

Implementing a Public / Private Partnership to Produce Biofertilizer



FAIRFIELD-SUISUN
SEWER DISTRICT



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A PROGRESSIVE PARTNERSHIP FOR
BIOSOLIDS & ORGANICS MANAGEMENT

PRESENTATION OVERVIEW

- Partner Overview
- Partnership Agreement
- FSSD Process Description
- Lystek Technology overview
- Infrastructure components
- Summary of Partner Benefits
- Product Opportunities
- Future Developments



PARTNER OVERVIEW - FSSD

- Fairfield-Suisun Sewer District (FSSD), established in 1951, is a special district serving 135,000 people in Fairfield and Suisun City in Solano County
- Approximately 60 full-time employees
- Advanced Secondary treatment with a permitted ADWF capacity of 23.7 MGD, 510 miles of sewers
- 2015 ADWF was 9.8 MGD
- Award winning





PARTNER OVERVIEW - Lystek

- Lystek International is a Canadian-based company; first US office opened in Fairfield, California in 2014; office in Boston, MA in 2015 and Pittsburgh, PA in 2016
- Ownership is management team and RW Tomlinson, Ottawa(>\$1B private firm with 1,000+ employees)
- Patented technology in US and Canada since 2000
- 6 operating facilities in Canada + 2 in development
- 1 operating facilities in Fairfield CA



Current Lystek Installations



Location	Status	Capacity (WT/Y)	Location	LysteMize Digester Enhancement	LysteCarb Carbon Source for BNR
Guelph	2008	18,000	On Site	Full Scale Pilot	No
St. Mary's	2010	3,500	On Site	Full Scale	Yes
* Southgate	2012	150,000	Off Site	Merchant Plant (No Digestion)	No
Iroquois	2012	40,000	Off Site	Merchant Plant (No Digestion)	No
Elora	2014	3,500	On Site	Aerobic Digestion	No
North Battleford	2014	3,500	On Site	Aerobic Digestion	No
* Fairfield, California	2016	150,000	On Site	Full Scale	No
St. Thomas	2017, est.	5,600	On Site	No	No
Innisfil	2018, est.	5,500	On Site	Aerobic Digestion	No

- Southgate, Canada serving cities in Ontario - Toronto, Ottawa, Peterborough etc.
- Fairfield, California serving SF Bay Area – FSSD, Santa Rosa, CMSA, etc





PARTNERSHIP AGREEMENT

- Discussions began in 2013 for mutual beneficial arrangement
- A Letter of Intent signed in 2014
- Project CEQA was approved by the FSSD Board of Directors in April 2015
- 20-year Lease Agreement signed in June 2015
- Allows Lystek to lease un-used space and infrastructure to design/build/own/operate processing facility called the Organic Materials Recovery Center (OMRC)





PARTNERSHIP AGREEMENT ...cont.

- Process FSSD's Biosolids ~13k wet tons/yr.
- Sets maximum capacity at 150k wet tons/year
- Allows Lystek to process Biosolids and organics into LysteGro, LysteMize, LysteCarb and other products
- Allows Lystek to market capacity to other wastewater plants and organics generators in the region
- Establishes a pricing structure with incentives for increasing WWTP efficiencies and profit sharing on product sales





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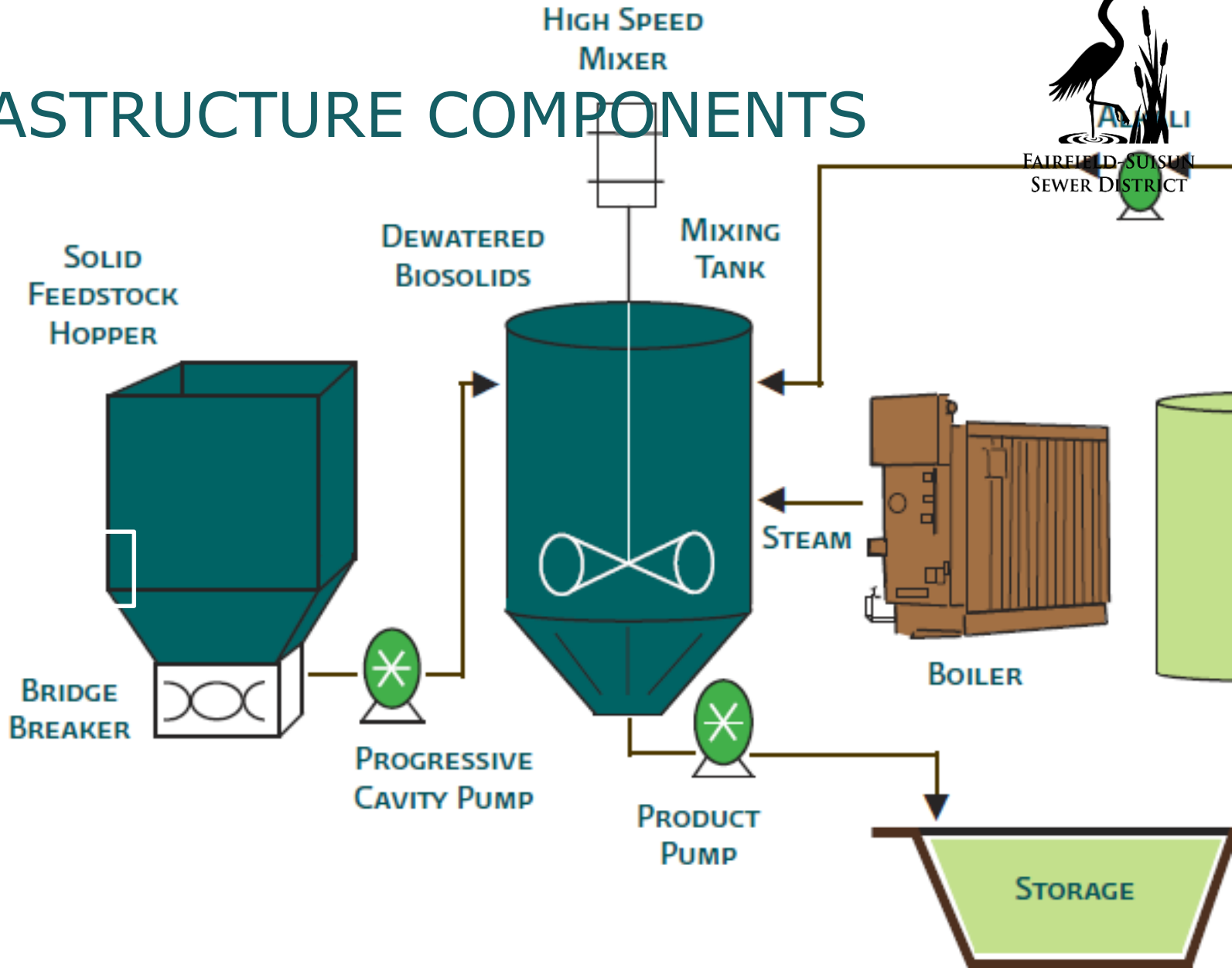


LYSTEK TECHNOLOGY OVERVIEW

- Low Temperature/Physical/Chemical/Hydrolysis Technology, typically installed after dewatering
- Produces multi-purpose products:
 - LysteGro: A liquid biofertilizer – Class A EQ (US EPA) – high organic matter & NPK;
 - LysteMize: A digester re-feed enhancement to increase gas production (30%+) and reduce biosolids volumes (20%+)
 - LysteCarb: A cost effective, alternative carbon source for Biological Nutrient Removal



INFRASTRUCTURE COMPONENTS



LysteGro Recipe

- Blend biosolids and/or organics, alkali and steam in reactor to meet time, temperature and pH recipe (patented)
 - 10 m³ of either
 - 15% to 19% solids of Digested (biosolids) or undigested sludges
 - Source separated organics 1% to 35%
 - Approximately 20-lbs of alkali per WT biosolids
 - Add Steam to bring mix to +170 degrees F
 - Add nutrients, to desired "taste"
 - Shear for approximately 15 minutes
 - Additional hold time for VAR requirement

...and Voila !! Class A-EQ licensed biofertilizer



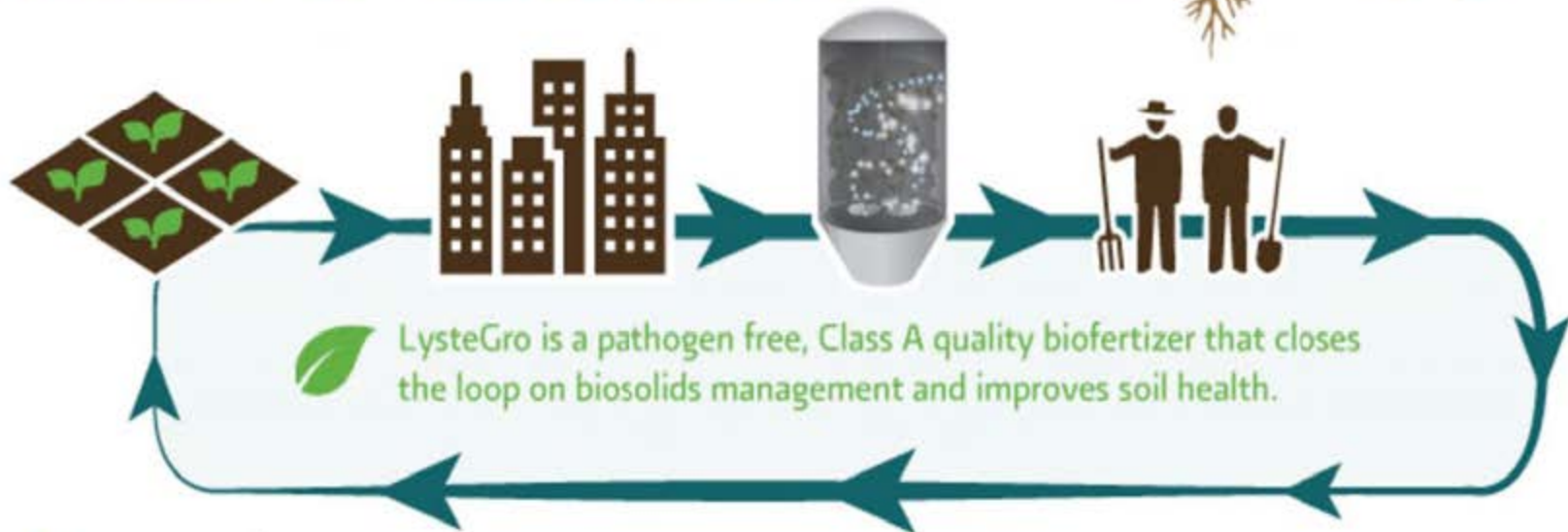
Product Delivery – In the field



Standard trucking & application equipment



HOW LYSTEGRO BIOFERTILIZER HELPS GROWERS



WHY DOES LYSTEGRO WORK?



- Nitrogen (N)**
- Phosphorus (P_2O_5)**
- Potassium (K_2O)**
(65 - 100 - 30 lbs/1,000 imperial Gallons)
- Sulphur (S)**
(16 lbs/1,000 imperial Gallons)
- Calcium (Ca)**
(46 lbs/1,000 imperial Gallons)
- Other valuable micronutrients**
(Cu, Zn, Mg and more)



75% of the Nitrogen is in a slow-release organic form, which is made available to the plants through mineralization throughout the year, as the crops need it.



ITS ALL ABOUT **THE SOIL**

LysteGro is applied based on soil samples results, crop removal predictions and long term strategies of the farmer.
The application process utilizes best management practices to ensure beneficial results and environmental sustainability.

SOIL SAMPLE RESULTS

P = LOW
K = LOW
OM = LOW



LysteGro provides growers with an economical method to build soils low in P, K and Organic matter.





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Corn trials in 2015 comparing equal nutrient inputs of LysteGro with commercial fertilizer have demonstrated an average increase of 16.5 bushels/acre with LysteGro*

LYSTEGRO BIOFERTILIZER YIELDS **AMAZING RESULTS**



Trials also demonstrate a **higher grain protein content** for corn fertilized with LysteGro vs. commercial fertilizer*



Nothing wasted.
Everything to gain.

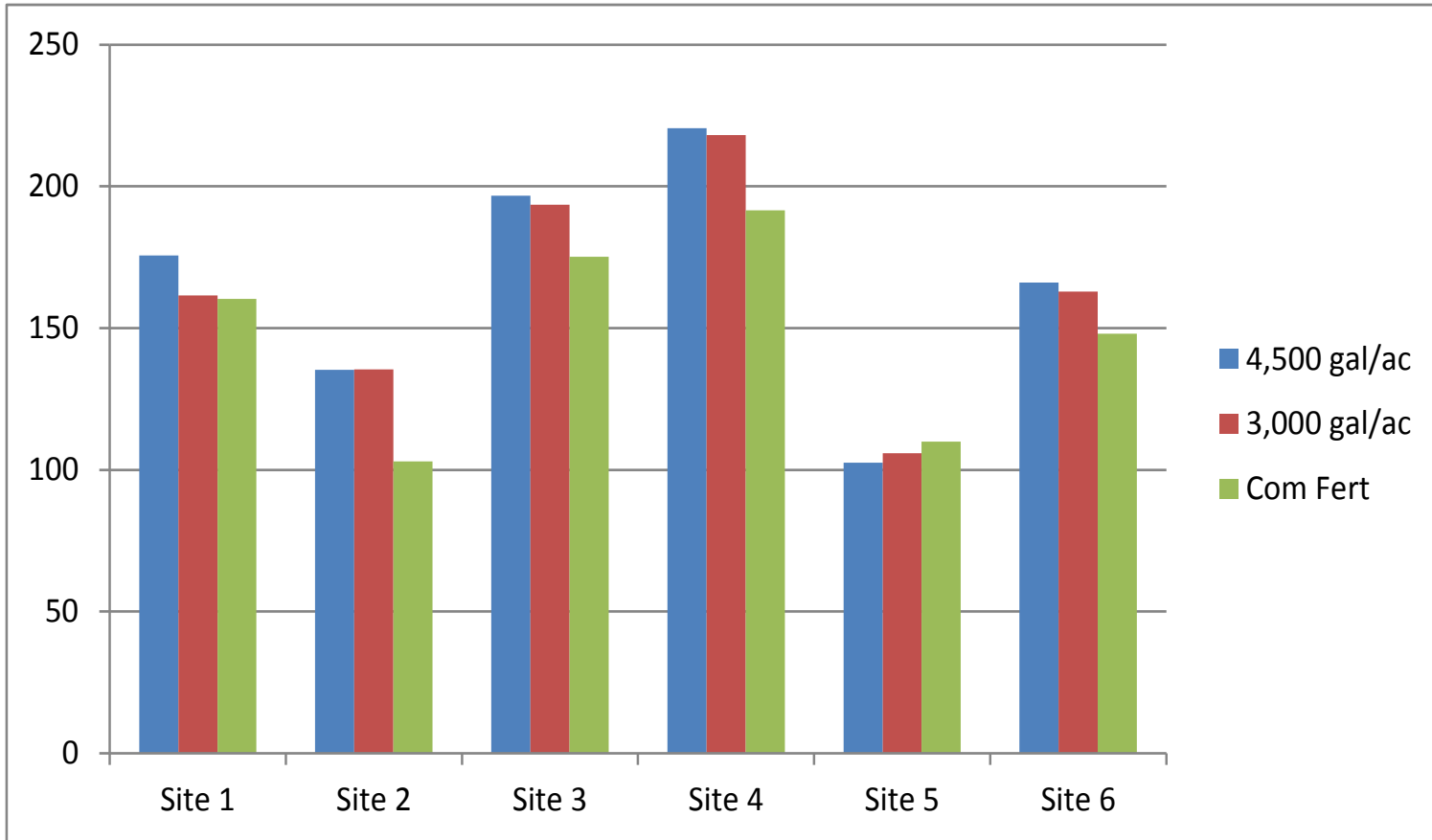


YIELD DATA (LysteGro vs Commercial Fertilizer)



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Bushels per acre of Grain Corn



2015 Georgian Central Soil & Crop Improvement Association Project (Canada)



PRODUCT OPPORTUNITIES

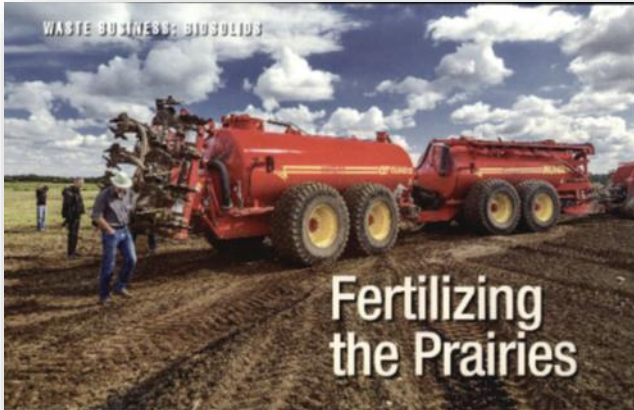
- Product can be easily transported in common tanker carriers to local agricultural areas; sub-surface application eliminates common nuisance factors
- LysteGro (Class A-EQ) can be modified with additional nutrients based on farmers request
- Product can be diluted to enhance delivery in low-flow irrigation systems
- LysteGro adds organic material to stressed and over-production soils; allows for greater retention of water and nutrients





SUN
ICT

A great "green" story...



Fertilizing the Prairies

Source: WASTE MANAGEMENT OF BIOMASS RESIDUES FOR PRODUCTION OF BIOGAS AND BIOFERTILIZER

City sought alternative solution after experiencing odour issues from landfilling domestic Class B biosolids

by Steve Lishler

"The new biosolids management system allows the city to divert biosolids from its landfill and convert them into a nutrient-rich, Class A quality fertilizer."



Lystek source

A advanced, acid-washing biosolids exchange system developed by Lystek International Inc. has been delivered as large and latest of its kind to the North Bay landfill.

Through a competitive request for proposal process, the City selected the Canadian-based Lystek system because it was of a proven, commercially available and compact enough to easily meet a long-term project using proven municipal infrastructure technology.

A covered conveyor will be used to move the liquid fertilizer product produced at Lystek's 55.2 m³ per hour facility, which was commissioned in November 2014. The Lystek system will produce one million cubic metres of Class B fertilizer annually.

The city has been looking for an alternative biosolids management solution for its large existing odour issues with a practice of landfilling residential Class B biosolids.

As one of the first municipalities in Eastern Canada to step on biosolids cycles, Senior Advisor, the North Bay landfill's director of operations, stated the municipal treatment of WWT biosolids could be "a model for the world as a whole."

Lystek says that treatment of millions of tonnes of biosolids waste is estimated to Canada and the U.S. alone. In North Bay, about 75 per cent of this material has been landfilled, applied to land or incinerated.

For info, visit www.lynstek.com or call 416-299-2222

BUSINESS Farmer

A better way to land-apply biosolids



Lystek's 55,000 cubic metre lagoon holds 8,000 cubic metres of organic material

What makes Lystek different from the other biosolids companies that are already out there? For starters, Lystek's recovery process is unique.

In fact, Lystek's fertilizer is the only product of its kind to receive the CFIA seal of approval.

The company's product is also higher in organic matter than traditional biosolids as farmers won't have to use as much to get good results.

Lishler said this cuts back on over application, which has been an issue on many farms in the past.

Lystek's facility in Dundalk is state-of-the-art and was built with the soil being of the rural community in mind.

Mike Dougherty, senior operator at Lystek, said odour was one of the biggest factors considered throughout the development and construction process.

"One third of the \$30 million that was invested into this plant was spent on odour control and air handling," said Dougherty.

The investment seems to be worth it because Lystek has yet to receive an odour complaint from the surrounding community.

It's the facility's closed loop design that keeps odours from contaminating the surrounding airways. The system is installed to pump into the plant is never again over the light of day or its original form.

The material is transferred from one process to the next inside the plant and is pumped underground to a 55,000 cubic metre lagoon where it sits in its final state.

Dougherty said farmers would not be disappointed with Lystek's market-ready product.

The more 1,200 tonnes of material there is 40 pounds of nitrogen, 50 pounds of phosphorus, and 20 pounds of potassium," he said.

Although the fertilizer can be spread in the spring (weather dependent) and at second cut hay, the fall will be the optimal time to land apply.

Lystek is encouraging farmers to sign the materials rather than surface apply to get the most out of the nutrients available.

Producers will be able to access Lystek's organic material through a web-portal or directly from the company.

Dougherty said Ontario farmers could expect the fertilizer to be on the market in January 2014 since the CFIA registration process is complete.



Better Farming FOCUS ON THE ENVIRONMENT

A promising future for treated biosolids on the farm

Application of municipal biosolids on farmland has traditionally presented some nuisance problems. But a new treatment process offers an array of nutrients for farm use without the risk

...ion, Grey County of Chitika toured an incineration plant in edge from the city's waste processing plant. Lystek International that developed this it is able to providing a combination of high-shear mixing, the other and is "a gas-free, nutrient-rich, or product." and applications of also known as and he'd liked the were the applications were fine, but he a difference to soil of getting organic to the ground," he says. acres, too. While the not waste processing, engines were destroyed, but what other did they way into the soil levels.



Mike Chitika (right) said the process used by Lystek International has taken the risk out of spreading in biosolids derived fertilizer product.

...Lystek product would nutrients only without company was prepared first.

...and add Lystek's 55,000 acres. In doing contracting a type of become a new risk.

...Farm with those controls in place, he predicts the use of biosolids like the ones that municipal biosolids have value for farm fields, but come with some baggage. "There were some nuisance odours, there were some issues with application or poor handling," the introduction of standardized non-agricultural source provincial rules and regulations, which came into effect in 2011, was a step forward, he says.

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...Chitika first applied it on the waste. The future for biosolids lies in the further processed products, such as that which Lystek is making, he says. "We basically took all the positive sides, augmented it, improved the fertilizer value and got rid of some of the issues."

...Because it's considered a fertilizer, which is regulated by the Canadian Food Inspection Agency, Lystek's product also studies complicated provincial regula-

Photo: Better Farming.com

Better Farming April 2014



Nothing wasted. Everything to gain.



FUTURE DEVELOPMENTS



- Expand Lystek & FSSD infrastructure to accept and process greater volumes of organic materials for Lystek processing
- Modify technological process(es) to enhance product output; >solid content or nutrients
- Continue with R&D on alternative end-product development; blending and dry products for greater diversity of applications



Thank you & discussion



**Nothing wasted.
Everything to gain.**

FSSD	Lystek
Greg Baatrup	Jim Dunbar

