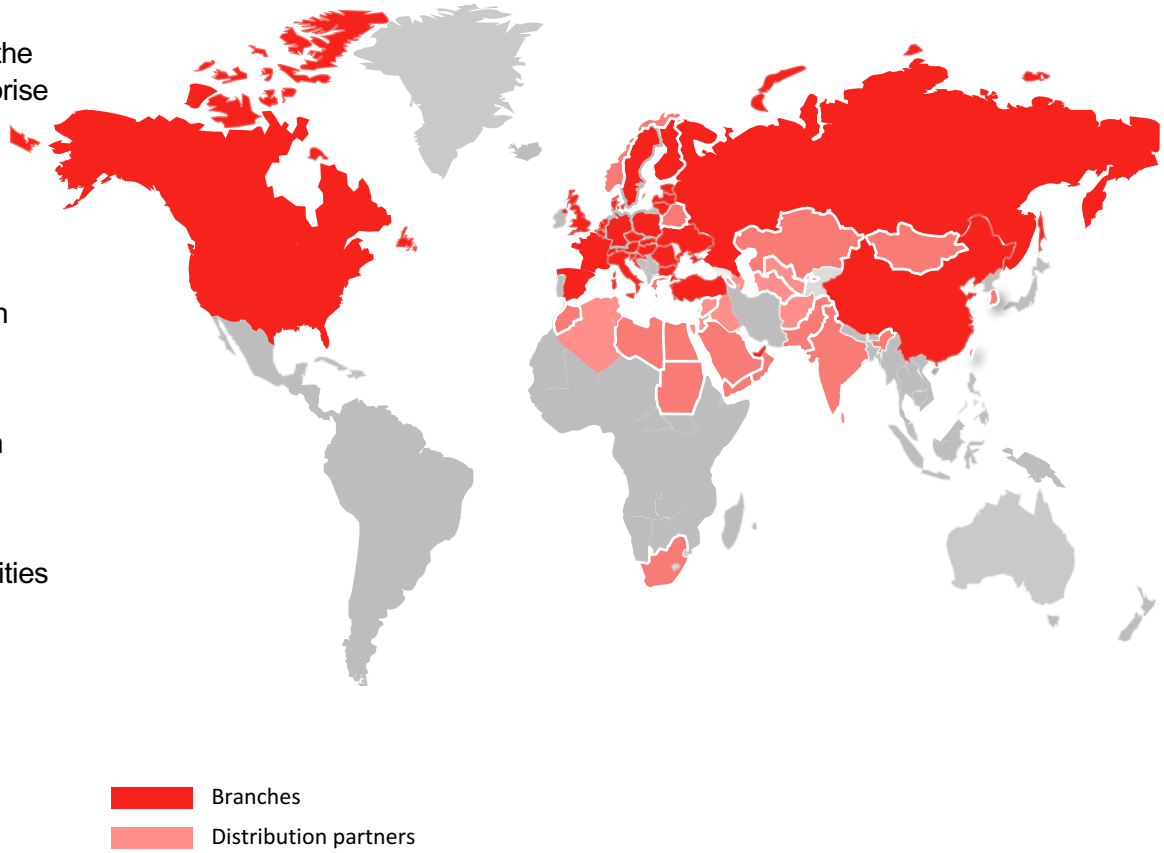
Fighting Organic Waste – City of Edmonton to the Rescue with High-Solids Anaerobic Digestion!

BIOFerm™ Energy Systems
A Company of the Viessmann Group
Michael Brown
22 September 2016

Viessmann Group

The Company

1917	Company foundation of the Viessmann family enterprise
11,600	Employed workforce
$2.5	Billion dollars Viessmann Group turnover
22	Production companies in 11 countries
74	Countries with sale activities and distribution partners
120	Branches world-wide
56	Percent of the turnover derived from export activities



BIOFerm™ Energy Systems, Viessmann Group

North American Anaerobic Digestion & Gas Upgrading

Expertise		Turnkey anaerobic digestion systems Turnkey gas upgrading systems
Commitment		Industry's best performance guarantee
Experience		450+ anaerobic digestion 900+ PSA installations
Reputation		High repeat business

Clean Energy from Municipal Organic Waste

MSW Waste Streams

Waste Collection Considerations

- Collection
  - Single-Stream
  - Residential Separation
  - Frequency
- Residence Times
- Hauling Distances

Images courtesy of Google

MSW Waste Streams

Typical MSW Generation (Before Recycling/Diversion)

Photo courtesy of BioCycle.net, information courtesy of 2012 EPA Estimates

- Paper 27.4%
- Food Waste 14.5%
- Yard Waste 13.5%
- Plastics 12.7%
- Metals 8.9%
- Rubber/Textiles 8.7%
- Wood 6.3%
- Glass 4.6%
- Other 3.4%

BIOFERM™ ENERGY SYSTEMS
VIESMANN Group

MSW Waste Streams

Waste Characterization

- Waste Constituents
  - Contamination
  - Physical properties
- Laboratory Testing
  - Total & Volatile Solids
  - Biogas & Methane Potential

MSW Waste Streams

Pre-Processing Considerations

- Goals
- Equipment
  - Debaggers
  - Shredders
  - Magnets
  - Trommels
- End Use

MSW Waste Streams

Anaerobic Digestion - Non-Pumpable Materials

Dry Fermentation Anaerobic Digester

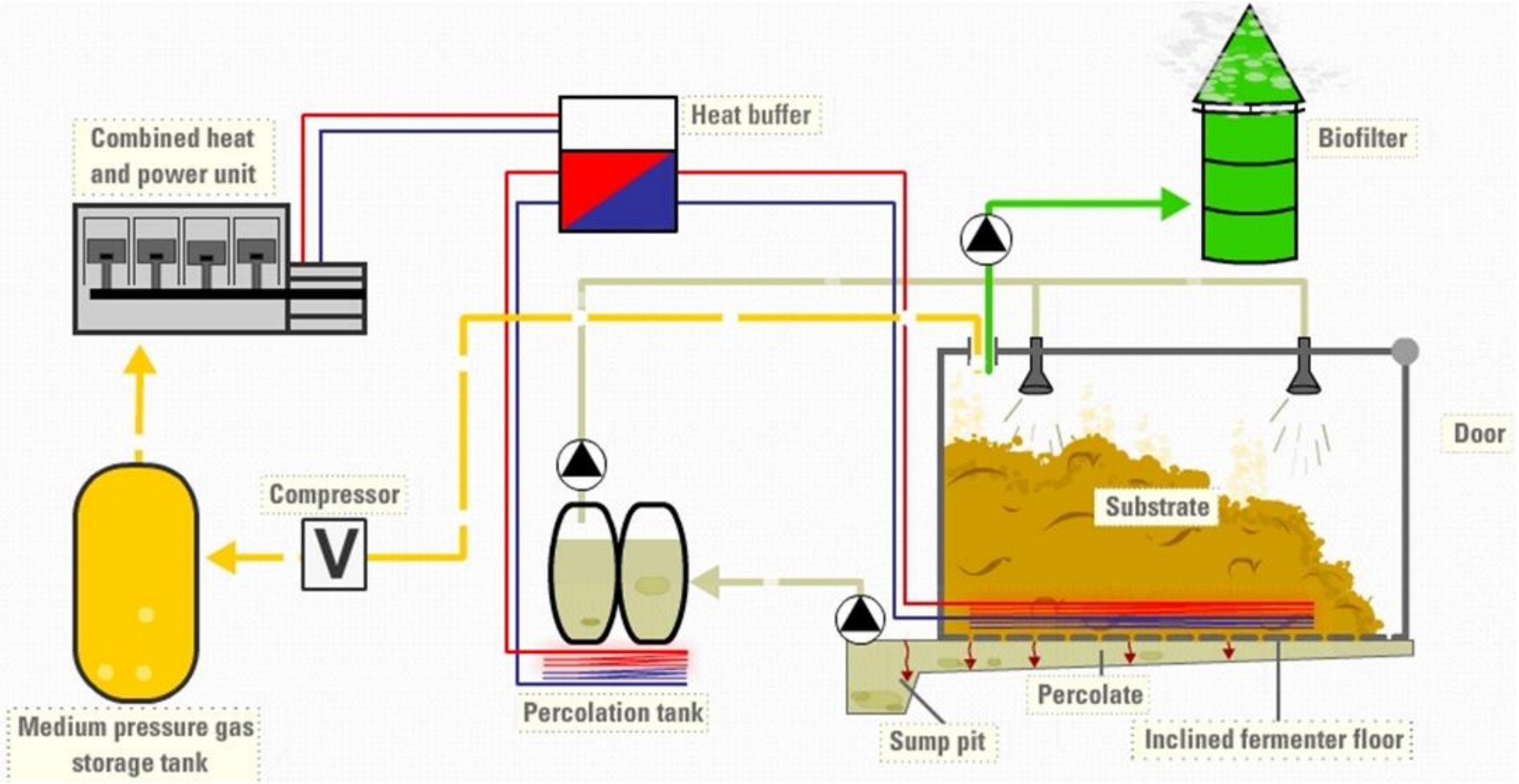
High-Solids Waste Management

- Processes high-solids organics—food waste, yard waste, animal bedding, and more—without need for pumpable waste stream
- Capable of processing 8,000 tons per year and up
- Input material volume reduced by up to 40%
- Expandable design

- Handles large items & contaminated waste streams
- Material remains stationary (no internal moving parts)
- Batch system reloading on ~28-day cycle
- Little to no additional water

MSW Waste Streams

Biogas Generation – Dry Fermentation



Case Study: Anaerobic Digestion in Edmonton, AB

City of Edmonton

Anaerobic Digestion Project Details

- **Partnerships:** City of Edmonton and University of Alberta
- **Capital funding opportunity:** Climate Change Emissions Management Corporation (CCEMC)

City of Edmonton

Consideration for Anaerobic Digestion

- Additional organics processing on small footprint
- Synergistic fit with existing composting operation
- Biogas to electricity generation
- GHG offsets

City of Edmonton

Edmonton Waste Management Centre

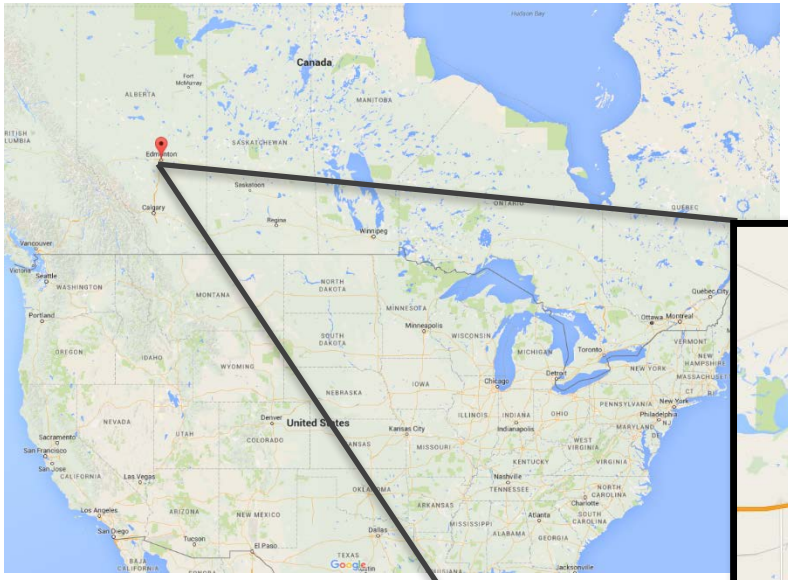


Photo courtesy of Google Maps

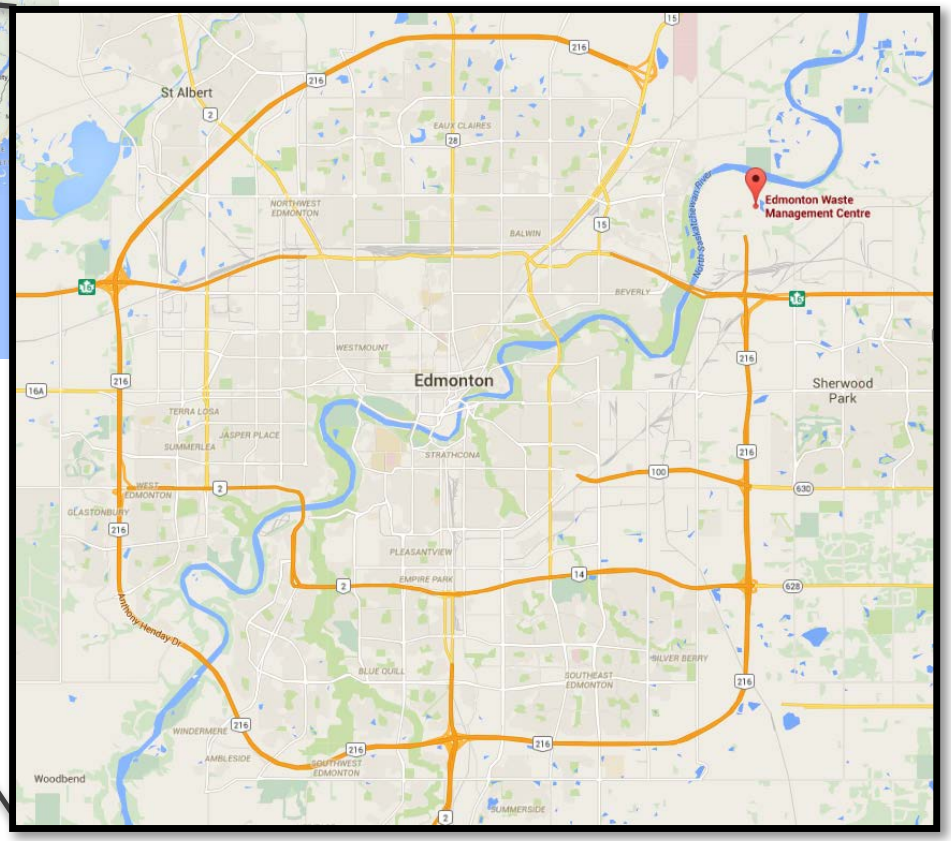


Photo courtesy of Google Maps

City of Edmonton

Edmonton Waste Management Centre (EWMC)

Aerial view of the EWMC - Photo courtesy of Google Maps

City of Edmonton

Edmonton Waste Management Centre (EWMC)

- The EWMC is 575 acres (233 hectares)
- Buildings occupy more than 860,000 ft^2 (80,000 m^2)
- More than 4,500 trucks per week
- Average 10,800 US tons of material enter per week

Aerial view of the EWMC - Photo courtesy of Google Maps

City of Edmonton

EWMC – High Solids Anaerobic Digestion Facility Site

Aerial view of the EWMC - Photo courtesy of Google Maps

BIOFerm™ Energy Systems
Company Presentation

City of Edmonton

High Solids Anaerobic Digestion Facility (HSADF) Design

- Process 40,000 tonnes per year of high-solids organic wastes
  - Municipal Solid Waste (Includes Yard Waste)
  - Source Separated Organics
- 8-Fermenters
- 2-Aeration Tunnels

Interior view of BIOFerm™ Dry Fermentation (HSADF) system

City of Edmonton

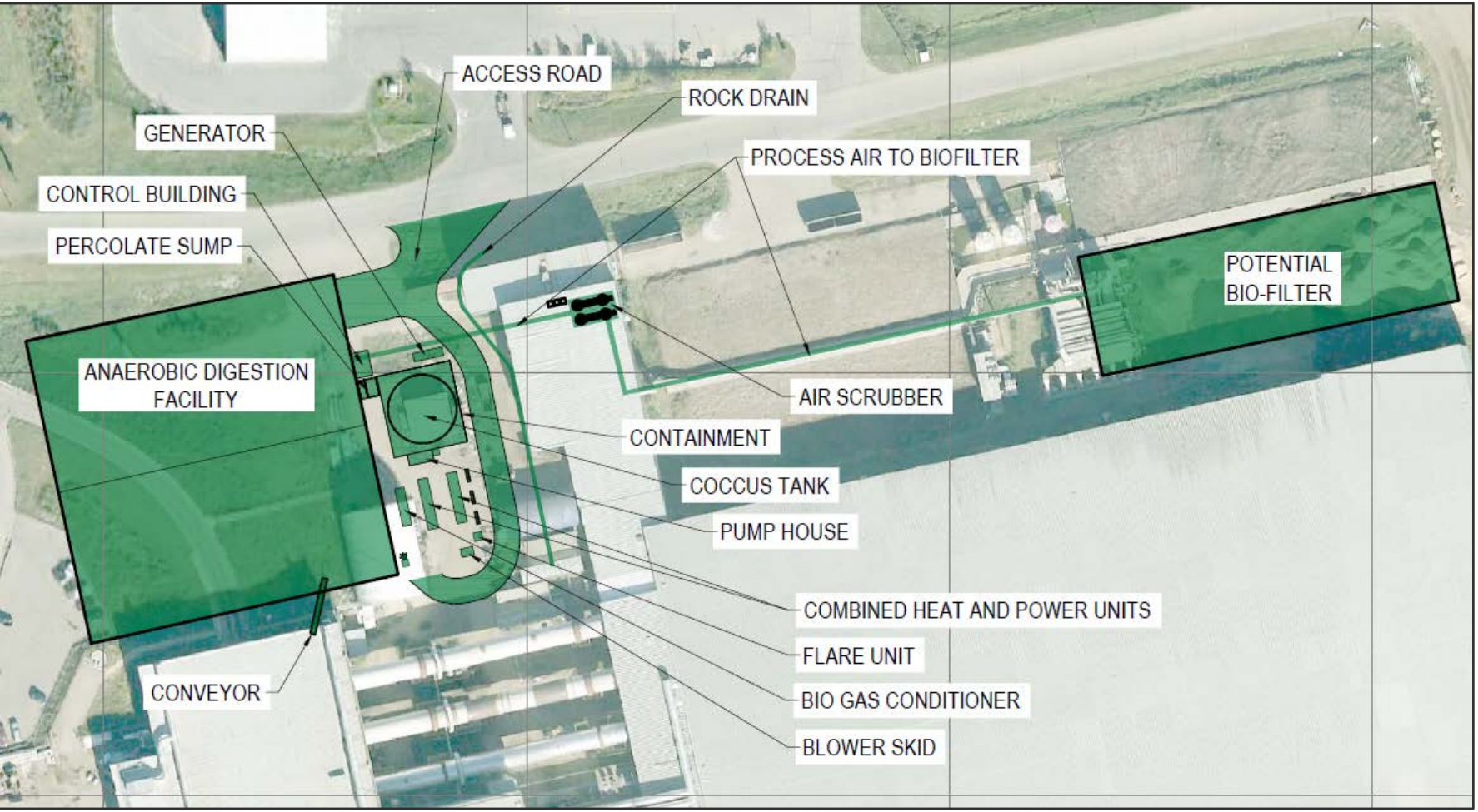
High Solids Anaerobic Digestion Facility (HSADF) Design

- Pre-AD Processing
  - Municipal Solid Waste
    - 3” Screen Separation
  - Source Separated Organics
    - 4” Screen Separation
- Post-AD Processing
  - Aeration Tunnels
  - Composting
  - Screening

Biodigester 1 mixing lobby at the University of Wisconsin Oshkosh

City of Edmonton

High Solids Anaerobic Digestion Facility (HSADF) Design

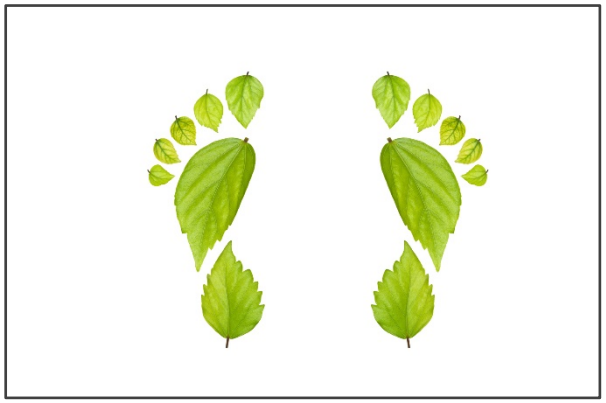


Conceptual Layout

City of Edmonton

High Solids Anaerobic Digestion Facility (HSADF) Output

50,000 MMBTU/year
heat generation



46,000 tonnes CO_2
reduction

Two (2) 846 kWe CHPs

20,000 tonnes compost for
sale

City of Edmonton anaerobic digester project update – Where we're at in the project, timeline discussion

Our Purpose

Redefining “Waste”

At BIOFerm™ we see our role as “re-definers” of waste. We hope to provide the tools for industries to make the most of the resources within their reach–

nothing is waste until you waste it.

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