

Nutrient Recovery & Reuse (NR2) Project

City of St. Cloud, Minnesota, USA

Lystek 
Nothing wasted.
Everything to gain.



“The biggest, driving force behind the various upgrades to our biosolids program was that we were running out of storage,” says Brian Shoenecker, Wastewater Services Manager for the City of St. Cloud

ABOUT

The City of St. Cloud is the 10th largest city in Minnesota. It is centrally located in the heart of the Midwest along the banks of the mighty Mississippi River. The City is the first municipality to use the Mississippi River as its drinking water source. Maintaining high water quality standards and preserving the integrity of the receiving waters is of the highest priority to the City.

CHALLENGES

- Biosolids storage capacity was under increasing pressure due to continued community growth, increased flows, and wet weather events shortening the land application season
- Anticipated future regulatory pressures to produce a Class A product for recycling to land
- Desire to retain and utilize as much existing treatment infrastructure as possible

SOLUTION

- Integration of the Lystek Thermal Hydrolysis Process (Lystek THP®) in a major (NR2 Project) plant upgrade

RESULTS

- A 70% decrease in biosolids volume significantly extending the capacity of the City’s existing storage
- Production of a liquid, Class A quality biosolids product, which can be managed with the City’s existing transportation and land application equipment
- \$12 million in estimated cost savings over a 20 year life cycle as compared to alternative solutions

LOCATION & BACKGROUND

The St. Cloud Nutrient, Energy & Water (NEW) Recovery Facility is located in southern St. Cloud. The center services a population of about 120,000, including the City of St. Cloud and several area cities such as St. Augusta, St. Joseph, Sartell, Sauk Rapids, and Waite Park.

In 2014, the City began developing a Resource Recovery and Energy Efficiency Master Plan (R2E2) to remain well positioned to exceed future regulatory requirements and continue to be an innovative and sustainable utility. The primary goals of the R2E2 Master Plan were resiliency, cost-efficiency, innovation, excellence, and continuous improvement.

As a forward-looking utility, the St. Cloud NEW Recovery Facility had already been recognized as a leader in resource recovery. In fact, in 2017, the facility was one of only 25 water utilities in the United States to be named a “Utility of the Future Today”, in recognition of its “leadership in community engagement, watershed stewardship, and recovery of resources such as water, energy, and nutrients”, by the National Association of Clean Water Agencies (NACWA).

Armed with a notification in July 2017 from the Minnesota Public Facilities Authority that \$6.6 million dollars in funds from a Point Source Implementation Grant had been made available to St. Cloud, the City embarked on an ambitious initiative, known as the Nutrient Recovery and Reuse (NR2) Project, to further advance their efforts in resource recovery. The grant was made possible by the Clean Water Legacy Act. Two of the primary goals of the NR2 initiative were to recover phosphorous and produce a fertilizer product at its facility.

PROJECT DRIVERS

Prior to the implementation of the Lystek THP solution, the City had already established a highly successful, Class B, liquid biosolids management program. However, as the community around the facility continued to grow, it became obvious there would be increasing pressure on the existing storage capacity at the center. This was a challenge that needed to be addressed. Simply put, City staff understood that, in the near future, they would run out of capacity to store their liquid (3-4% solids) material. Therefore, they needed to implement a plan that would reduce the volume of their low solids content product.

In addition, St. Cloud wanted to achieve a Class A quality product to prepare for possible changes in future regulatory requirements. With the Lystek THP system, St. Cloud was able to find a solution to address both of these key project challenges/drivers, while continuing to utilize and maximize the value of their existing infrastructure.



“We were trying to find a way – a process or a technology – where we could continue to provide a liquid fertilizer product to our agricultural customers. That’s what they like, that’s what they ask for, so we evaluated a number of alternatives to find a solution that would be a good fit.”

– Tracy Hodel, Public Utilities Assistant Director for the City of St. Cloud.



LYSTEK THP SELECTED

The solution also had to align with the St. Cloud’s commitment to innovation in nutrient reuse and recovery and be as cost effective as possible for its ratepayers.

Evaluation included several options, such as producing a dewatered cake.

According to Hodel, “We were in our facility planning phase when we first heard about Lystek. The timing was perfect. We were looking at various solutions and we are known for being innovative and taking some (measured) risk in our approach, including different technologies. It started with a conference call and evolved into a detailed review of the Lystek THP system. What really impressed us was how well it fit with our existing infrastructure and equipment. Plus it enabled us to continue providing the type of end product our agricultural customers prefer and ask for.”

Bench scale testing was initiated in 2015 to evaluate the effect of the Lystek THP approach on St. Cloud’s biosolids. The process features a patented and proven combination of low temperature heat (167° F/75°C) via low-pressure steam, alkali addition (to pH 9.5), and high-speed shearing to achieve a variety of benefits for wastewater treatment facilities. Results of this initial testing showed that St. Cloud’s biosolids could be dewatered and processed through the Lystek THP system, achieving a Class A quality, liquid biofertilizer product (LysteGro®) that is also high in essential nutrients and vital, organic matter.

Ultimately, Lystek was selected by the city of St. Cloud. Project construction began in 2017 and the Lystek THP system was successfully commissioned and being independently operated by City staff by September, 2018.



COST SAVINGS

Utilizing existing infrastructure also contributed significantly to overall cost savings for St. Cloud.

“Not only did it meet our sustainability goals and our customer’s needs in terms of the liquid product, but it also saved us on capital money because we didn’t have to build a new cake storage building. We didn’t have to change our injection or our recycling equipment. So, as far as the total project goes, we are projecting approximately \$12 million in lifecycle savings over 20 years.” – says Tracy Hodel

The ability for the City to advance their successful land application program, while reducing and controlling costs, were key selling features of the project.

In addition to the benefits of the City being able to continue using their existing liquid land application trucks and

equipment, they were also able to utilize existing plant infrastructure, such as liquid storage tanks, buildings, and the truck loading station. The City was also able to improve efficiencies. The concentrated nature of the LysteGro product dramatically extended the capacity of St. Cloud's existing storage, thus solving this challenge.

Further, the high solid, liquid properties of the product maintained pumping, loading, and unloading efficiencies, while also dramatically decreasing the amount of road time and wear and tear on trucks, overtime, and the number of passes the application equipment must undertake, per field.

“The cost savings alone on this project are significant with reduced maintenance on equipment, staff overtime and so forth. Not to mention the advantages of being able to move the product from storage to the fields and into the ground when it’s timely for our agricultural customers.”

– Brian Shoenecker

SUMMARY OF SUCCESSES

Overall, implementation of the Lystek solution as part of St. Cloud's vision and leadership in innovation and sustainability in biosolids management was an efficient, affordable, and seamless transition.

The system was deployed within the City's existing infrastructure and has reduced the volume of material going to storage by 70%, thereby significantly extending operational capacity to accommodate future growth. Plus, St. Cloud's land application program was able to proceed without interruption, and they are now producing a Class A biosolids product that their customers want and need.

Additionally, in terms of forward planning, because the Lystek THP system is modular and flexible, it can be further leveraged in the future to integrate with other components of the plant and provide further value, such as the LysteMize® approach to digester optimization for increased biogas production. Or, should the City ever require additional carbon for its BNR system, this could be achieved through the provision of LysteCarb®. On-site research has also shown the ability for the Ostara WASSTRIP process (also implemented as part of the NR2 project), to utilize this material as a carbon source for additional nutrient removal at the plant.

One system = Multiple benefits

Patrick Shea, Director of Public Utilities for the City, sums up the project this way; "One of the aspects that makes me smile when I reflect on the NR2 Project as a whole is the culture of wastewater treatment going from sewage to sewer plant to wastewater treatment facility and now to full-blown resource recovery. This is an industry game changer. We're reusing the organic material, we're reusing the nutrients, and we're converting these materials back into useful products that can help rebuild our soils while benefitting the environment over the long-term."

About Lystek International

Lystek is a leading provider of low temperature Thermal Hydrolysis solutions for the sustainable management of biosolids and organics. The multi-use, award-winning Lystek system reduces costs, volumes and GHG's by converting wastewater treatment facilities into resource recovery centers. This is achieved by transforming organic waste streams into value-added products and services, such as the patented LysteMize® process for optimizing digester performance, reducing volumes and increasing biogas production; LysteGro®, a high-value, nutrient-rich biofertilizer and LysteCarb®, an alternative source of carbon for BNR systems. www.lystek.com



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