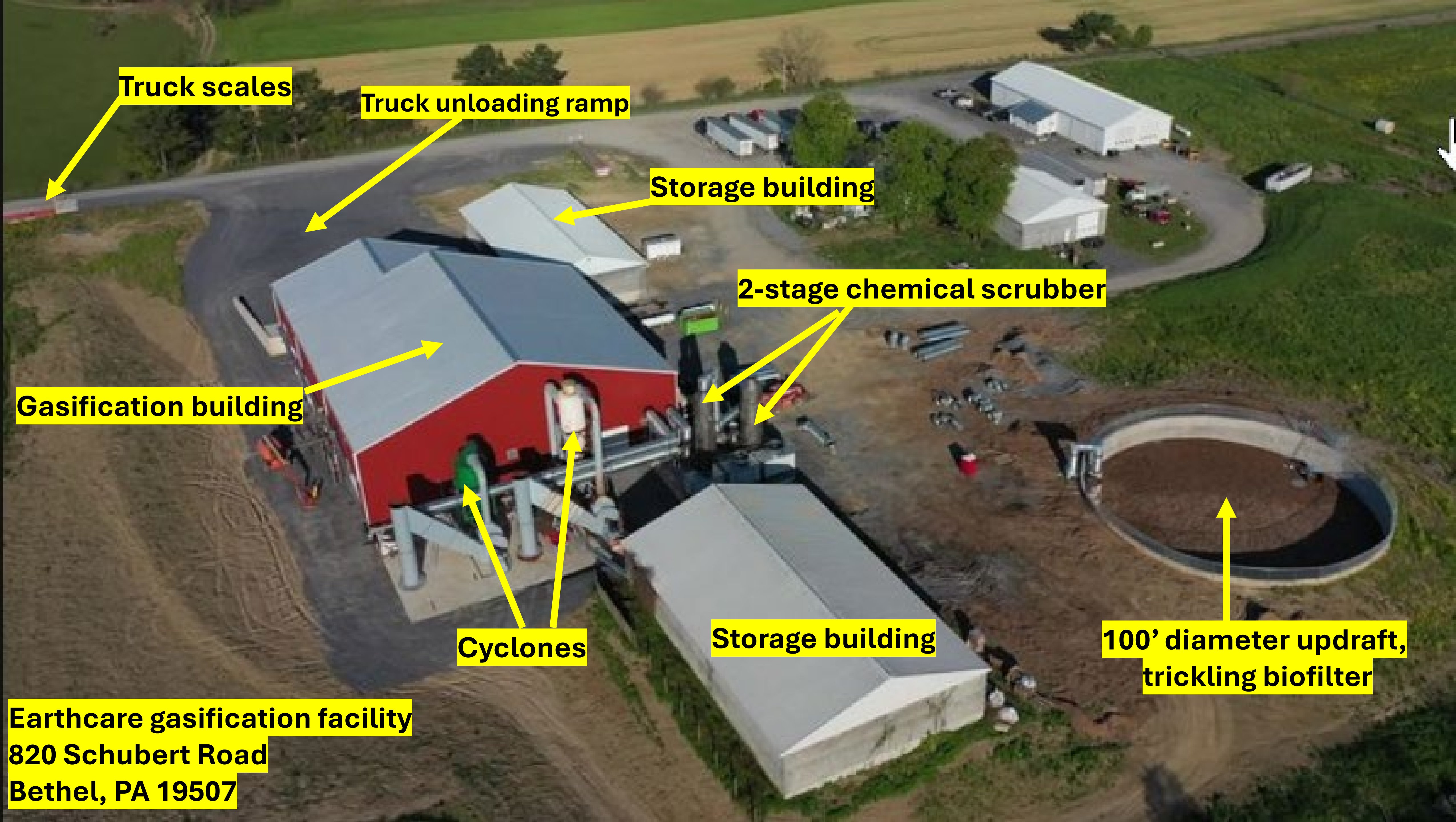
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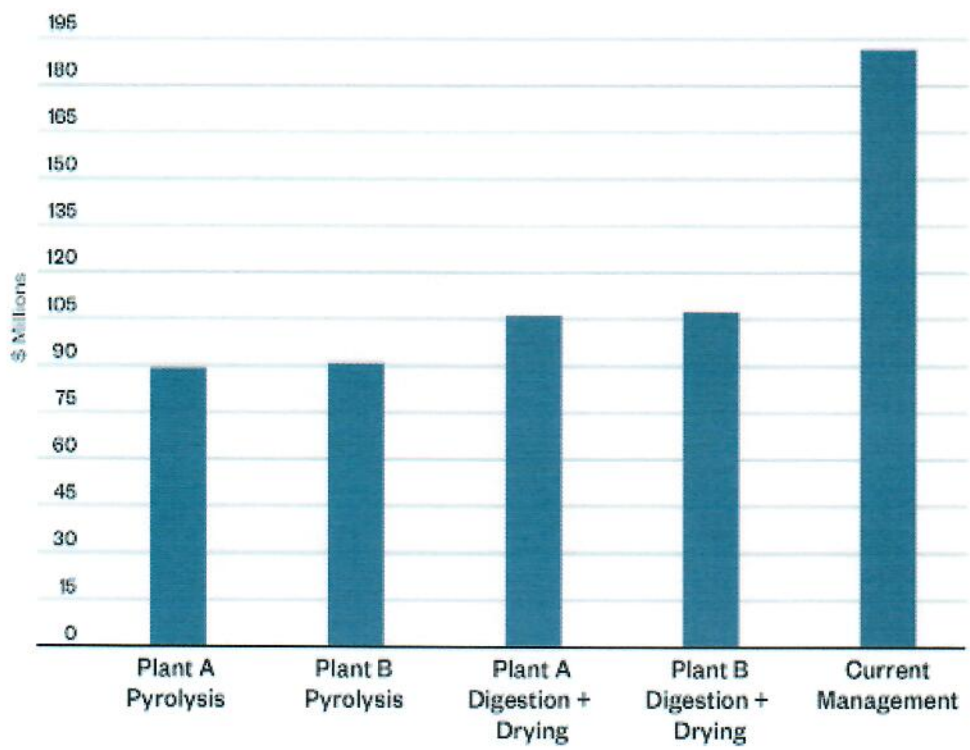

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