University of Regina

Sustainable Dairy Cattle Manure Treatment System

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Environmental Systems Engineering

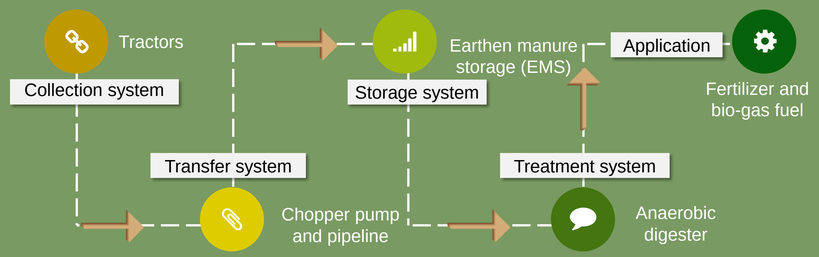
PART 01 Background

Livestock manure is rich in nutrients and can be a valuable resource if used properly.
Poor livestock manure management may lead to potential risks of:

- Water contamination
- Nutrient accumulation
- Offensive odor production
- Spreading of pathogens

PART 02 Treatment Process

- This project is about designing a manure treatment system.
- The system includes collection, transfer, storage, treatment and application.
- The main design is earthen manure storage (EMS) facility.



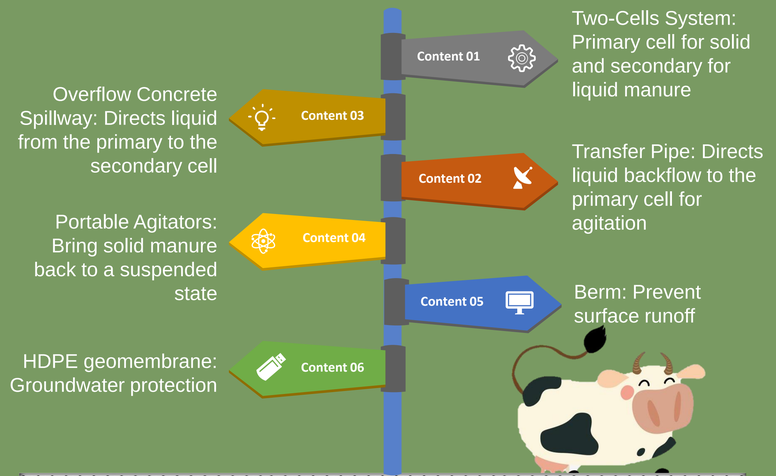
Flow diagram of the system

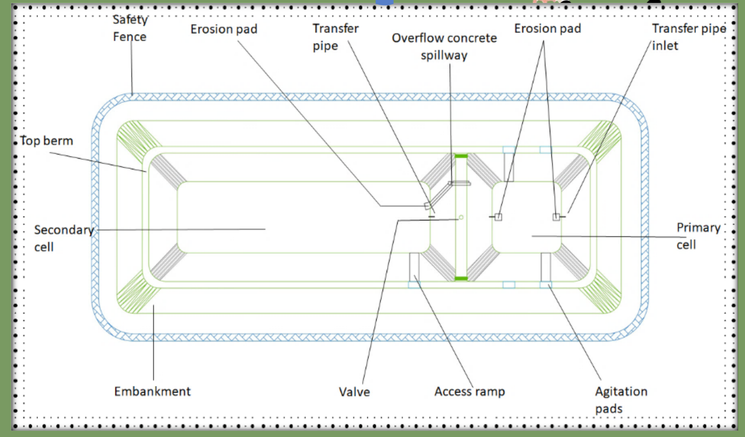
PART 03 Site Assessment

The project is chosen to be built 100 m to the south of Ell Dairy Farm Ltd.
The conclusion of site assessment is listed below:

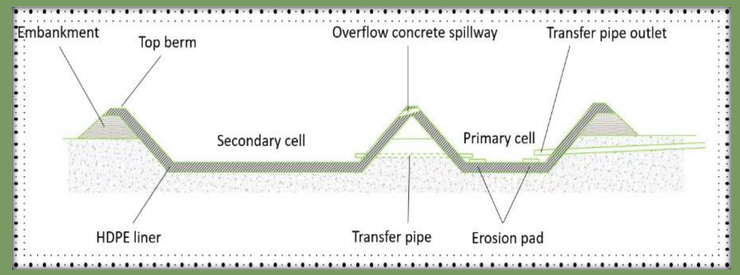
- No surface water bodies nearby
- Hydrometer analysis and falling head permeability tests were performed to find soil parameters.
- High-density polyethylene liner is required.
- Sensitive resources: four wells nearby the site
- The site is close to main highway, farm, and crop fields.

PART 04 EMS Components





Top view of the EMS components



Front view of the EMS components

PART 05 Environmental Impact Assessment

Lohani and Thanh Method:

Relative Priority Values	Project Activity / Resources	Manure Collection	Manure Storage	Manure Treatment	Fertilization	Energy Generation	Lohani & Thanh
8	Air Quality	2 / 3	1 / 2	4 / 4	-1 / 2	4 / 1	208
10	Soil Fertility	1 / 1	1 / 2	3 / 3	4 / 5		320
9	Water Quality	4 / 6	1 / 6		-3 / 1		243
4	Pathogen Transmission	2 / 3	1 / 2	5 / 2			72

Conclusion: The positive scores indicate the project has positive impacts to the environment.

PART 06 Cost of the Project

Components	Price (in CAD)
Excavation	$120,030
Spillway	$405
Agitation Pads	$3,377
Pump Pads	$180
Pipeline	$41,294
Anaerobic digester	$1,200,000
Total	$1,365,286

PART 07 Acknowledgements

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- Internal Co-supervisor: Dr. Yee-Chung Jin - University of Regina
- External advisor: Ms. Priscila Dickinson - SK Ministry of Agriculture
- Laboratory supervisor: Mr. Ben Lichtenwald - University of Regina

PART 08 Reference

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