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WATER TECHNOLOGIES

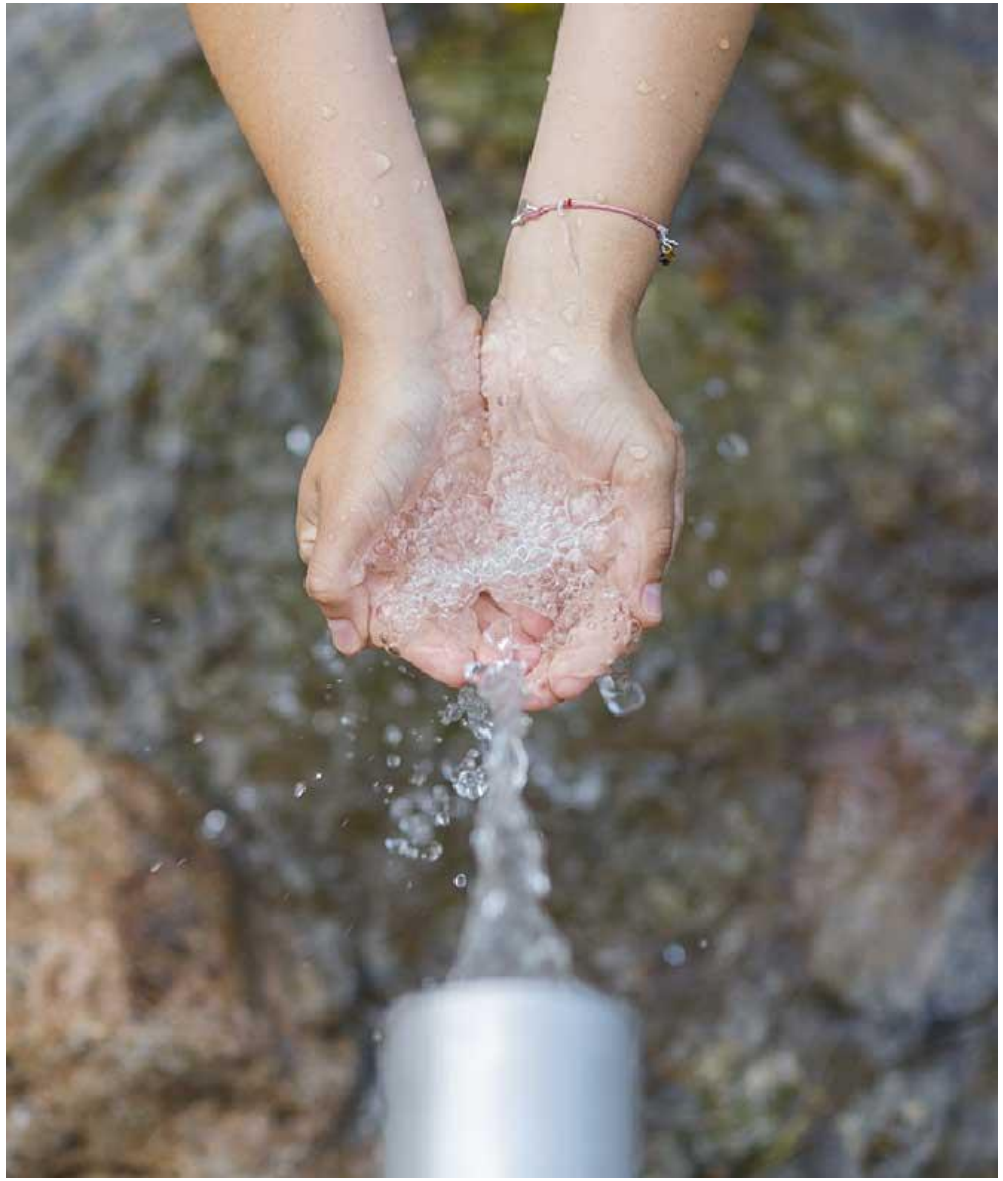
CLOSING THE LOOP ON COMPREHENSIVE NUTRIENT MANAGEMENT

Imagine if Feeding the World Also meant Protecting it.

Reimagining resources for a better tomorrow

Ostara's nutrient recovery technology helps communities and companies around the world clean water to grow more food.

We recover valuable nutrients from where they shouldn't be – in wastewater – and transform them into high-performing sustainable fertilizers, proven to increase yields while reducing runoff.



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Sum is Greater than the Parts:
Improved Market Sustainability and Increased Resource Recovery

1 OSTARA

Technology & Fertilizer Management

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Sales/Marketing & Project Delivery

= 3

- Improved Financial and Environmental Sustainability
- Increased Adoption of Resource Recovery
- Integrated Phosphorus Management

…greater impact working together!

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Creating a Circular Economy Together

1 RENEWABLE PHOSPHOROUS SOURCE
Wastewater streams from treatment facilities rich in phosphorous and nitrogen.

2 FERTILIZER PRODUCTION
The Pearl process harvests nutrients from wastewater and transforms them into a pure, eco-friendly fertilizer.

3 AGRICULTURE
Crystal Green minimizes phosphorous tie-up and significantly reduces the risk of leaching and runoff to local waterways

4 ENVIRONMENTAL IMPACT
Helping cities win the battle against nutrient pollution by removing phosphorous from where it shouldn't be – in our waterways – and upcycling it into a safe, pure, environmentally responsible fertilizer.

5 GROWING POPULATION
Positive global impact on issues of water health, resource scarcity and sustainably feeding a growing population

Nutrient Recovery Has Established Global Footprint

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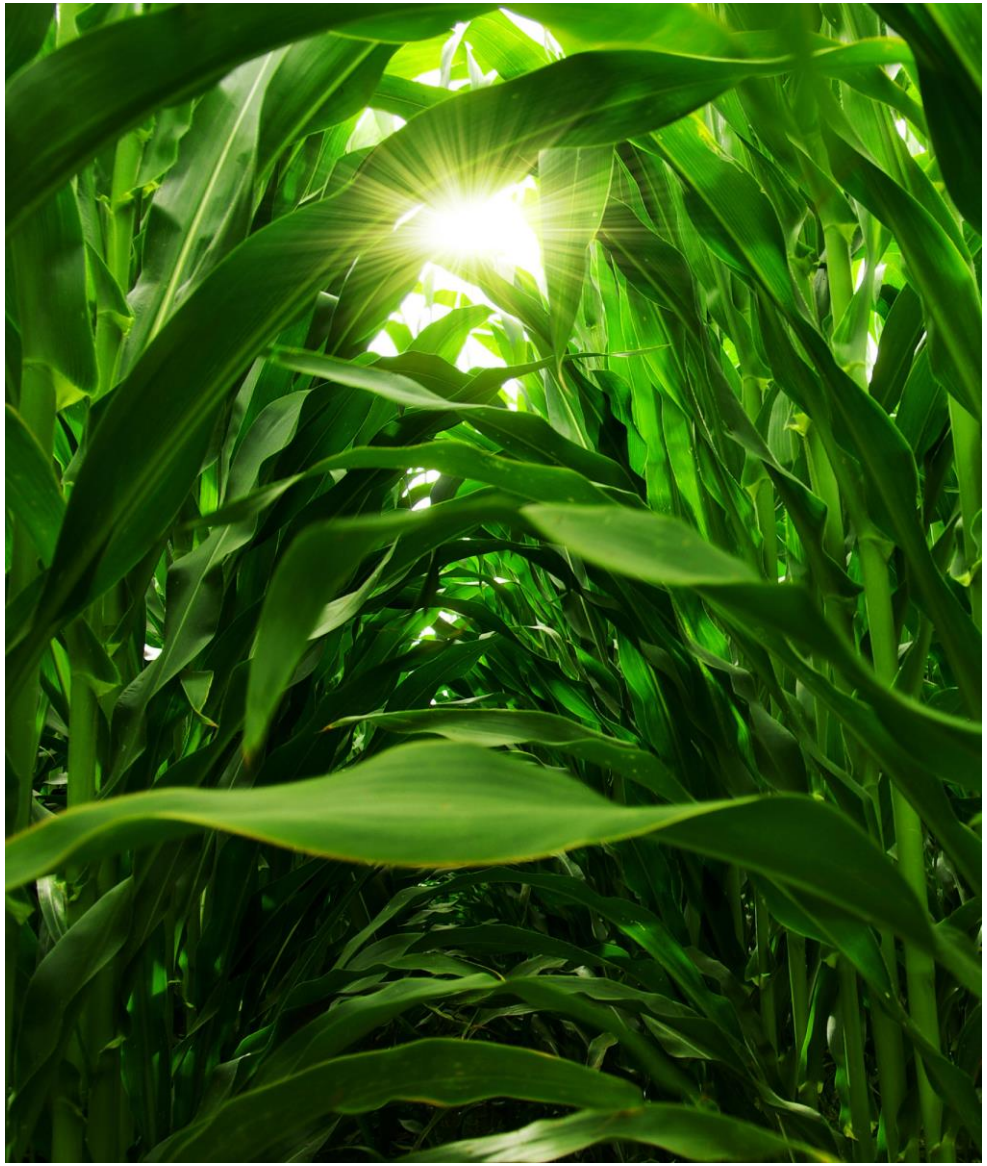
Agenda

1. Why is phosphorus recovery important?
2. What problems does Ostara nutrient recovery solution solve?
3. How does the Pearl® System work?
4. Benefits of Crystal Green® fertilizer



Phosphorus

is Essential to All Living Organisms

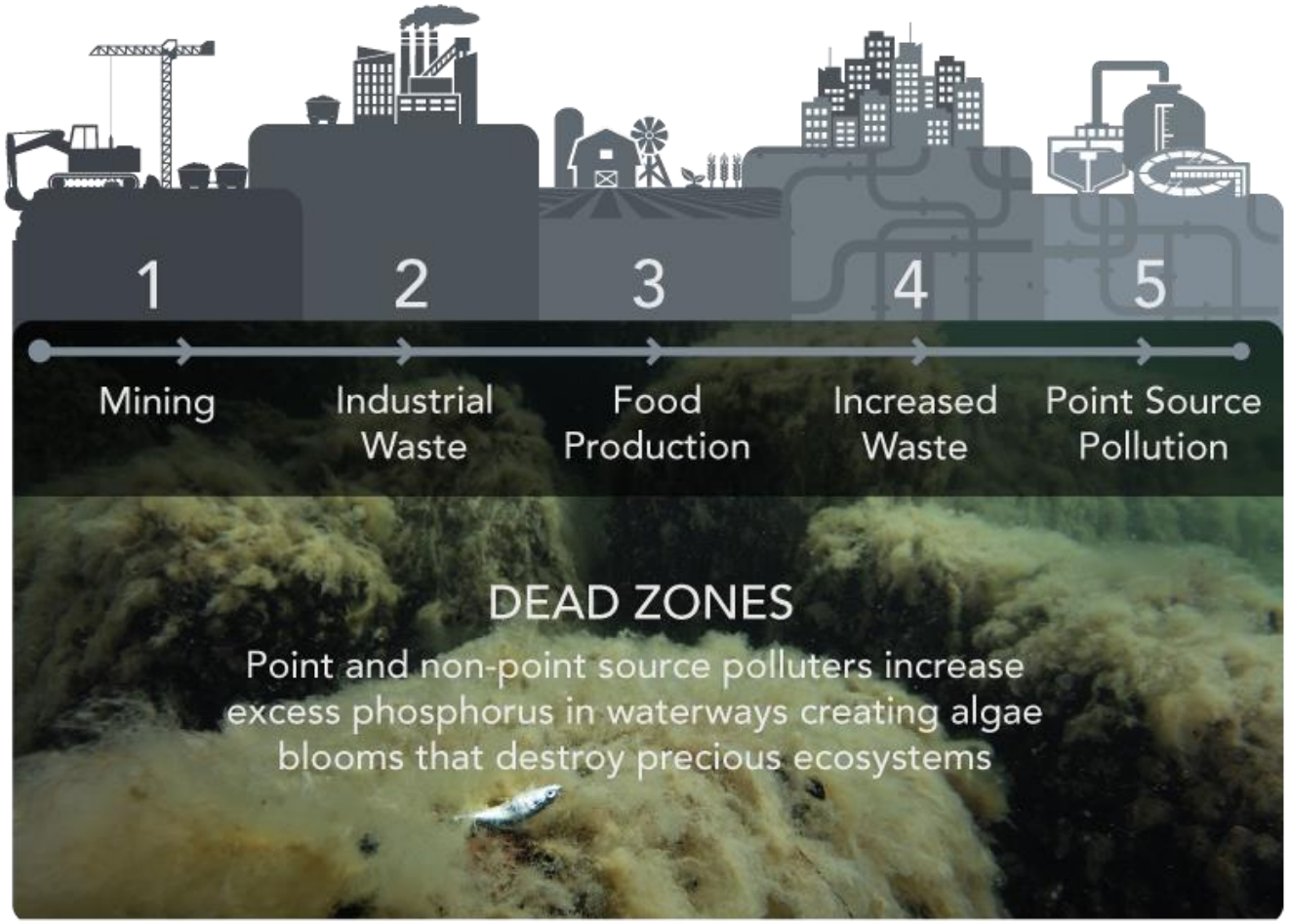
There is No Substitute for Phosphorus

Phosphorus is a building block of DNA, cellular membranes and energy metabolism

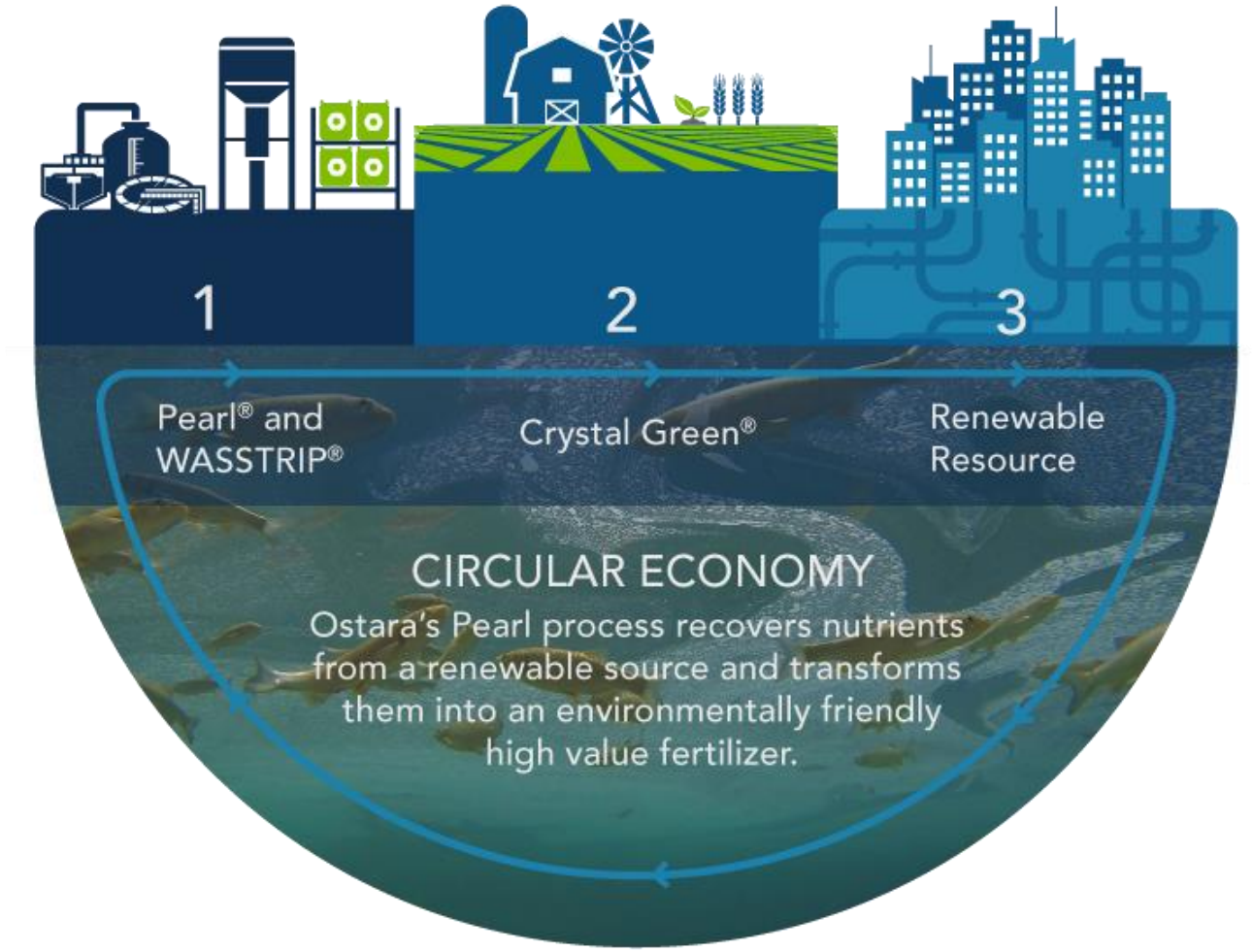
The human adult body contains approx. 1.5 kg (~2%) phosphorus, mostly in teeth and bones

There is no known substitute for phosphorus

The Phosphorus Cycle today is Broken



Ostara Provides a Sustainable, Closed Loop Solution



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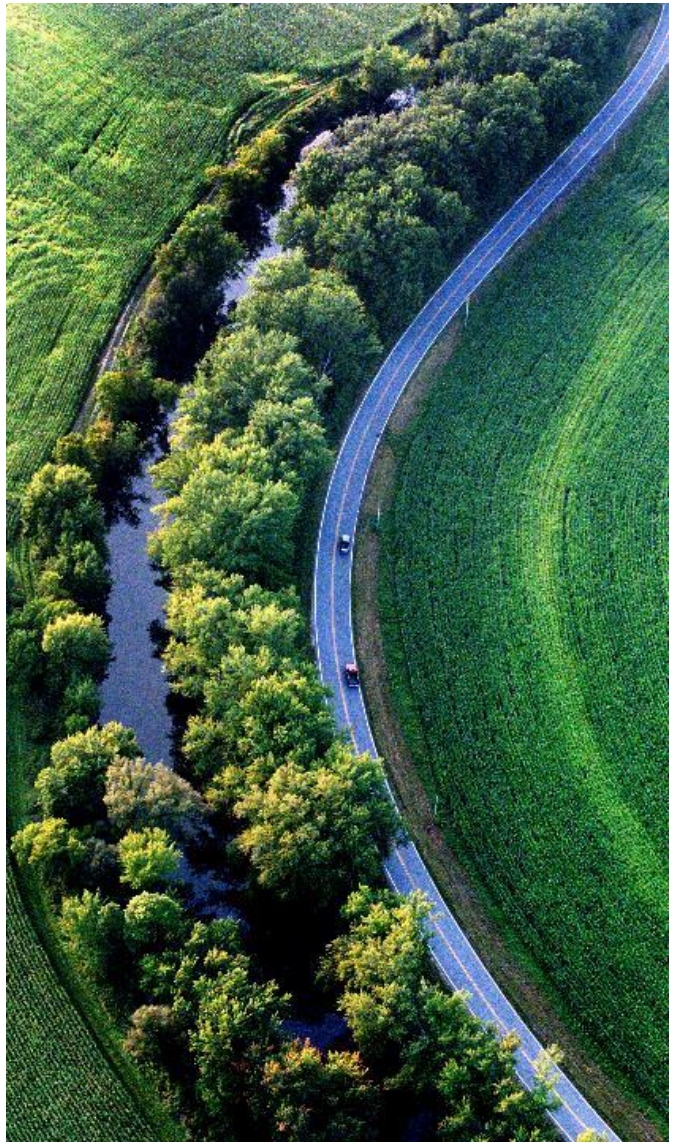
Municipal Wastewater Treatment Plants

STRICT LIMITS ON EFFLUENT PHOSPHORUS

OPERATIONAL ISSUES WITH STRUVITE BUILDUP



Municipal Sewage Treatment Plants Benefits:
Optimize Plant Operations & Achieve Cost Savings

Up to 70% recovery of total WWTP phosphorus load
- Reduce or eliminate chemical dosing for P management
- High value fertilizer production
- Improved N:P balance in biosolids

15-30%+ recovery of side stream ammonia
- Reduced aeration requirement

10-20% reduction in sludge production
- Avoidance of struvite in sludge cake
- Avoidance of chemical sludge

Up to 90% reduction in digester struvite
- Reduced digester maintenance (lower cleaning frequency)

Dewatering improvements
- Up to 2-4% improvements in cake solids (~20% volume reduction)
- Up to 10-15% polymer reduction

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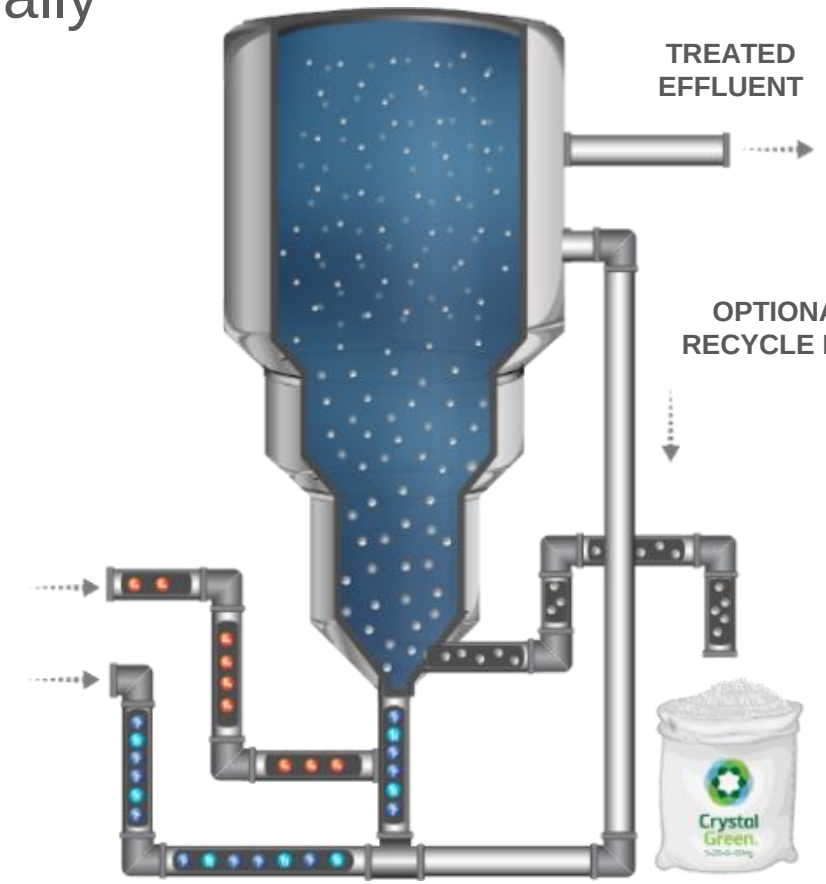
Core Technology: The Pearl® System

Ingredients for struvite are naturally occurring:

$Mg^{2+} + NH_4^+ + PO_4^{3-} + 6H_2O =$
$MgNH_4PO_4 \cdot 6H_2O$ (“struvite”)



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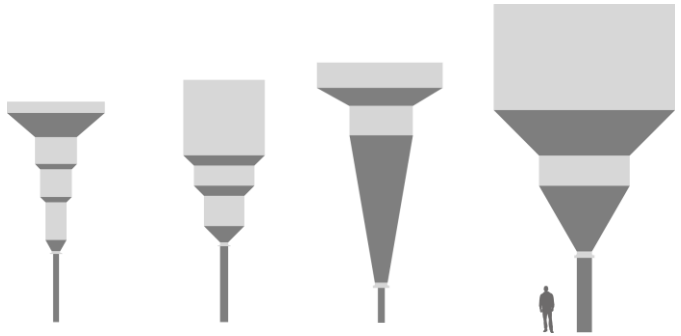
Full Suite of Pearl Reactors: A Flexible Technology Offering

Feature Models: Pearl 500, 2K, Fx, 10K

Scalable Technology, Market Leading Benefits:

- Customizable options varying flow & P concentrations
- Modular designs for easy installation
- Competitive, capital-reduced offerings
- Guaranteed fertilizer purchase
- Flexible financing options
- Industry leading operational benefits

OSTARA Pearl®



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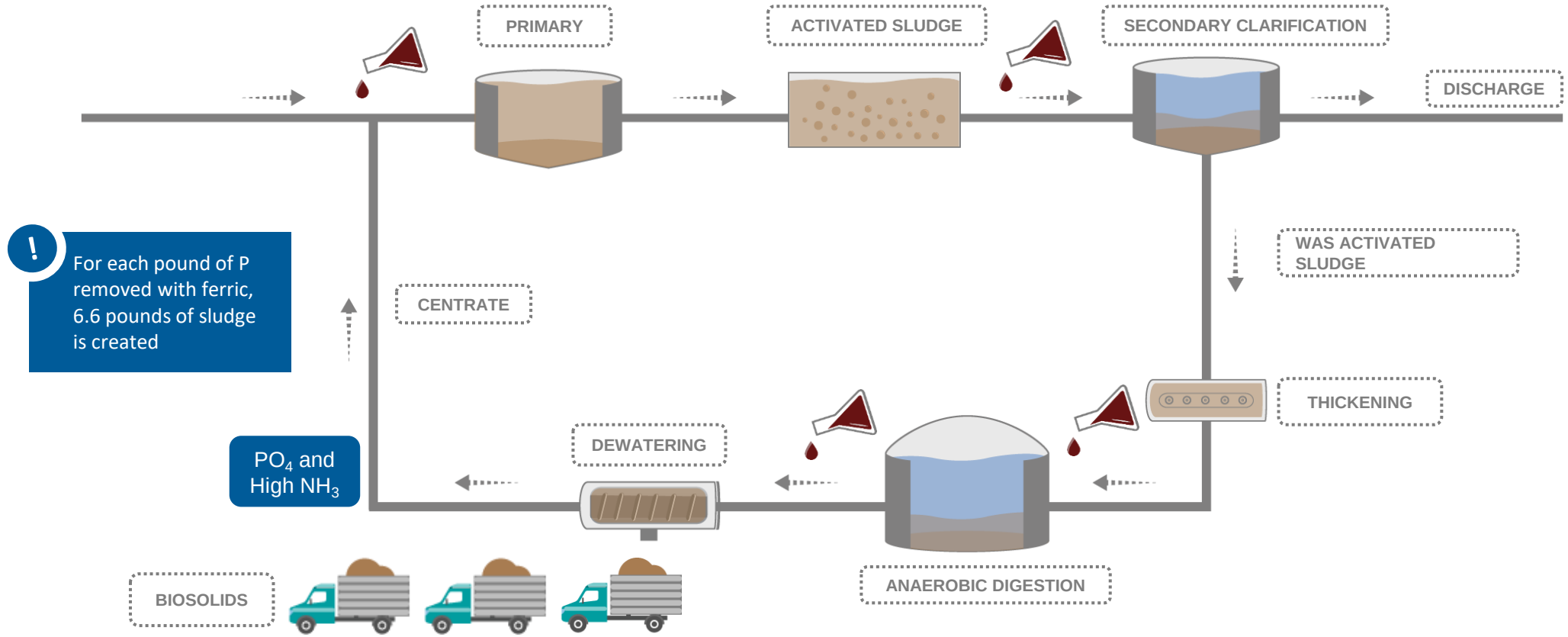
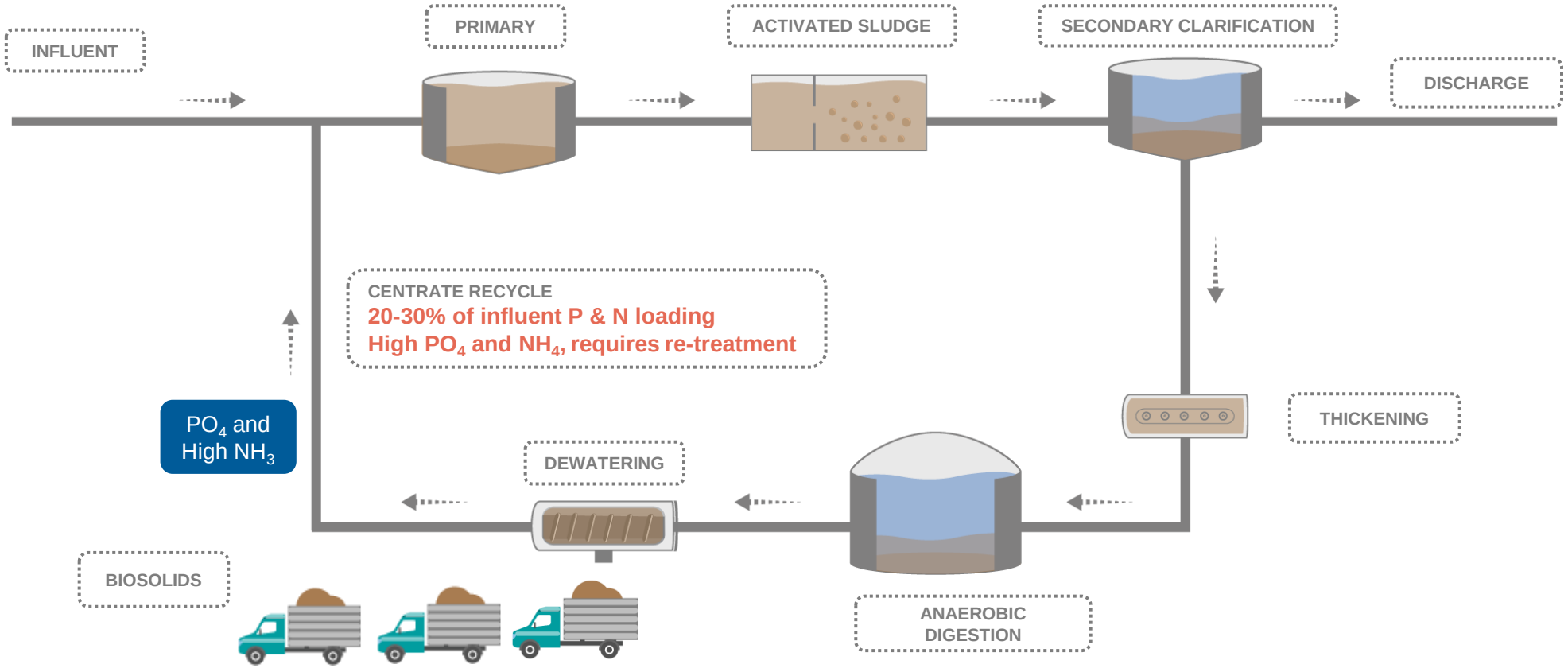
Some Facilities Rely Upon Expensive Chemical P Removal

Increases Sludge Volumes, Does not Allow for P Recovery



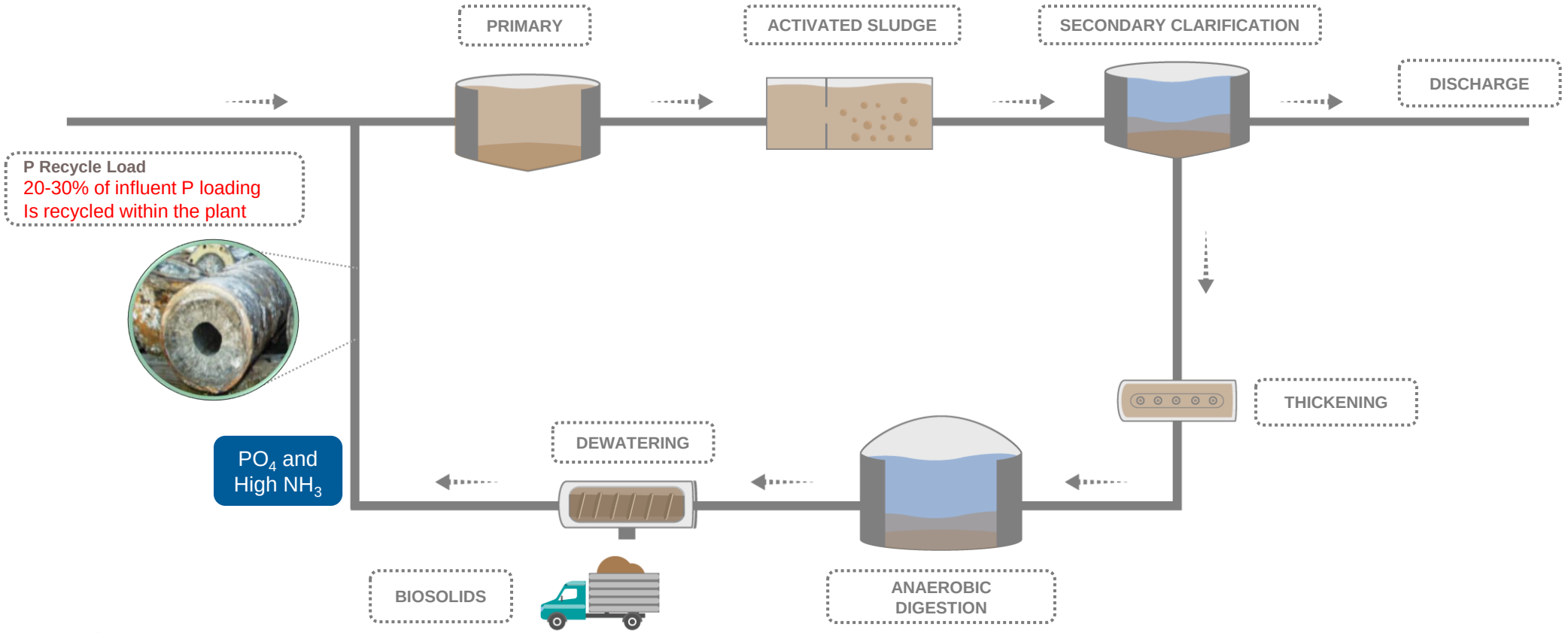
Biological Nutrient Removal is Gaining Popularity

Efficiently and Effectively Reduces Effluent Nutrient Concentration, more Sustainable and Cost-effective

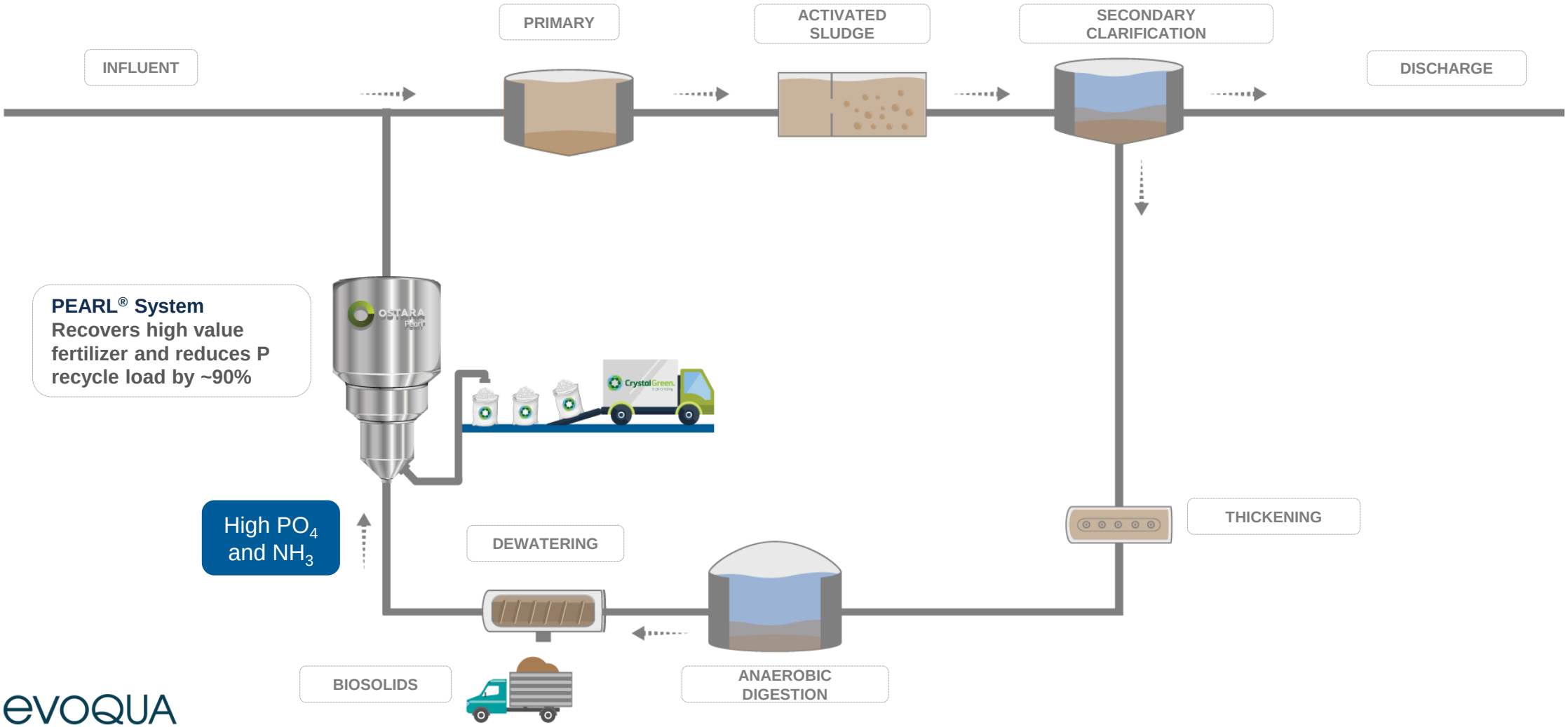


Unfortunately, Biological Removal Can Create Accidental Struvite

Biological Treatment Combined with Anaerobic Digestion of Solids Can Create Operational Challenges



The Pearl® System Treatment of Centrate Solves Operational Challenges of Recycle Loading while Providing P Recovery



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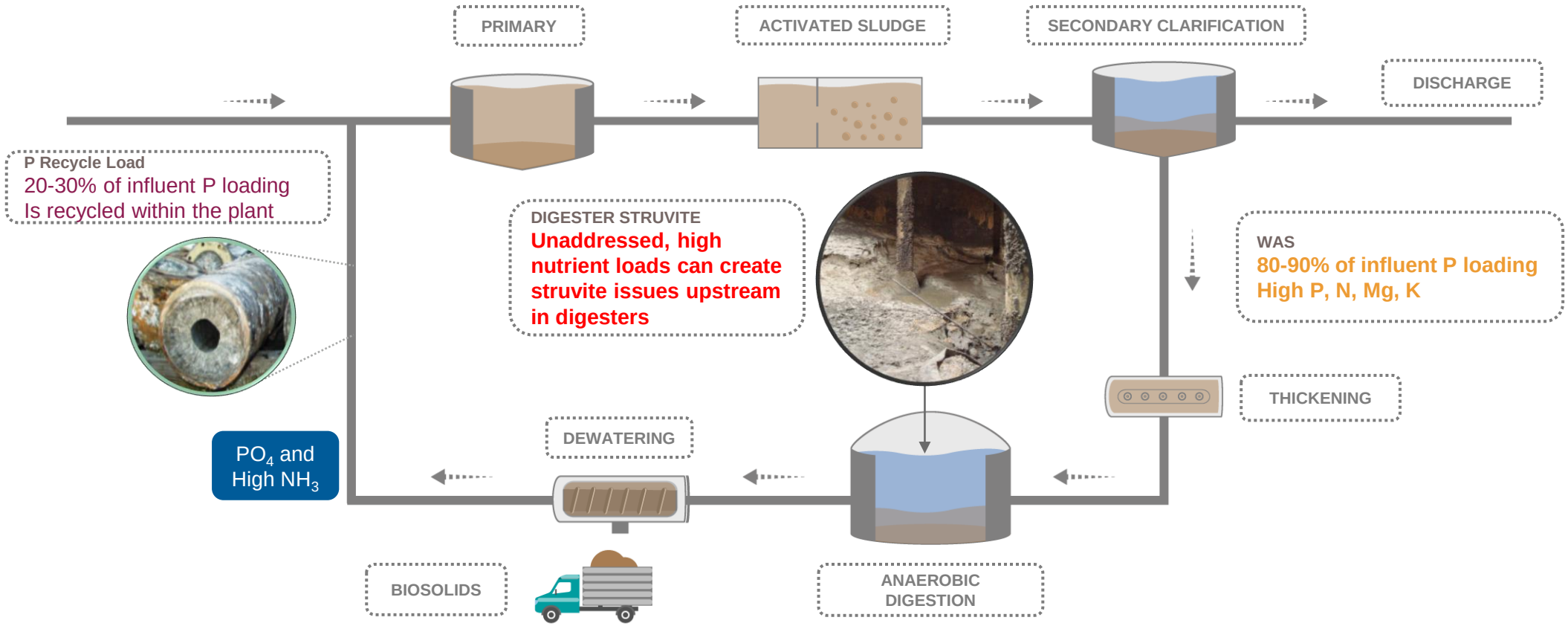
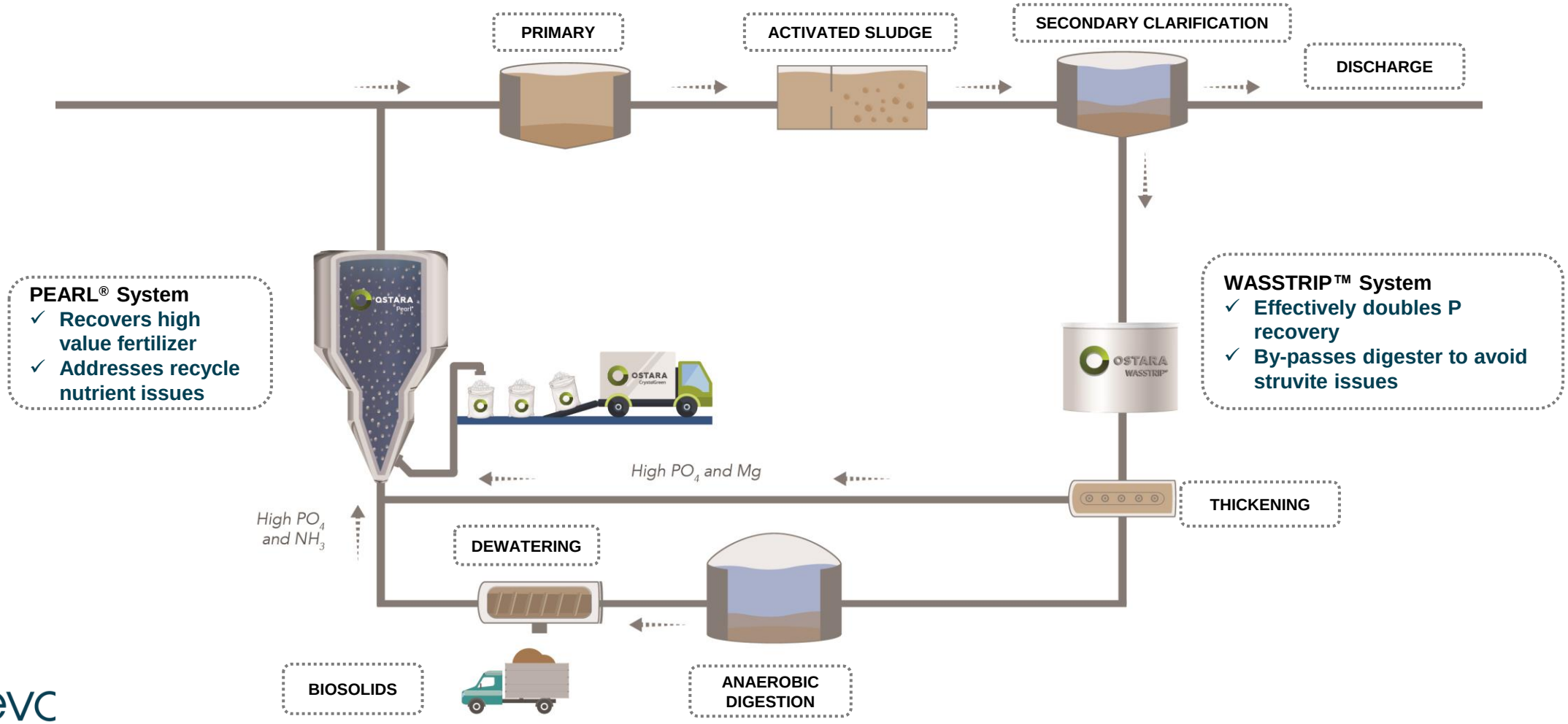
Without Full Facility Nutrient Management - Digesters Can Also Create Operational Issues



The Pearl® System + WASSTRIP™ System Can Address Complete Site Nutrient Management Challenges, and Optimize P Recovery



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WASSTRIP™ Systems Protect Digesters and Reduce Troublesome Struvite

Reduced Struvite in Digester by up to 90%

- ✓ Each ton of Mg diverted around the digester results in 10 tons less unintentional struvite
- ✓ Reduced maintenance and cleaning costs
- ✓ Increased digester capacity

Date Source: CWS - Durham WRRF

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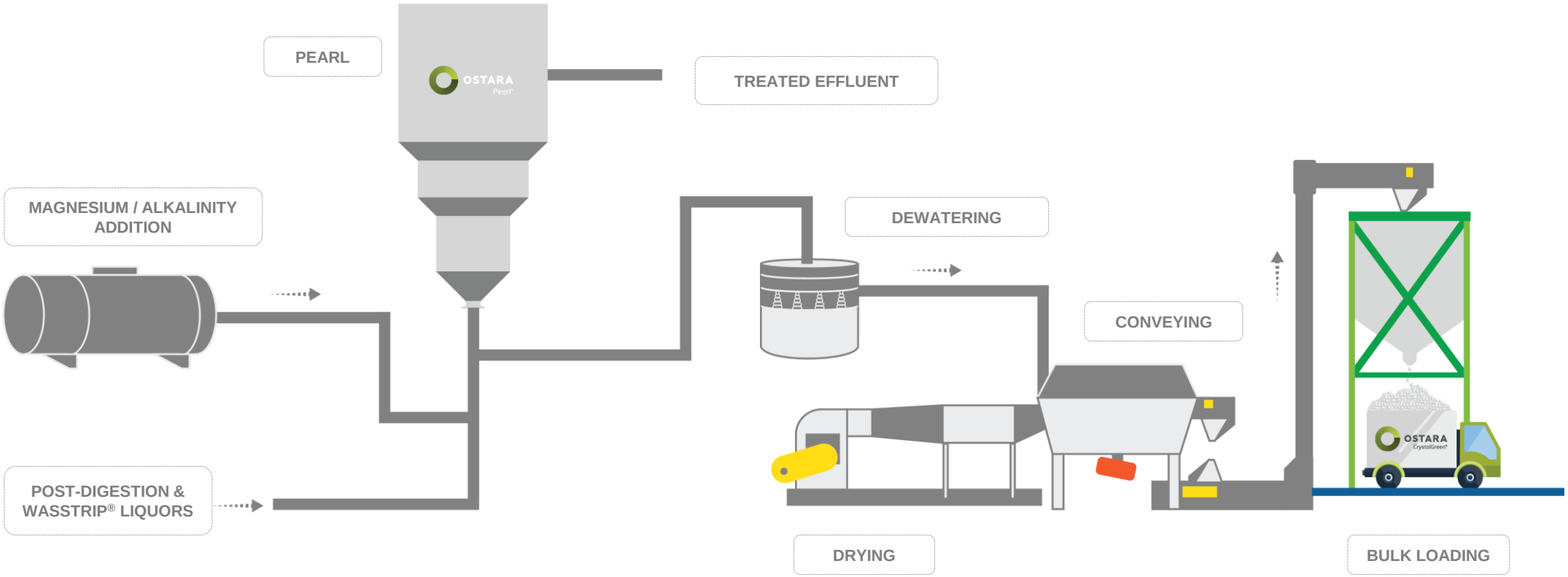
Maximize Benefits with Ostara Solutions

	SIDESTREAM CHEMICAL ADDITION	STRUVITE PRECIPITATION IN SLUDGE	OSTARA
OPERATING BENEFITS			
Reduce Phosphorus Recycle	✓	✓	✓
Reduce Struvite Maintenance	✓	✓	✓
Mitigate Digester Struvite Buildup	x	x	✓
Improve Dewaterability	x	✓	✓
Reduce Polymer Demand	x	✓	✓
Reduce Sludge Production	x	x	✓
ECONOMIC BENEFITS			
Commercial Fertilizer Recovery	x	x	✓
Guaranteed Fertilizer Buyer	x	x	✓
Financed/No Capital $ Option	x	x	✓
ENVIRONMENTAL FOOTPRINT			
Full Cycle Resource Recovery	x	x	✓
Reduce Carbon Footprint	x	x	✓

Fertilizer Product Handling is Simple and Fully-Automated

Crystal Green® Fertilizer can be dried, sorted and distributed ready-for-sale onsite



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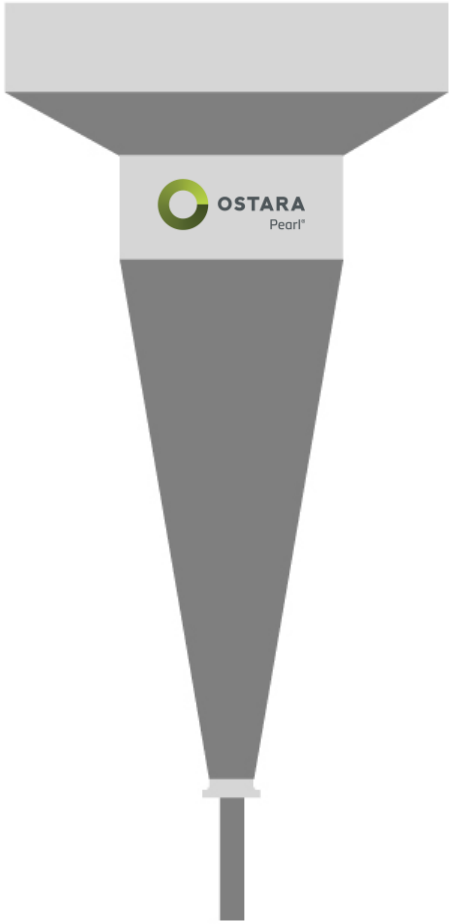
Say Hello to the Pearl® Fx System

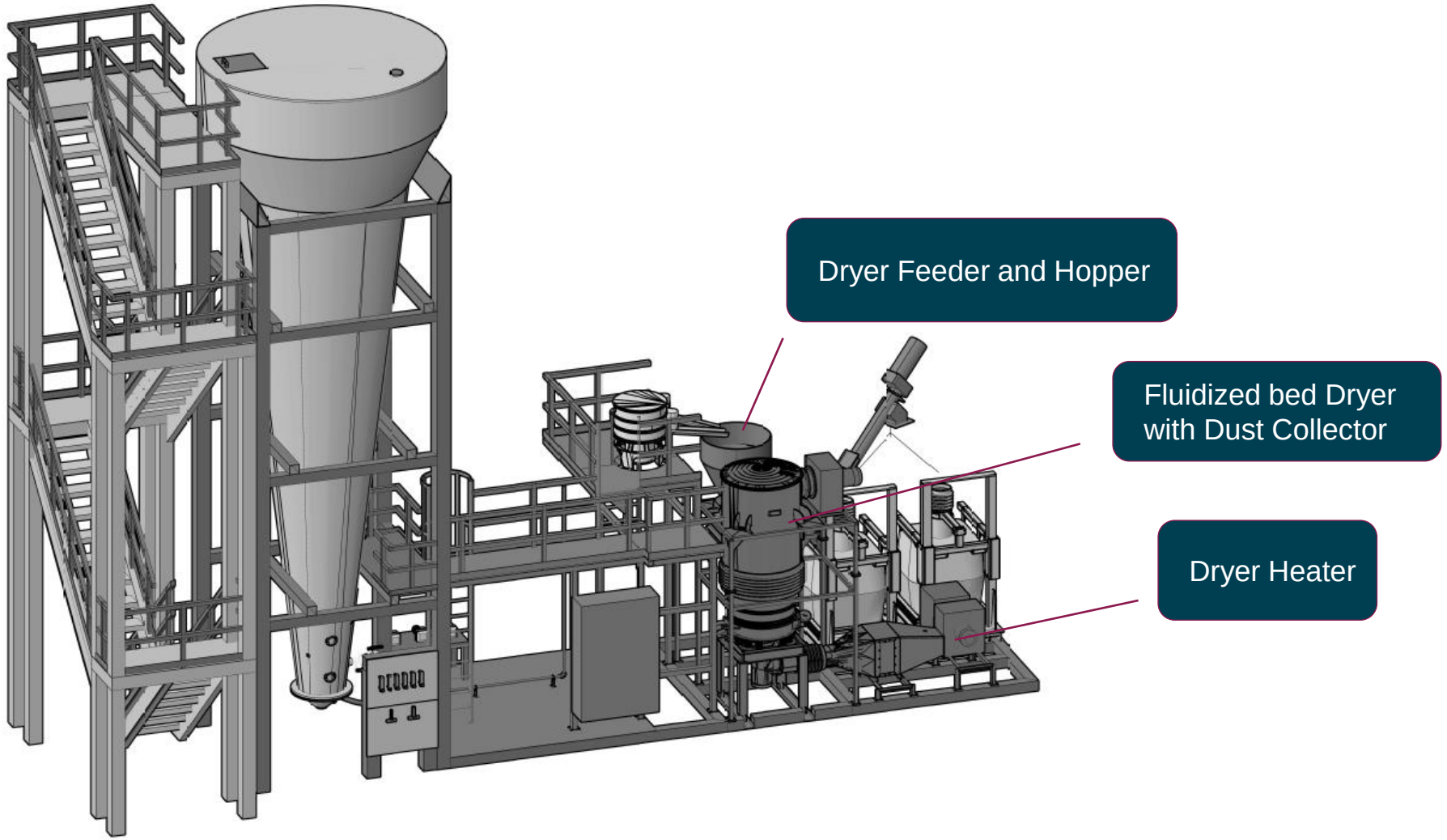
Introducing the newest optimization: The Pearl® Fx System provides a low capital, simplified, modular solution, allowing us to scale our offering to meet site specifications and market demands.

Main Features and Benefits – Lower Capital Option

- Simplified design
  - No recycle, single pass reactor
  - Reduced instruments and controls architecture
  - Reduced product handling (unclassified product is processed offsite by Ostara)
- Modular delivery (pre-plumbed & prewired skids, set on a slab, connected with flanges)



Fertilizer Handling Skid Integrated with Reactor Module(s)



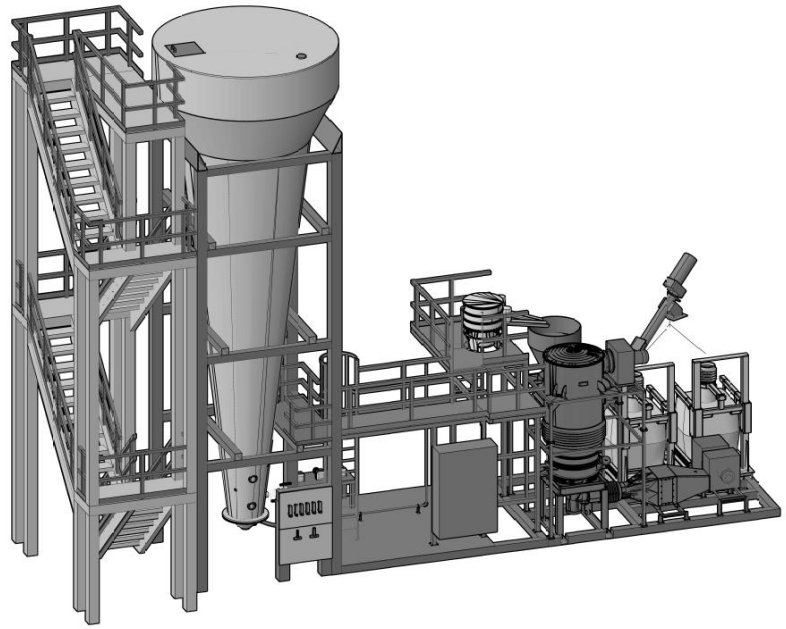
Modular Pearl® Fx System Project CAPEX Reduction

CAPEX Comparison

Project Example (15 MGD Plant)

	Cost Reduction to Customer
Equipment	-12%
Design & Construction	-65%
Installed Price	-37%

Based on proposals (2016 to April 2019)



CRYSTAL GREEN FERTILIZER OFFERS BROAD ENVIRONMENTAL BENEFITS

Crop-Driven Release™ Fertilizer

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Drastically Lower Heavy Metals Content Than Conventional P Sources

Heavy Metals Comparison

	AAPFCO [1] Limits	MAP	DAP	TSP	Crystal Green® Fertilizer
Arsenic	13	7-30	10-23	13-16	<2.0
Cadmium	10	0-172	3-35	5-96	<0.4
Chromium	n/a	17	55 - 196	89	< 5.0
Lead	61	0 - 10	1 - 10	4 - 13	< 0.2
Molybdenum	42	5 - 20	3 - 20	11	< 4
Nickel	1	7 - 350	14 - 48	15 - 118	< 2
Zinc	250	10 - 3010	50 - 386	61 - 1296	< 2

1 AAPFCO (Association of American Plant Food Control Officials)
Sources: AAPFCO's Statement of Uniform Interpretation and Policy (SUIP) #25 "The Heavy Metal Rule"
Washington State Department of Agriculture; The Science of the Total Environment 204:245-250; Journal of Environmental Quality 26:551-557.

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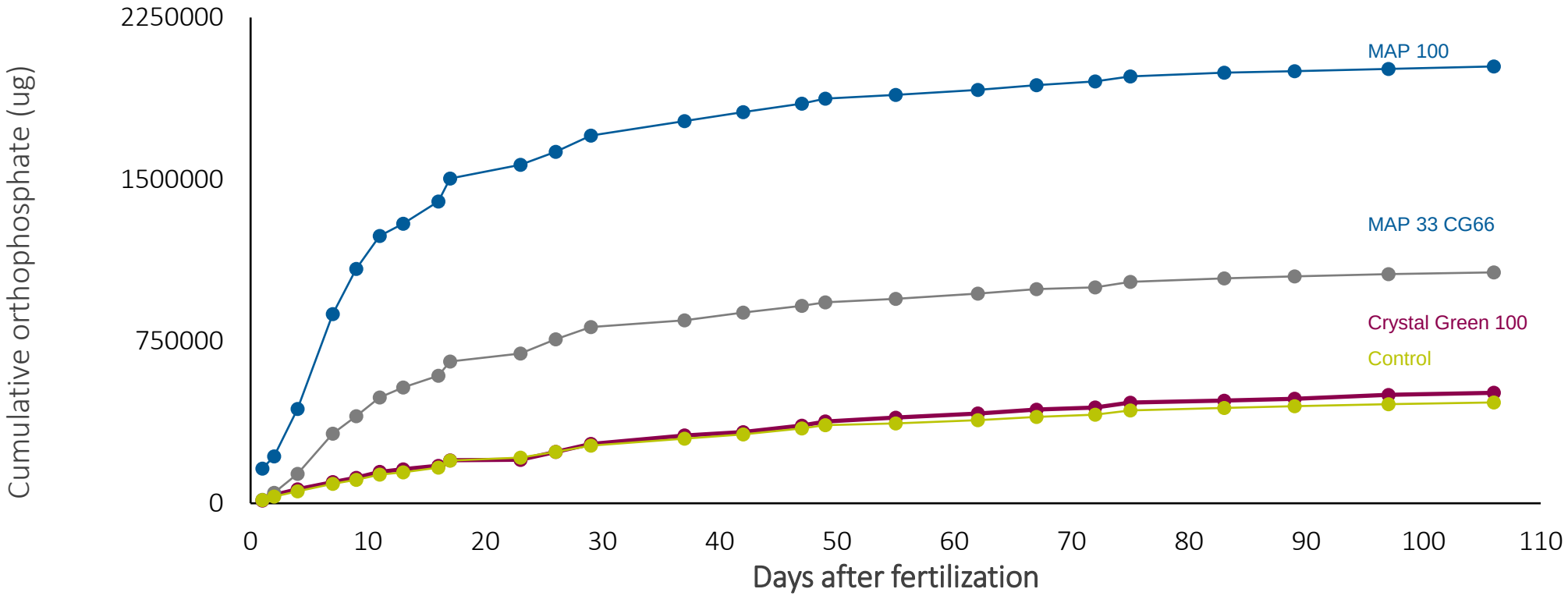
Crystal Green® Fertilizer Prevents Leaching of P into Soil/Groundwater

Cumulative Orthophosphate in Leachate as Affected By P Source*



** Auburn University study 2014*

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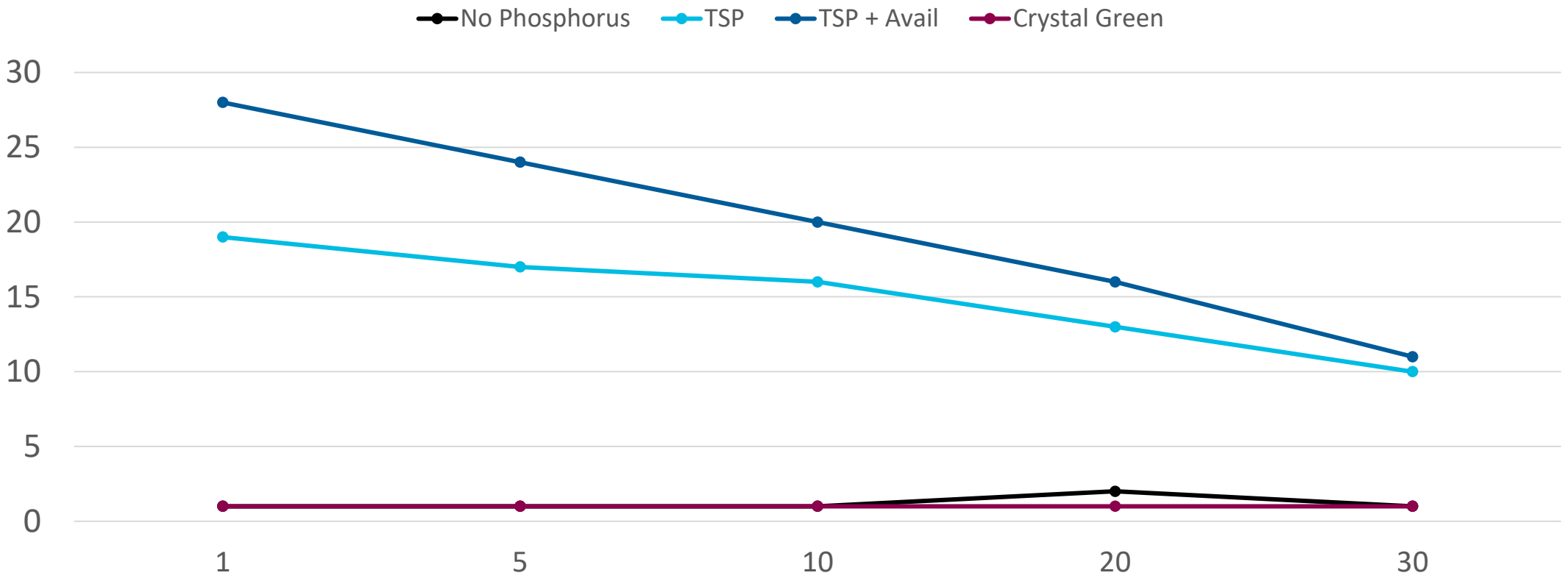
Crystal Green® Fertilizer Virtually Eliminates Run-Off

Surface P Runoff Study*



Concentrations of phosphorus in run-off during a 30-minute rainfall event after receiving water soluble (TSP) phosphorus, slowly available (Crystal Green) phosphorus and a fertilizer additive (TSP+Avail)

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** P-Link Project - Loddington,UK, 2016*

Crystal Green® Fertilizer Protects the Environment

Growers using recovered Crystal Green® Fertilizer are actively improving and protecting the environment versus a conventional phosphate fertilizer.

Impact Category	**Potato** Minnesota	**Potato** Poland	**Corn** Illinois	**Canola** Canada
Global Warming Potential	-10.6%	-15.6%	-4.4%	-5.9%
Freshwater Eutrophication	-52.4%	-41.0%	N/A*	-54.4%
Phosphate Rock Extraction	-46.5%	-31.6%	-26.0%	-18.1%

** When recovered Crystal Green is utilized in these applications, the impact of use become negative (a good thing!) thus making the reduction math non-representative as a percentage.*

Source: Crystal Green: Streamlined Life Cycle Assessment, 2022: ERM
Full data report available by request

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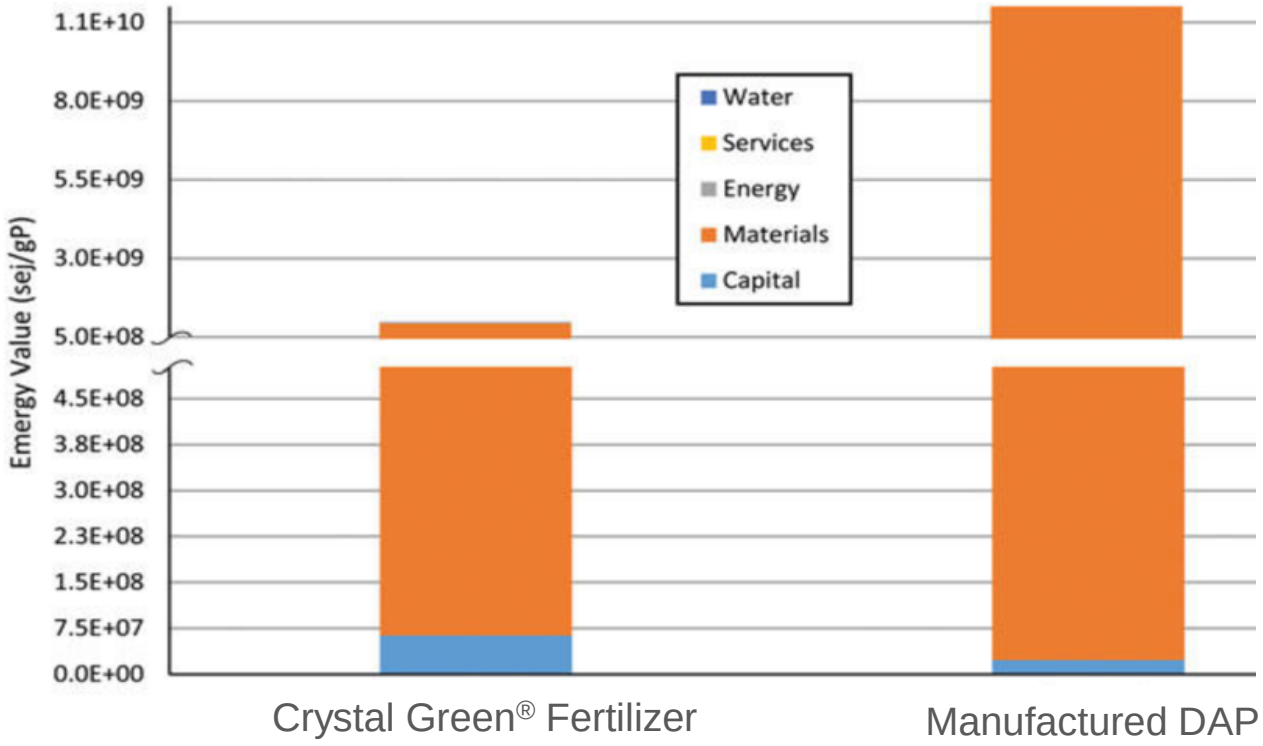
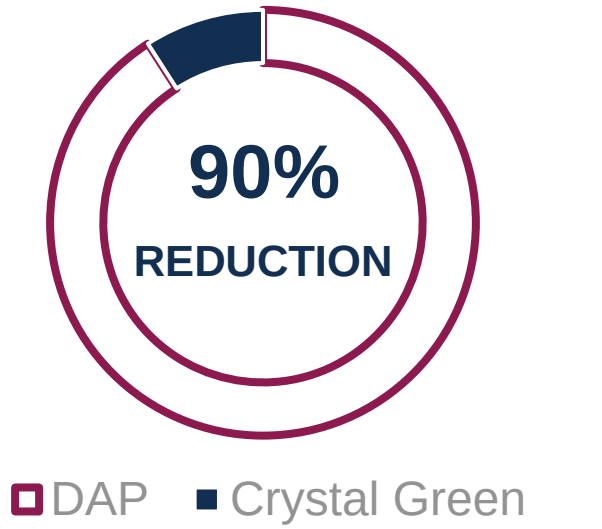
Crystal Green® Fertilizer Production Uses 90% Less Emergy* than Conventional Fertilizer Production…thus Less CO_2e impact



Emergy (sej/gP)
Crystal Green® Fertilzier vs DAP Production



*Emergy = Emergy is an expression of all the (solar) energy used in the work processes that generate a product or service in units of one type of energy. Emergy is measured in units of emjoules, a unit referring to the available (solar) energy consumed in transformations

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Source: US EPA – Theregowda, Ma, Garland 2019
"EMERGY EVALUATION OF WASTEWATER-DERIVED STRUVITE AS AN ALTERNATIVE TO CONVENTIONAL FERTILIZER FOR CROP PRODUCTION"

Ideal Opportunities for an Ostara Pearl® System from Evoqua

- Plants with Anaerobic Digesters
- Plants with P limits or plants expecting future P limits
- Plants that favor Bio P over Chemical P removal (tertiary polishing with chemicals ok – CoMag® System)
- Plants with Struvite problems

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