



Lystek THP[®] Technical Specifications

About the Technology

Lystek THP[®], a low-temperature Thermal-Chemical Hydrolysis Process, is a sustainable solution to biosolids and organics management with full-cycle resource recovery.

Lystek THP transforms raw or digested residuals into a Class A quality biosolids fertilizer and multi-use hydrolyzed product. This technology provides operational flexibility with multiple product uses, including LysteGro[®] Class A biosolids fertilizer, LysteMize[®] digester enhancement process, and LysteCarb[®] alternative carbon source.

Operating inputs are low pressure steam, high speed shearing, and alkali, all applied simultaneously in an enclosed Reactor.

One System. Multiple Benefits:

Lystek THP has a small footprint, is cost effective, efficient, and reliable.

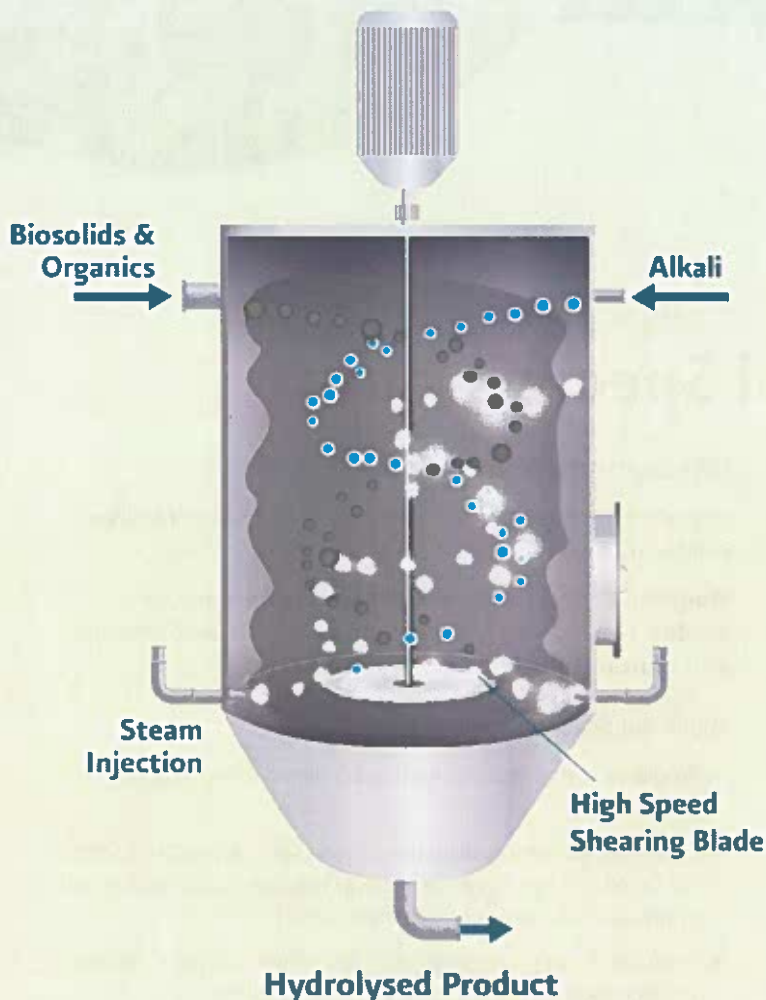
Modular design makes it scalable and easy to deploy (or retrofit). The system is fully automated and simple to operate and maintain.

Additional advantages include:

- Produces a marketable, high-solids liquid Class A quality fertilizer
- Optimizes anaerobic digesters; increasing biogas production for green energy while decreasing residual volumes through improved volatile solids reduction (VSR)
- Produces a safe, cost-effective alternative source of carbon for biological nutrient removal (BNR) systems
- Significantly reduces liquid biosolids volumes
- Augment to existing plants - does not disrupt existing processes
- Autonomous operations
- Simple and efficient to install, operate, and maintain
- Comprehensive, worry-free LysteGro product management services



Lystek THP[®] Reactor



LysteGro[®] - Class A biofertilizer

LysteMize[®] - Anaerobic digester optimization

LysteCarb[®] - Alternative carbon source

Moduleⁱ Sizing

Module size	LY3	LY6	LY10
Processing rate (dry tons per hour)	0.3	0.6	1.0
Typical processing footprint ⁱⁱ (ft ²)	800	1,250	1,600

Key Operating Parametersⁱⁱⁱ

Electrical consumption	60 kw-h per dry ton
Heat requirement ^v	1,100,000 BTU per dry ton
45% liquid alkali solution ^v	190 - 230 lb per dry ton
Operating temperature	167°F / 75°C
Solids content - processed product	13 - 16%
Viscosity - processed product	5,000 - 10,000 cP

Valuable End Products and Processes

LysteGro [®] biofertilizer	Pathogen free, nutrient-rich, Class A quality fertilizer
LysteMize [®] digester optimization	Increase biogas production and volatile solids reduction
LysteCarb [®] alternative carbon source	Eliminate use of costly chemicals (i.e. methanol, glycerol) used for BNR

- ⁱ Module includes the THP Reactor and associated process equipment.
- ⁱⁱ Minimum space required for processing equipment only (Module, alkali storage, boiler). Product storage and ancillary system requirements will vary by site conditions.
- ⁱⁱⁱ Operating parameters are estimates only and will vary according to site conditions, feed stock characteristics, and intended use of hydrolysed product.
- ^{iv} Dependent upon biosolids feed temperature into the Reactor. Heat requirements estimated based upon an average feed temperature of 60°F.
- ^v Typically potassium hydroxide (KOH).

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June 21, 2023

James Dunbar
1014 Chadbourne Rd.
Fairfield, CA 94534-9700

Dear Mr. Dunbar,

Thank you for submitting an Article 2 application to CalRecycle on June 2, 2023. As discussed on June 20th, 2023, the department has reviewed your application and determined that an Article 2 application is not necessary as the proposed project is already defined under the SB 1383 regulations as a reduction in landfill disposal.

The application proposed a project to add the Lystek technology to the processing of biosolids that can be land applied. [14 CCR Section 18983.1](#) includes biosolids management and biosolids land application as an organic waste reduction activity. Therefore, the technology determination as prescribed in [14 CCR Section 18983.2\(a\)](#) is not necessary.

Please let us know if you would like to withdraw your June 2, 2023, application by sending your request via email to SLCP.Organics@CalRecycle.ca.gov.

Regards,

Cara Morgan

Cara Morgan, Deputy Director
Materials Management and Local Assistance Division

The contents of this communication and any analysis, guidance, or other information herein are based on current, existing, known facts and legal authority as described to and understood by the author and/or CalRecycle at the time of this communication. Please be advised that any relevant facts or legal authority or authorities that are undisclosed or unknown at the time of this communication may affect or alter any analysis, guidance, or other information herein. Please be further advised that any analysis, guidance, or other information herein may be subject to change and/or correction based on changed facts or legal authority, actual or understood, subsequent to the time of this communication. No analysis, guidance, or other information herein should be construed as a waiver of any rights or remedies available to CalRecycle.



STATE OF CALIFORNIA
DEPARTMENT OF FOOD AND AGRICULTURE
FEED, FERTILIZER, LIVESTOCK DRUGS REGULATORY SERVICES
1220 N STREET
SACRAMENTO CA 95814

FERTILIZING MATERIALS LICENSE

NON TRANSFERABLE

LYSTEK INTERNATIONAL LTD

FIRM NO. 447666

LICENSE NO. 447783

DATE OF ISSUE

Jan 4, 2023

EXPIRES

Dec 31, 2024

Mailing Address

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FAIRFIELD, CA 94534
United States

Licensed Location

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FAIRFIELD, CA 94534

Meeting Wheat Nutrient Needs with LysteGro Fertilizer in Northern California



Since 2017, University of California Cooperative Extension has been working on field trials to evaluate the effectiveness of LysteGro relative to commercial fertilizer for wheat production in Solano County, California.

WHAT IS LYSTEGRO?

Lystek utilizes a patented thermal hydrolysis process Lystek THP® to transform biosolids and other organics into LysteGro® a Class A quality, pathogen-free high-quality concentrated liquid fertilizer. LysteGro, a fertilizer with the California Department of Food and Agriculture (CDFA), contains valuable concentrations of Nitrogen (N), Phosphorus (P), and Potassium (K) (approximately 45, 45, and 35 lbs/1,000 US gallons, as total N, P₂O₅, and K₂O, respectively). LysteGro also contains a variety of other micro and macronutrients (Calcium, Magnesium, Sulfur, Iron, and Zinc), as well as organic matter.



Figure 1. LysteGro Trial Application

THE TRIAL

The project evaluated two years of wheat yields by comparing a synthetic nitrogen treatment and different rates of LysteGro in Northern California. In 2018, the trial took place at a dryland site in the Montezuma Hills of Solano County on upland soils. The common practice of this grower is a three-year rotation of wheat, safflower, and fallowing. The treatments in 2018 were: LysteGro at 1,750 and 2,750 US gallons/acre (equivalent to approximately 61 lbs and 96 lbs plant available N/acre), anhydrous ammonia at 90 lbs N/ac and an untreated control.

In 2019, the trial site was located on irrigated ground on valley soils near Dixon, California. This grower has a three-year rotation of wheat, safflower, and tomatoes. The treatments in 2019 were: LysteGro at 2,000, 2,500 and 3,000 US gallons/ac (70, 88, 105 lbs plant available N/acre¹), UAN at 120 lbs N/acre and an untreated control. All treatments were applied prior to seed planting with no in-season top-dress. Yield was measured at harvest on an area basis and then converted to lbs/acre. Mean yields were then calculated for each treatment from the individual plot yields.

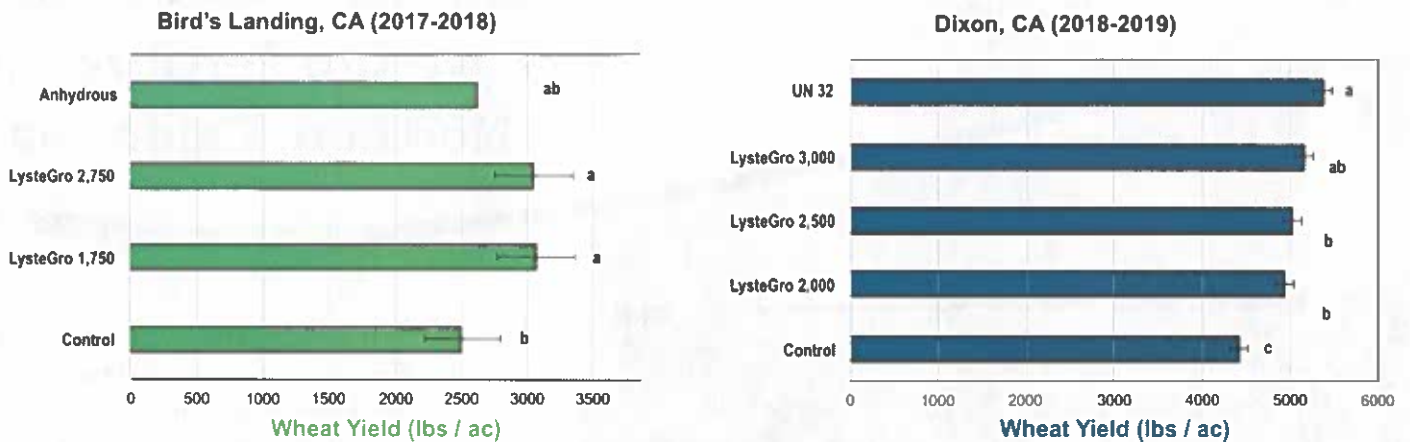
¹Plant-available nitrogen is based on 40% mineralization rate.

RESULTS

In the 2018 harvest, wheat yields were significantly higher in the LysteGro treatments than in the control, which received only starter fertilizer. Mean yields of LysteGro treatments trended higher but were not significantly different from the anhydrous treatment. The anhydrous treatment was not significantly different from the control

Nothing wasted. Everything to gain.

Figure 2. Wheat yield in 2018 harvest (left) and in 2019 harvest (right). Bars represent estimated marginal means of replicates (accounting for block effects). Error bars represent standard error (2017-2018 n=3, 2018-2019 n=4). Significant differences between treatments are indicated by different letters.



In 2019, the yield for the highest application rate of LysteGro (3,000 US Gallons/ac) was similar to the UN treatment. All LysteGro treatments and the fertilizer treatment had significantly higher yields than the untreated control. Yields trended higher with increasing application rates of LysteGro but were not significantly different among those rates.

DISCUSSION AND CONCLUSIONS

Overall, LysteGro proved to be similar in its performance relative to synthetic fertilizers applied at similar rates of available lbs N/acre, in wheat. In both years, yields in LysteGro plots were higher than the untreated control and comparable to synthetic fertilizer treatments.

In 2018, the two LysteGro rates had similar yields, indicating that at that site, a lower application rate of 1,750 US gallons/acre was sufficient in that year (likely due to the fact that water was limiting). In periods of extreme drought stress (as seen in the 2017-2018 season), the small amount of extra water added to the soil at depth by the injection process may have given individuals a slight advantage relative to other fertilizer treatments. This dynamic may explain why LysteGro treatments were significantly different from the control, and the anhydrous treatment was not.

Month	2017- 2018	2018- 2019	2019- 2020
Dec.	-	1.89	7.3
Jan.	1.5	2.43	1.01
Feb.	0.27	8.99	0.01
Mar.	1.84	4.80	0.79

Table 1. Winter Monthly Rain Total, Solano County (inches)

In 2019, rainfall was well above average, and there was a yield response that trended higher to increasing application rates of LysteGro. The 3rd year trial, 2019-2020, suffered from severe drought stress on non-irrigated ground. Soil data was recovered, which will contribute to overall understanding of the mineralization behavior of these types of biosolids, but yields were not collected.

Lystek will continue to participate in the annual biosolids wheat trials in Solano County run by UCCE. There are additional benefits of applying LysteGro, such as providing micronutrients and organic matter to build soil biology and improve soil physical properties over time. Additional results will be included as they become available.

ACKNOWLEDGMENTS

Sincere thanks extended to Konrad Mathesius of the University of California Cooperative Extension and the plot cooperators for their work on this topic.

If you have any questions related to the trial or the product, or you wish to see the full report for this project, please contact:

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2021-06-16



Lystek

Advantages of LysteGro® *Class A Biosolids*

The Lystek Thermal Hydrolysis Process (Lystek THP®) technology produces a concentrated high solids liquid product, LysteGro®, that is considered a Class A biosolids in the US and is registered with the California Department of Food and Agriculture (CDFA) in California. In Canada, LysteGro is regulated by the Canadian Food Inspection Agency (CFIA). LysteGro has a solids content ranging from 13 – 16% with a viscosity below 10,000 centipoise. This means that it is fully pumpable using traditional liquid manure handling and application equipment.

There are several advantages to producing and managing a Class A biosolids.

Simple and Cost Effective Liquid Pumping and Storage Systems

Pumping LysteGro from processing to storage and from storage to truck loading is completed with standard pumps proven within the industry. This allows for rapid, familiar and low maintenance pumping operations, and accurate quantification of the volumes. Liquid solutions offer automation that is not possible with solid loading operations which often requires manned loading equipment. Concentrated liquid storage solutions reduce site footprint compared to solid options as storage tanks can be constructed with practically unlimited vertical storage capacity unbound by the slumping properties of dewatered biosolids.



Transportation Loading and Unloading Efficiencies

Depending on the site requirements, loading of tanker trucks can be completed quickly (5 – 10 minutes at larger facilities) and accurately. Additionally, the product can be transferred to the application tank in the field in as little as 5 minutes. The result is an efficient and clean program at both the facility and field sites with minimal staffing requirements.

Odor Mitigation with Enclosed System

From the point of production to application in the field, the product is contained within enclosed Reactors, piping systems, storage, tanker trucks, and finally the soil. Lystek THP generates minimal process air compared to dry alternatives, which require the evaporation of water and the liberation of odorous compounds that must then be captured and treated. This is a significant advantage when managing odor throughout the life cycle of the process.

Efficient and Cost-Effective Land Application

Due to the loading methods at the facility and in the field, LysteGro application programs are highly efficient. At the field, the product is injected into the soil subsurface, requiring only one pass over the field with the application equipment. This translates to less equipment, less staffing, and less time spent on fields as well as minimizes compaction risk and facilitates application into living crops.

Application Accuracy and Nutrient Use Efficiency

The application rate is controlled with flow meters to ensure it is placed evenly and accurately throughout the field. This provides confidence that the customer can rely on the material as a synthetic fertilizer replacement. This also creates opportunities for farmers to utilize their GPS technology to place the seed close (within 2" for example) to the band of LysteGro to optimize carbon and nutrient use efficiency. The sub-surface injection of the product minimizes nitrogen loss, maximizing the effective nutrient value of the product.



Environmental Protection

LysteGro is sub-surface injected, which increases soil contact and removes the risk of run-off. Additionally, because the material is concentrated there is a dramatic reduction in the overall water volume applied per acre versus traditional liquid programs. As a result, application above the hydraulic loading rate of the soil is not a concern with this product.

Improved Optics (Out of Sight, Out of Mind)

Injection of the product minimizes soil disturbance and the outcome is a professional job with little product on the soil surface, avoiding public nuisance and concern.

Value Proposition for the Farmer

The value proposition to the farmer is to provide a consistent quality product they can rely on to improve yields and reduce input costs. LysteGro is enhanced with potassium during the treatment process, adding further benefit to the farmer. The Lystek approach to Class A biosolids management is preferred by farmers compared with historical application methods, as it only requires one pass to inject and incorporate the product. Additionally, it is compatible with minimum till systems, which are rapidly growing in popularity in agricultural systems throughout North America.

LysteGro 

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