

*Industry's Most Advanced Technology.
Experience, Not Experiments.*



NUTRIENT RECOVERY

Advanced Technology for Agriculture



BRIEF FOR

STANDING COMMITTEE ON ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Technology
Perspective

KPD Consulting Ltd.
101-2238 Queen Street
Abbotsford, BC V2T 0B7
Canada

President
Kerry Doyle

+1.604.330.2500

NUTRIENT RECOVERY

ADVANCED TECHNOLOGIES FOR AGRICULTURE



Executive Summary

Current Commercialization: We have commercialized a cost effective system of nutrient recovery that is consistently capturing and segregating significant amounts of the solid nutrients (NPK) from dairy manure. We do this with both AD digestate and raw manure.

While this is beneficial, gaps still remain: NPK capture rates need improvement; Ammonia remains in the effluent; Total Suspended Solids (0.4%) and Total Dissolved Solids (0.6%) remain in the effluent; nutrient cake is not organic certifiable; high-consumable costs are ongoing; markets for nutrient cake are immature; effluent still requires large storage lagoons.

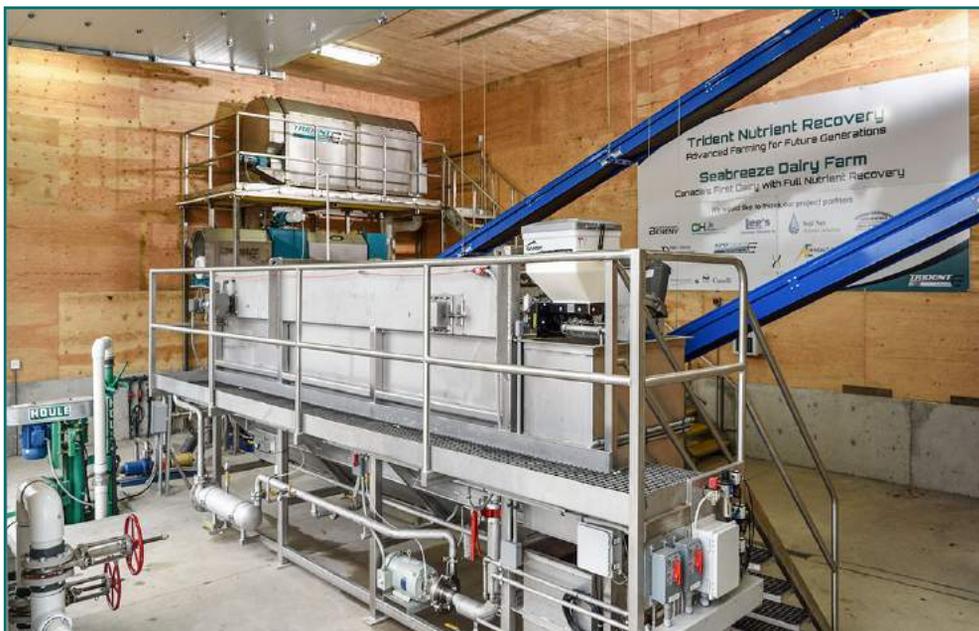
Current R&D Development (2nd Stage): We are currently working on technologies that increase the benefits of existing outputs and provide a broader range of applications, including 1) increasing NPK capture rates; 2) eliminating Total Solids in the effluent; and 3) enabling on-farm production of nutrient granules.

Conceptual R&D Development (3rd Stage): We are embarking on development of new technologies that will enable operators to capture virtually all nutrients, create lignin-based polymer leading to organic certified fertilizer, and producing effluent water that is stream dischargeable.

Advanced Nutrient Recovery Technology for Agriculture

“ Our expectation is that the Trident system as it affects the various component costs of our entire manure management ecosystem is going to bring our costs down by at least one-third. So, the economics look promising.”

Dr. Michael McCloskey
CEO, Fair Oaks Farms
Fair Oaks, Indiana



Nutrient Recovery on Seabreeze Farm 400-cow Dairy, Delta, BC.

Current Commercialized Farm Benefits:

- ▶ Complete automation of manure system
- ▶ Reduced bedding costs
- ▶ Significant transport cost savings
- ▶ New nutrient format for precision Ag-application
- ▶ Accelerated farm growth without additional land purchase
- ▶ Reduced risk from a lagoon breach
- ▶ Clean flush water



Manure fiber presents tremendous opportunities for innovation.

Future Developments

Based on availability of funding opportunities KPD Consulting Ltd. is going to continue to drive technology development. Concepts for new scientific and mechanical processes are being developed to take current Trident nutrient recovery technologies to the next progressive level. KPD Consulting Ltd.'s fundamental development premise is that its' new technologies be practically and economically viable for all users. Concepts under development are:

Granulized Fertilizer: On-farm processing of nutrient cake into granules for nutrient stabilization, improved storage and commercial sales.

Organic Polymer: A proprietary in-house process that creates organic polymer from manure fiber replacing polyacrylamides, facilitating organic certification which produces higher value fertilizer.

Ammonia Recovery: A proprietary process that captures all the soluble nutrients (ammonia/orthophosphate) from the effluent.

Stream Dischargeable H2O: Complete clarification of the final effluent to meet regulated BOD and COD levels enabling stream discharge of all remaining water.

Cellulosic Ethanol Feedstock: A proprietary process that converts recovered fiber into valuable high-grade Cellulosic Ethanol Feedstock.

Farm Economic Partnerships: Establishing relationships with 3rd party facilitators

Expected Cost of Development

Over the next 3 years we expect to allocate funding towards laboratory testing and verification, scale testing, prototype development, piloting and commercialization.

Expected cost of development of all 6 concepts

Year 1	Year 2	Year 3	Total
\$2,200,000	\$1,500,000	\$300,000	\$4,000,000

Development Team

Trident has assembled a dynamic management team each with many years of experience in the AG sector.

Kerry Doyle, President is an engineering technologist with 35 years executive management experience in technology development, manufacturing, marketing and sales.

Richard Ludke is a process and operations specialist with 25 years project management experience including expertise in automation and materials handling.

Dr. Aicardo Roa, PhD, Scientific Research & Experimental Development Scholar, an Adjunct Professor at the University of Wisconsin's Biological Systems Engineering Dept. owner of Soil Net LLC and holder of patented technologies for separating materials in effluents.

Strategic Alliances

Trident has numerous strategic alliances with relevant organizations that add important experience and know-how to the design, development and marketing of its technologies.

Agricultural Center of Excellence in Sustainability (ACES) - A state-of-the-art resource for anaerobic digester and agricultural technology.

Earthwise Inc. - A consultancy that develops and implements practical strategies for state and federal environmental laws and regulations that serve the dairy industry.

Midwestern BioAG - A biologically-based agricultural based consulting company specializing in agricultural fertilizers.

National Research Council of Canada-IRAP Program - A Gov't program that consults with and funds the development of innovative Canadian businesses.

Terra Novo - A leading manufacturer of innovative solutions for erosion and sediment control products.

Development Highlights

The Nutrient Recovery System is now fully commercialized and installed in the USA and Canada.

2016 (in progress): Fiber Recovery for 7,000 cow dairy with digester at Windy Ridge Farms, Fair Oaks, IN.

2015: Nutrient Recovery for 15,000 cow dairy with digester at Fair Oaks Farms, Fair Oaks, IN.

2015: Nutrient Recovery for 300 cow dairy with digester at Seabreeze Farm, Delta, BC.

2014: Fiber Recovery for 5,000 cow dairy in Dong-Jun Nei Meng Gu Co., Ltd in Linhe City, Shandong, China.

2013: Fiber Recovery for 9,000 cow dairy with digester, Rosendale, WI.

Our Future Vision of Nutrient Recovery on the Farm

Nutrient management is foremost on the minds of intensive livestock producers. Effectively managing nutrients from animal manure serves the environment and provides solid business opportunities for the producer. The Trident Nutrient Recovery System is a comprehensive solution that is affordable and easy to manage. It is available today commercially as a proven, cost effective technology. In the near future, Trident envisions a greater freedom for farm operators from the many operational requirements of manure handling and nutrient management. Our systems will soon enable complete automation of the processes and create significant revenue streams from manure-sourced outputs. Imagine a dairy farm enjoying the following benefits:

- Abundant volumes of clean fiber bedding recycled directly from manure.
- Nutrients recovered from manure at levels of 85%N 95%P and 45%K.
- Organically certified fertilizer produced and granulated on-farm and sold commercially at premium organic prices.
- Nutrient recovery systems that produce their own natural polymers from manure fiber, eliminating the need for polyacrylamide or other harsh chemistry.
- Elimination of all water hauling and even lagoon storage because the final component of manure processing will be plain water used for watering the herd and then stream discharged.
- Producing volumes of valuable cellulosic fiber feedstocks which sell to producers of Ethanol, a highly valued renewable fuel.
- Strategic partnerships with purchasers of valuable new by-products produced on-farm.
- Opportunities to partner with organizations that will capitalize or license-to-operate the advanced manure processing facilities.

The Complete Trident Nutrient Management System of the Future

