



SG Mobile™ System GORE® Cover **(DRAFT) Project Plan**

March 15, 2018
Revised by Brian Fuchs

City of Battle Creek, MI



Source: City of Battle Creek, MI

From:

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Sustainable Generation – SG
W. L Gore & Associates – Gore
City of Battle Creek, MI - BC

PROJECT OBJECTIVES

The purpose of the demonstration project is to enable City of Battle Creek to evaluate the GORE® Cover technology, the operational process, and the system performance at its facility. The goal is to validate that the SG Mobile™ System utilizing the GORE® Cover is an approved solution for the organic waste treatment application in the City of Battle Creek environment.

The project will test and provide results for the following:

- Input material mix ratio as follows: (starting mix recipe values)
 - 1:1 by weight or 1:3 by volume biosolids to bulking material
 - Biosolids – typical of 18% to 24% cake solids
 - Bulking material – shredded/ground wood waste / green yard debris, etc....
 - C:N ratio of 1:25 to 1:30
 - Moisture between 55%-65% (or 35% to 45% dry matter)
 - Adequate porosity +35% to promote positive aeration in the process
- Finished product quality for producing a Class A compost
- Control of odors and emissions:
 - Odor evaluation by SG, Gore and Battle Creek staff using non-scientific methods (nose) to determine effectiveness of trial process for any noticeable odors.
 - Emission testing (i.e. VOC) not part of this trial.
- Design, operational, and environmental considerations for the composting application
- Confirmation of treatment time for system sizing, construction and design considerations



PROJECT PLAN

The project plan will outline the activities, equipment and responsibilities required for the pilot demonstration. Items are listed in order of importance; (A) required prior to demo start up, (B) required as part of installation, (C) required as on-going operations and support, and (D) required for decommissioning and final reporting.

Information in the following pages are part of the demonstration “progress report” and will be fill in as we collect the data, including pictures, analysis reports, control process graphs, weather data and special comments. Additional spreadsheets can be developed outside of this report and referenced in the final report.

1. Sample Collection and Analysis

a. Input Material Sampling

Input materials samples shall be collected and sent for lab analysis prior to installation of the demo equipment. Reported data will be used as baseline information and to confirm the initial mix in Batch #1 and subsequent Batches.

b. Batch Material Sampling

Batch material samples shall collected at pre-determined steps in the composting process. Reported data will be used as to confirm the initial mix and monitor the performance of the composting process.

Samples to be collected by City of Battle Creek staff and sent to:

Samples analysis recommended: 1 - 2 samples each batch or per every 3-4 month period.

- Input Material – individual feed stocks
- Mixed Material
- Phase 1 Material
- Phase 2 Material
- Phase 3 Material
- Pre-Screened Material
- Screened Material
- Storage Material

Soil Test Labs

**2925 Driggs Drive
Moses Lake, WA 98837
Phone: 509- 765-1622**

Chain of Custody Form and Test Group

C5: Input Materials, Mix, Phase 1, 2 and 3

C1: Final Test Pre-Screen, Post-Screen Storage and Aged Material



2. Equipment and Staff Requirements (Battle Creek)

Equipment and Staff required for the demonstration project.

Per Batch: 1-2 Operators for the following Days:

Day	Activity	Equipment
Day 1:	Mixing and Heap Construction Phase 1: 2 Days	1 Mixer, 1 Loader
Day 28:	Material Movement Phase 1 to Phase 2: 1 Day	1 Loader
Day 42:	Material Movement Phase 2 to Phase 3: 1 Day	1 Loader
Day 56:	Material Movement Phase 3 to Storage: 1 Day	1 Loader
Day 86:	Screening and Storage: 1 Day	1 Screen, 1 Loader

UNITS	ITEM	DESCRIPTION
All	Permitting	Obtain permits and approvals per the State or Local governing approving authority.
1	Equipment Acceptance	Receive pilot equipment and store prior to installation.
1	Compost Pad	Minimum 200 ft. x 50 ft. solid ground (concrete, asphalt, or as approved by SG)
1	Electrical Connection	480v 3phase 10-amp circuit to be installed and connected by licensed electrician Other power configurations may be available. Ask SG for details.
250 Tons/batch	Feedstocks	Adequate feedstock and bulking agent for 250 ton heap <ul style="list-style-type: none"> • Feedstock Recipe Mix • C:N of 25-30:1 • 55-65% Moisture Content • Minimum 35% porosity
1	Pre-treatment	Mixer or other for material recipe mixing Pre-treatment is defined as the activity associated with receiving and mixing of the input materials (manure with wood shaving and bulking material) into the mixed recipe in preparation for entering the composting process. Mixing equipment to be supplied by other.
1	Material Handling Machine	Front-End Loader or other machine for building heap 12 ft. high
1	Installation and Start Up Assistance	Assist SG Technician in the startup checklist and system testing to ensure proper functioning of the equipment
1	Heap Construction	Building of the heap, GORE® Cover placement, weighting system placement, flipping of heap for Phases 1-3
1	Post-treatment	Screening of final product
1	Equipment Shipment	Pickup by carrier of equipment for shipment back to SG
1	Lead Operator	Designated Single Point of Contact who will be responsible for operation of control system and system reporting.
8	Laboratory Testing	Sample, ship, and lab testing per SG protocol. All laboratory testing costs are CUSTOMER responsibility. Lab results shared by CUSTOMER, SG, and Gore.
Required	Insurance	Proof of Insurance as specified in Insurance Terms section

REQUIREMENTS FOR INSTALLING THE GORE® COVER SYSTEM

Following requirements are required:

Power Supply Options	480 Voltage, 3 phase
Electrical Connection to be performed by a certified electrician.	
Heap Dimension:	85ft x 26 x 10ft
Number of Heaps	1
Compost Pad: per unit	100ft x 30ft
Volume per Heap	530 cubic yards
Tons per Heap	250 tons



EQUIPMENT

Material Movement – mixing, heap construction/deconstruction and screening

- Front End Loader with:
 - 8-10 cubic yard - recommended

Loader should be capable to construct heap minimum height of 10-12 ft.

Pre- Treatment Mixing

Mixing Equipment Recommendation:

Wally Stimpert
Manager of Distributor & Gov't/Industrial Sales
620-338-0090 cell
620-225-1142 ofc.
wstimpert@rotomix.com

ROTO-MIX, LLC
2205 East Wyatt Earp Blvd.
PO Box 1724
Dodge City, KS 6780

Water Management

- Access to water
- Water Truck or Fire Hydrant (Potable or non-potable water source)

Post – Treatment Screening

- Rotating Drum Screen –
- Star Screen –

AERATION PIPES

Length per aeration pipe: 85 ft
Diameter outside: 6 inch
Material content: HDPE (High density polyethylene)
Wall thickness: 3/8 to 1/2 inch

- Weld the pipes together to get a final length.



- Pipe requires to be capped a one end using welded Cap with D-Ring or Bolted Flange End
- Hole pattern to be provided by SG technician during Installation



PERIMTER WEIGHTING SYSTEM

- 3 or 4 inch Plastic pipe in 10 ft sections capped and filled with sand/water
- Sand Bags
- Fire Hose



GORE® COVER STANDARD OPERATING PROCESS FLOW

Treatment Guideline: The recommend treatment time for the use of the standard GORE® Cover operating process is 8 weeks (4+2+2), which is the best management practice for active and curing composting to achieve a highest quality finished product output.

NOTE: Keep in mind that if the active and curing compost definition is met in a shorter time period than stated, than the designed facility will be capable to handle a higher amount of throughput in the same number of heaps or foot print. However, shorter treatment also can reduce the finished product quality.

It is Gore’s experience that the following treatment time period and phases will produce the highest quality of output while meeting regulatory compliance for PFRP/VAR and with optimal performance for control of moisture and odors/emission.

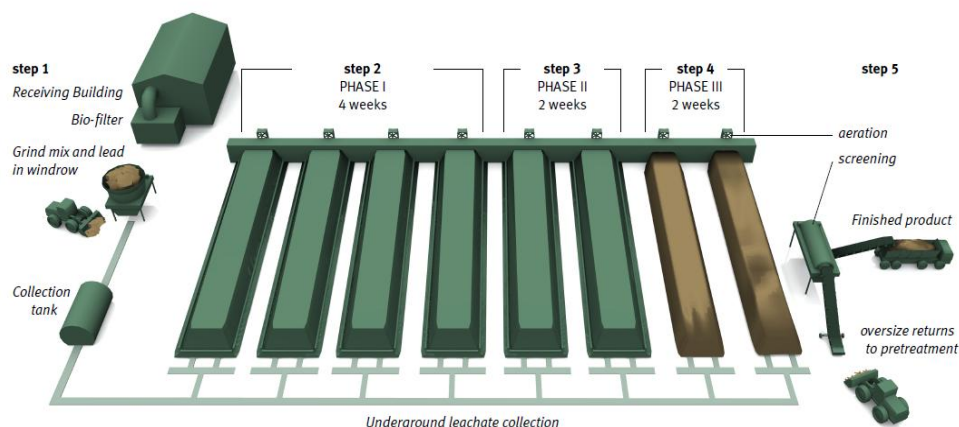
Active Composting: 14- 28 days: the phase of the composting process that begins when organic materials are mixed together for composting and lasts until one of the following conditions is met:

- The organic material emits no more than seven (7) mg carbon dioxide per gram of organic material (CO₂-C) per day; or
- The material has a Solvita® Maturity Index of 5 or greater; or
- The material has been composted for a period of at least 21 consecutive calendar days.**

Curing Composting: 14 - 21 days: the phase of the composting process that begins immediately after the end of the active phase of composting and lasts until one of the following conditions is met:

- The organic material emits no more than four (4) mg CO₂-C per gram of organic material per day; or
- The compost has a Solvita® Maturity Index of 7 or greater; or
- The material has been composted at least 40 consecutive calendar days including the active composting.**

Finishing Composting (optional): 14 days: the phase of the composting process that begins immediately after the curing phase of composting for the purpose of additional aging, temperature and moisture management prior to screening and storage.



MIX RECIPE and SAMPLING

Mix Recipe Recommendation: typical

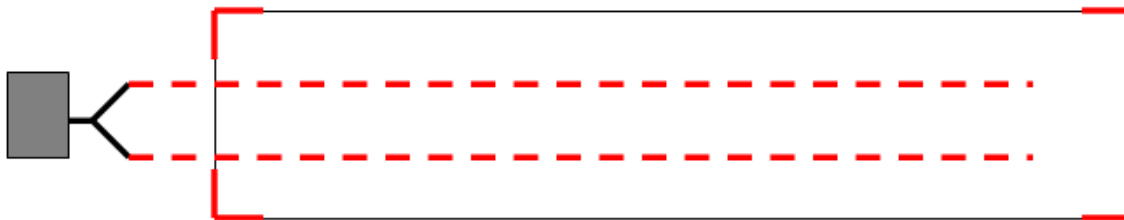
- Biosolids – dewatered to 15-30% dry cake solids
 - Moisture Content 70-85%
 - Bulk Density 1200 – 2000 lbs/y³
- Bulking Material – 1-1/2” to 3” shredded green waste and/or woodchip material
 - Moisture Content 35-50%
 - Bulk Density 400 – 600 lbs/y³
- Mix Ratio Range (Food Waste/ Biosolids to Bulking Material, may include screened overs)
 - By Weight: 1:1 to 1:2
 - By Volume: 1:3 to 1:5
 - Target Mix Bulk Density: ~800 to 1100 lbs/y³
 - Target Mix Moisture Content: ~45-35% solids (55-65% moisture content)
 - C:N ratio: 1:25 to 1:30
 - Porosity: ~35 - 50%

PHASE I

1. SG Mobile™ control box in position and power connected.
 - a. Attach Y-tube to control box
 - b. Attach flex-tube to Y-tube



2. Mark rectangular windrow shape and On-floor pipe layout with cones or spray paint
 - a. Length: 85 ft
 - b. Width: 26 ft
 - c. Double pipe: 2 straight lines starting at Flex pipe to end of heap rectangle 4 ft apart



3. Place a 2 - 6 inch base layer of shredded green waste or wood chips or over-screen material on the ground for the pipe placement.
4. Place the on floor Aeration Pipes and make connection to the Flex pipe.



5. Mix Material according to Mix Recipe Recommendations.
 - a. To be discussed during installation and training.
 - b. Mix recipe subject to change during the year due to seasonal fluctuations
6. Turn the blower to "ON" position on SG Mobile™ control box
7. Build a triangular windrow on the Aeration Pipes starting at the end closest to the SG Mobile™ control box.
 - a. Length: 85 ft (25m) Width: 26 ft (8m) Height: 10-12 ft (3 – 3.5m)
 - b. Build the heap “as tall as possible” creating a uniform trapezoidal shaped heap.



8. Cover the heap with the GORE® Cover
9. Place the perimeter weighting system (fire hose/sand bags/weighted pipe) on the yellow rim material of the cover and secure it with the black velcro loops.
10. Place the oxygen and temperature sensor in the probe port inlets on top of the GORE® Cover.
 - a. O2 Probe: Place on 45° angle with the probe head ~6 to 12 inches above the cover so the vent hole is unobstructed. Secure with lanyard.



- b. Temp Probe: Place vertical into heap with probe head directly push down to cover surface. Secure with lanyard.
 - c. Secure probe cables to cover using Velcro probe straps.
11. Turn the bower to "AUTO" position on control box
 - a. Open the Control Software and Start Control system on Oxygen Control as discussed during installation and training.
 - b. Optional control to Interval Control
12. Let the heap operate for 21 - 28 days.
13. Monitor daily the Control data.
14. Check daily probes for correct positioning, re-position if required.

After Phase 1:

1. Stop Control software. **Do not turnoff the power to the SG Mobile™ control unit.**
2. Take out the probes from the heap. **Do not unplug or disconnect the probes.** Place on probe holders on SG Mobile™ control box.
3. Take off the perimeter rim weight.
4. Turn the blower to "ON" position on SG Mobile™ control box
5. Uncover the windrow.
6. Disconnect the aeration pipes; pull them out form the heap.
7. Turn the heap with the front end loader, re-cover the heap with the GORE® Cover, place the rim weight and set in the sensors.

Samples analysis recommended:

1. Input Material – individual feed stocks
2. Mixed Material
3. Phase 1 Material

PHASE II:

1. Place a 2 - 6 inch base layer of shredded green waste or wood chips or overscreen material on the ground for the pipe placement.
2. Place the on floor Aeration Pipes and make connection to the Flex pipe.
3. Turn the blower in "ON" position on control box
4. Build a triangular windrow on the Aeration Pipes
 - a. Length: 85 ft (25m) Width: 26 ft (8m) Height: 10-12 ft (3 – 3.5m)
5. Cover the heap with the GORE® Cover
6. Place the weighting system (fire hose/sand bags/weighted pipe) on the yellow rim material of the cover and secure it with the black velcro loops.
7. Place the oxygen and temperature sensor in the probe inlets on top of the GORE® Cover.
 - a. Attention: Leave the vent hole of the O₂ Sensor above the inlet 6 to 12 inches.
8. Turn the bower to "AUTO" position on control box
9. Open the Control Software and –Re-Start Control system on Oxygen Control.
 - a. Optional control to Interval Control
10. Let the heap operate for 14 days.
11. Monitor daily the Control data.

After Phase 2:

1. Stop Control software. **Do not turnoff the power to the SG Mobile™ control unit.**
2. Take out the probes from the heap. **Do not unplug or disconnect the probes.** Place on probe holders on SG Mobile™ control box.



3. Take off the rim weight.
4. Uncover the windrow.
5. Disconnect the aeration pipes; pull them out form the heap.
6. Turn the heap with the front end loader, re-cover the heap with the GORE® Cover, place the rim weight and set in the sensors.

Samples analysis recommended:

1. Phase 2 Material

PHASE III:

1. Place a 2 - 6 inch base layer of shredded green waste or wood chips or overscreen material on the ground for the pipe placement.
2. Place the on floor Aeration Pipes and make connection to the Flex pipe.
3. Turn the blower in "ON" position on control box
4. Build a triangular windrow on the Aeration Pipes
 - a. Length: 85 ft (25m) Width: 26 ft (8m) Height: 10-12 ft (3 – 3.5m)
5. Cover the heap with the GORE® Cover
6. Place the weighting system (fire hose/sand bags/weighted pipe) on the yellow rim material of the cover and secure it with the black velcro loops.
7. Place the oxygen and temperature sensor in the probe inlets on top of the GORE® Cover.
8. Attention: Leave the vent hole of the O₂ Sensor above the inlet 6 to 12 inches.
9. Turn the bower to “AUTO” position on control box
10. Open the Control Software and Re-Start Control system on Oxygen Control.
11. Optional control to Interval Control
12. Let the heap operate for 14 days.
13. Monitor daily the Control data.

After Phase 3:

1. Stop Control software. **Do not turnoff the power to the SG Mobile™ control unit.**
2. Take out the probes from the heap. **Do not unplug or disconnect the probes.** Place on probe holders on SG Mobile™ control box.
3. Take off the rim weight.
4. Uncover the windrow.
5. Disconnect the aeration pipes; pull them out form the heap.
6. Turn the heap with the front end loader, re-cover the heap with the GORE® Cover, place the rim weight and set in the sensors.

Samples analysis recommended:

1. Phase 3 Material

SCREENING: Screen size depends on end product quality requirements.

Samples analysis recommended:

1. Screened Material

STORAGE: To be defined locally by end user to meet specified finished product quality.

Samples analysis recommended:

1. Storage Material prior to sale

PROJECT DATA COLLECTION AND REPORTING

SAMPLING: (Insert new pictures)

Input Material #1	Biosolids: Age: Moisture: Density:
	
	Samples Sent to Lab: Lab Report ID
	
Input Material #2	Bulking Material: Shredded Green Waste 3 inch minus Age: Moisture: Density:
	
	Samples Sent to Lab: Lab Report ID
	

Notes:

LAB ANALYSIS: (Insert new sampling schedule)

Samples	Field Testing	•
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MIX RECIPE/ MASS BALANCE CALCUALTIONS:
(Insert Photo Journal Section Input/Pre-Treatment for Actual Mix)

MOBILZATION

SHIPPING INFORMATION

Company Name			
Project Name			
Address			
City			
State/ Region			
Zip			
County			
Contact	Function	Phone	Email

SPECIAL DELIVERY INSTRUCTIONS:
Shipment #1: 2 pallets Control Box and Gore Cover
Shipment #2: HDPE Pipe (8x20ft sections) & PVC Pipe (20 x 10ft sections), plus box of caps

PROJECT SCHEDULE/ CRITICAL PATH

See Critical Path Chart

DATA REVIEW

Batch #1:

Batch #2:

Batch #3:

Final Report

Notes:

PHOTO JOURNAL / ACTIVITY LOG

Site Visit: December 2, 2017	
	

System Set Up & Installation (Insert new pics)	
Insert Date: Pipe welding for Aeration Pipe, End Cap, Hole Pattern	
Insert Date:: System Set Up, Electrical Hook Up and Software Check	

Input #1	Biosolids

Input #2	Bulking Material

Pre-Treatment Machinery Type:	RotoMix Horizontal Rotary Mixer truck mounted 620		
			

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Batch #1 Day 0- 28	Insert Date:
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Heap #1: Phase I	Phase I -28 days
Start [Date]:	
End [Date]:	
Testing Requirements	Input Materials and Mix
Testing:	
Control Setting	O2 Mode
Additional Note:	

System Placement	
Position Demo Control Box and placement of base layer of wood chips and on-floor pipe	
	

Batch #1 Mixing Day 1	Insert Date:

Batch #1 Mixing Day 2	Insert Date:

Gore® Cover placement	Insert Date:



Control System Data	Insert Date:

End of Phase 1:	Insert Date:
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Heap #1: Phase II	Phase II - 14 days
Start [Date]:	
End [Date]:	
Testing Requirements	
Testing:	
Control Setting	O2 Control
Additional Note:	

Turning Event for Phase 2	Insert Date:

Opening the Heap:	Removing Cover
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Deconstruct Heap for Phase 2	

Phase 2 Heap Rebuild
Sample 1-4 Collected

Phase 2 Heap Rebuilt

End of Phase 2:	Insert Date:
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Heap #1: Phase III	Phase III - 14 days
Start [Date]:	
End [Date]:	
Testing Requirements	
Testing:	
Control Setting	
Additional Note:	

Turning Event for Phase 3	Insert Date:
Pictures of Heap at End of Phase.	
Removing cover and set aside, cover not needed for Phase 3.	



Opening the Heap:	Insert Date:

Deconstruct Heap for Phase 3	Insert Date:

Phase 2 Heap Rebuild
Sample 1-5 Collected

End of Phase 3:	Insert Date:
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Deconstruct Heap for Phase 3	
Removed Phase 3 material and set aside for storage and screening.	

Sample 1-6

INSERT PROCESS CONTROL DATA, GRAPHS, WEATHER, LAB REPORTS, OBSERVATIONS



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Wilmington, DE 19801