Nothing wasted.
Everything to gain.




Lystek Class A Biosolids Process

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About Lystek

- Biosolids management specialists providing services:
  - Biosolids processing
  - Fertilizer production
  - WWTP optimization
- Proprietary technology & intellectual property that is protected by several US and CDN patents
- Founded in 2000 in Canada
- Experienced management team
- Ownership: management and RW Tomlinson Ltd., Ottawa
- Tomlinson - a 60 year old company with 2,000 employees and prominent player in construction and environment services
- Financial and performance guarantees backed by Tomlinson

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Biosolids – Resource not Waste

- Wastewater / biosolids are now considered a means of resource recovery not a waste
- Currently about half of the biosolids volume produced in North America is land applied as a fertilizer or soil conditioner
- The trend is moving towards cost-effectively producing Class A Exceptional Quality biosolids or registered fertilizers
- Biosolids reduction, biogas recovery and utilization for heat and electricity generation
- Nutrient (N, P, K, Mg & S) recovery potential from wastewater

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Biosolids Management Options

- Landfilling
- Land application of Class B biosolids
- Incineration
- Composting
- Alkali stabilization
- Thermal hydrolysis
- Thermal drying
- Thermo-alkaline hydrolysis (Lystek)

- Technology has advanced - allows materials to be viewed as "raw materials" - a resource that can be transformed & beneficially utilized - in sustainable ways
- Municipalities & generators have a role to play in ensuring this happens!

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How can the Industry Help?

SOLUTIONS/BENEFITS

- Keep advancing & refining biosolids & organics management programs to meet and /or exceed guidelines for beneficial use
- Produce safe & healthy fertilizer products that can be sold to reduce ongoing costs for generators – (i.e. farming, greenhouses, sod farms, etc.)
- Develop revenue generating models that assist in short & longer term cost recovery
- Provide solutions that help to increase biogas recovery & conversion of materials into "green energy" while reducing costs & overall volumes

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Land Application

- More sustainable and beneficial than landfill etc.
- Globally – is dominant practice that takes place in many countries
- Has been in place for over 30 years and it is growing
- Biosolids contain important nutrients that are beneficial for crop growth
- Biosolids contain organic matter that enhance the soil structure
- Farmers can save by reducing the use of chemical fertilizer

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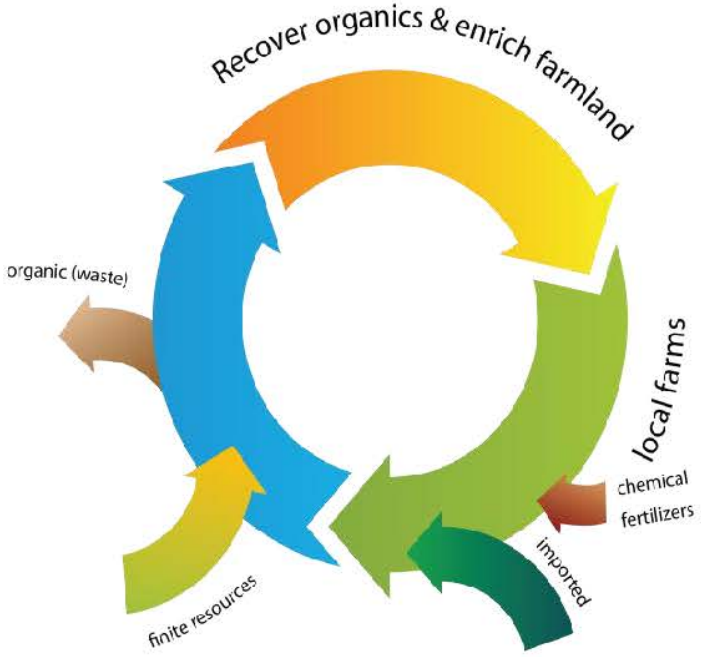
Lystek's Sustainable Solution

- Safe, sustainable, 100% beneficial reuse
- Decreases management & disposal costs
- Meets demand of local farmers for organic, nutrient-rich fertilizers
- Decreases use of chemical fertilizers
- Helps reduce social, environmental, agricultural & economic pressures



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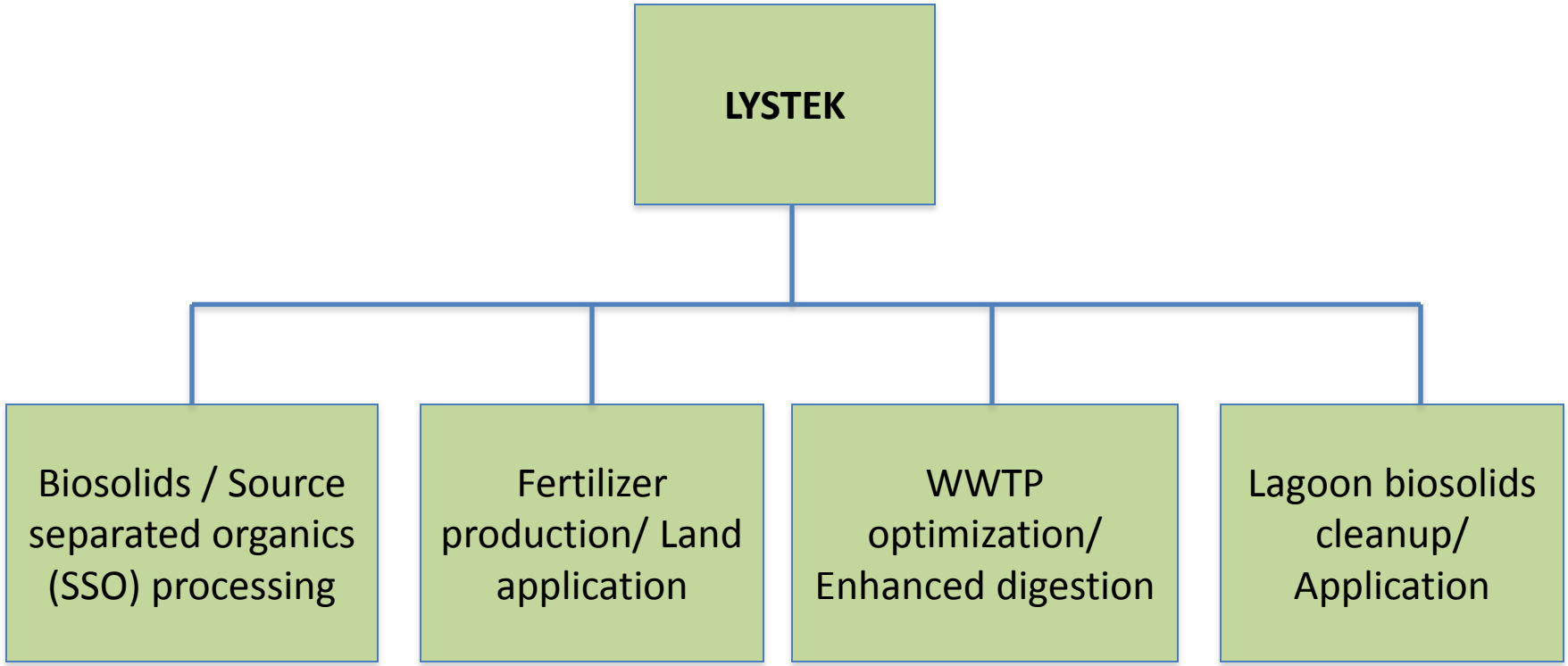
Lystek Solutions



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How does Lystek do it?

THE TECHNOLOGY

- A patented process that uses a combination of heat (158-167°F/70-75°C), pH 9.5-10.0 using KOH/NaOH and high shear mixing for up to 45 min
- End product – pathogen free, high-solid (14-17%), liquid fertilizer product (<5,000 cP) with high nutrient (NPK) values
- Registered fertilizer with Canadian Food Inspection Agency (CFIA)
- Meets US EPA Class A EQ criteria
- Recycling the product to anaerobic digester improves biogas yield (>30%) and reduces biosolid volume (>20%)

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Strict Odor Control

OUR PROCESS

- Waste receiving, processing: enclosed facilities, enclosed reactors, odour abatement train
- Transport: enclosed liquid tanker
- Storage: enclosed storage tanks, covered lagoons
- The product: stable, reduced odor, no pathogen regrowth
- Application: subsurface injection

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The Product - LysteGro

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LysteGro – Nutrients

Parameters		Lystek Biofertilizer (% dry wt)
Total Solids		15 - 17
Volatile Solids (% of TS)		50 - 55
Total NH_4-N		1.0 – 2.0
Total NO_3/NO_2-N		0.003 – 0.005
Total Kjeldahl N		4.0 – 5.0
Total P		3.0 – 3.5
Total K		2.0 – 4.0
Total Ca		2.8 – 3.2
Total Mg		0.4 – 0.5

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LysteGro – Pathogens non-detectable

Pathogens	MDL	Class A Criteria	Untreated dewatered biosolids	Lystek treated biosolids
Fecal coliforms (MPN/g dry wt)	1.8	< 1,000	> 1,600	< 1.8
Escherichia coli (MPN/g dry wt)	1.8	-	> 1,600	< 1.8
Salmonella (P-A / 25 g)	1	< 3 MPN/4g	POS	NEG
Polio virus (pfu / 4g)*	1	< 1	776	< 1
Ascaris eggs (per 4g)*	1	< 1	131	< 1

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Ease of Land Application

Stable liquid product

- High-solids low viscosity (<5,000 cP) liquid product is easier to mange – store, transport and land apply using conventional equipment
- Nutrient value: (15% TS) >$430/acre @ 3000 gal/acre application

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Corn Trial at University of Guelph

No Fertilizer

Lystek Fertilizer

Chemical Fertilizer

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Greenhouse Gas Reduction Potential –BEAM model 1.1

Biosolids management scenarios	GHG Estimate (Mg CO2 eq. /100 DT AD biosolids eq.)
Landfill	297 - 335
Incineration	- 23 to 224
Heat drying	51 - 71
Compost	6 - 34
Land application (Class B cake)	- 40
Lystek AD biosolids to land	- 49
Lystek, 30% recycle to AD, electricity production, rest to land	- 47
Lystek, 30% recycle to AD, heat production, rest to land	- 63

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Lystek's Proven Experience: Our sites

Site	Guelph	St. Marys	Dundalk	Iroquios	Elora	North Battleford
Status	operating	operating	operating	operating	2014 Summer	2014 Fall
Biosolids	18,000 t / 22-24%	3,500 t/ 13-15%	150,000 t/ 3% - 28%	20,000 t/ 3% - 28%	3,000 t / 15-17%	3,400 t / 15-17%
Capacity per hour	10 m^3 (2600 gal)	3 m^3 (800 gal)	30 m^3 (8000 gal)	9 m^3 (2400 gal)	5 m^3 (1300 gal)	5 m^3 (1300 gal)
Ownership	Guelph	St Marys	Lystek	DES Environ.	Elora	North Battleford
Solution	On site	On site	Off site Regional	Off site Regional	On site	On Site

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Serving multiple municipalities: Toronto, Ottawa, Orangeville, Peterborough, Regions of Halton & Waterloo etc.

WWTP Process Optimization

- Lystek process makes biosolids more amenable to further degradation of residual volatile solids when fed back to the anaerobic digesters.
- SCOD is ~35% of TCOD in the Lystek product
- Lab and pilot tests have shown >30% improvement in biogas production and corresponding solids reduction
- Lystek's hydrolyzed product provides a readily available nutrient source for the anaerobic microorganism
- Provides a cost effective source of readily available carbon for denitrification process in BNR system

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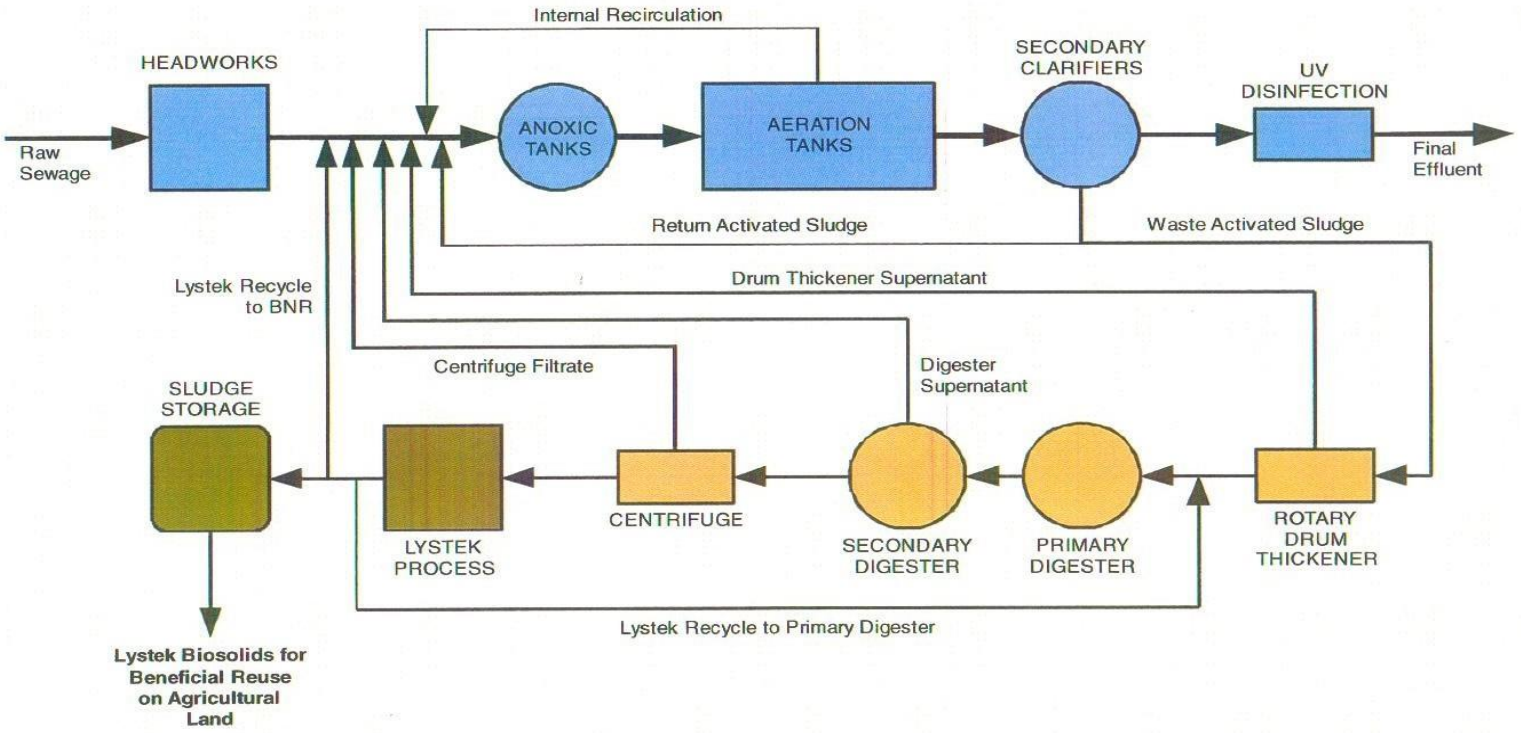
WWTP Process Optimization

ENHANCED ANAEROBIC DIGESTION & BNR SYSTEMS



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On site solution (at WWTP): *small* foot print, typically 8 m * 15 m

City of Guelph

Town of St. Marys

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Off-site Regional Lystek Facility

Dundalk, Ontario, 150,000 tons/year

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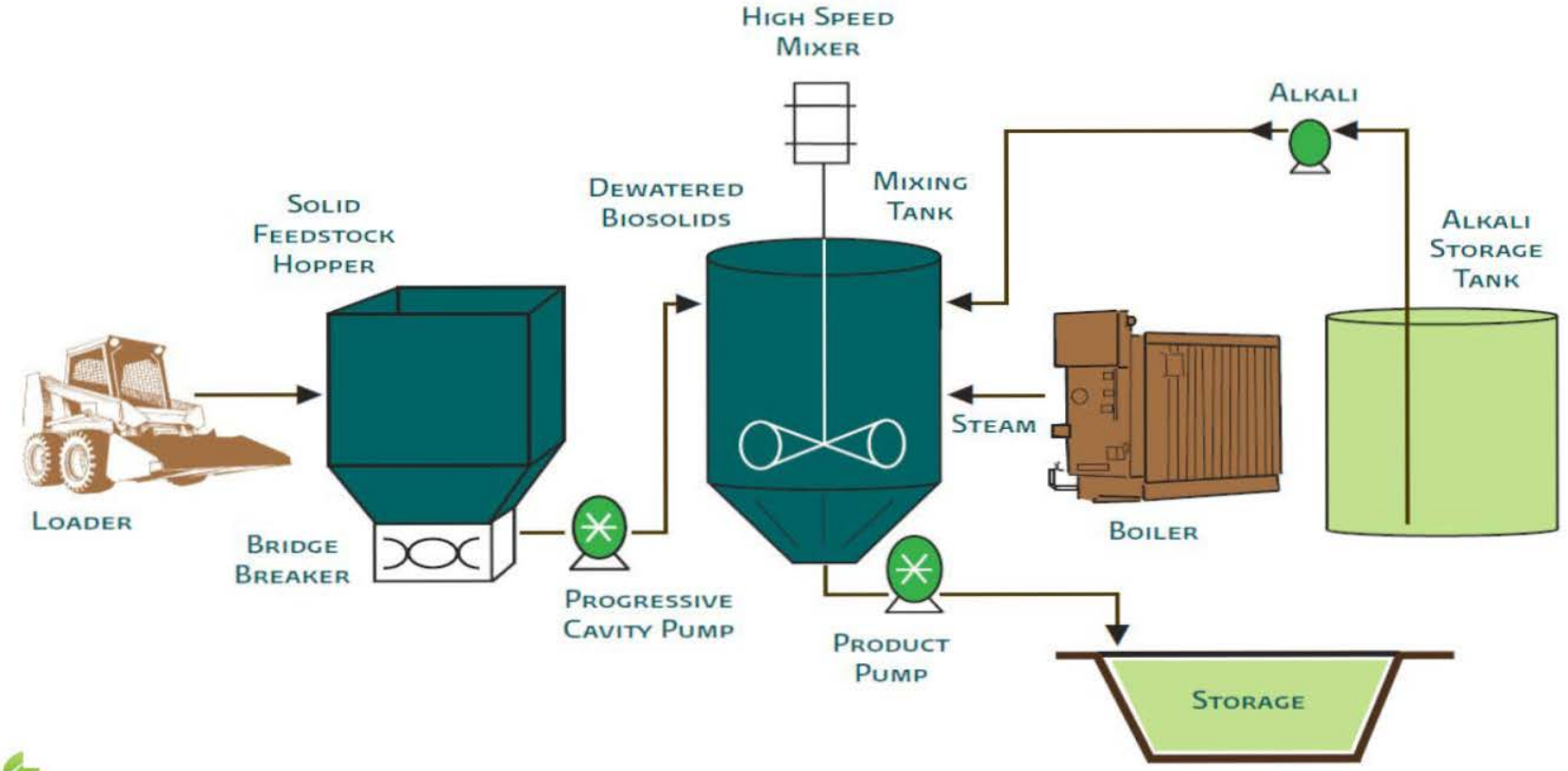
Dundalk OMRC Process



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Dundalk OMRC

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Dundalk OMRC

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Summary of Benefits

- **Scalable and Affordable**
  - Simple, affordable, proven – can be made available to all sizes of communities – not just for "big" cities and municipalities
- **Environmentally Safe & Responsible**
  - Safe, healthy & sustainable, lowers overall carbon footprint (GHG)
  - Metals and Pathogens - meets or exceeds all health and safety guidelines as set out and regulated by MOE, OMAFRA & CFIA
  - Recycling to anaerobic digester improves biogas yield and reduces volumes
- **Agricultural Benefits**
  - Cost effectiveness and high nutrient value of the product has been recognized by farmers

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Thank You - Q & A's

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