

The GORE® Cover System

Membrane Covered Positive ASP Composting Technology

W. L. Gore & Associates

The company began in 1958, when Bill and Vieve Gore set out to explore opportunities for Fluorocarbon polymers, especially Polytetrafluoroethylene (PTFE). Within the first twelve years, Gore had wire and cables on the moon and operations worldwide.

Today, the Gore enterprise is comprised of approximately 10,000 associates in 45 locations around the world. Annual revenues top \$3.0 billion USD. Gore fluoropolymer products provide innovative solutions throughout industry, in next-generation electronics, for medical products, and with high-performance fabrics. Gore has repeatedly been named among the '100 Best Companies to Work for in America,' and the culture is a model for contemporary organizations seeking growth by unleashing creativity and fostering team-work.

While Gore may be best known for their GORE-TEX® fabrics, all Gore products are distinguished in their markets. Gore technologies and fluoropolymer expertise are unsurpassed.

GORE® Cover Introduction

The GORE® Cover system technology is the most widely distributed composting system in the world with over 200 facilities located in more than 20 countries treating more than 3.5 millions tons of organic waste annually. The system has proven to provide a low risk, cost effective solution which can sustainably process a wide range of organic waste in the most varied climate conditions while controlling odors and emissions. More importantly, its simplicity in both construction and operation ensures that a facility can be maintained many years into the future without escalating operating costs which is not often the case with other technologies. Facilities can be built to any size and can also be easily expanded after construction which provides the most flexibility to the end user during the development of its organics processing facility. Composting is the most logical component in any organics management program and we hope to add your project to the growing list of commercially and publically operated facilities across the globe that have chosen the GORE® Cover system as the best choice for composting their organic waste.

The GORE® Cover has been proven in facilities processing quantities from 2,000 to over 200,000 ton/year, in a variety of feed stocks including and not limited to; green waste, food waste, biosolids, animal manures, fish and animal waste and MSW.

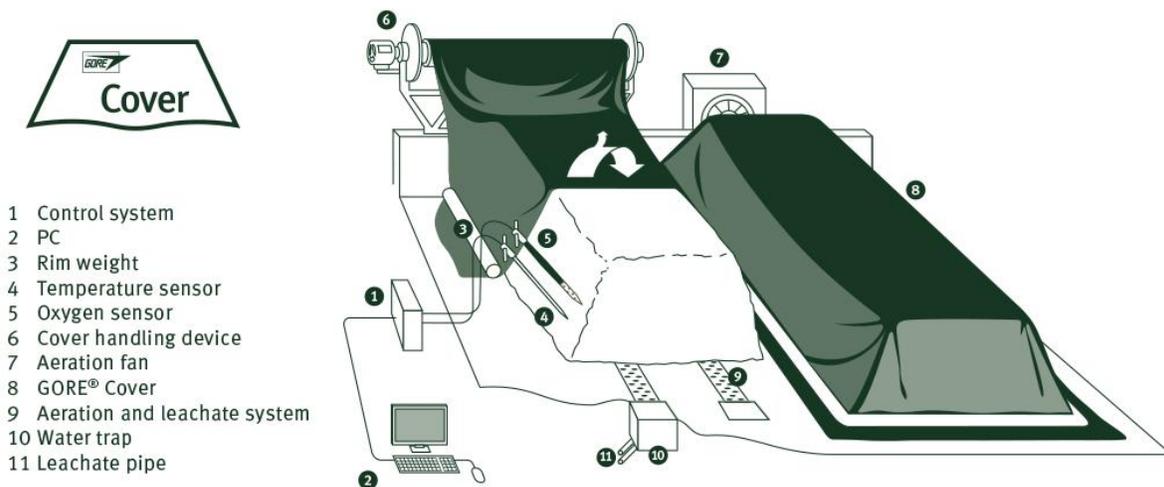
It has been implemented as a pre-treatment system for Waste-to-Energy facilities and existing Gore facilities have added "front end" anaerobic digesters (AD) to further optimize the process through the production of bio-gas.



Source Separated Organics, WA USA 2004

GORE® Cover System Supply Package

The GORE® Cover system will include all equipment supply and technical service as provided by Gore or a Gore certified authorized supplier or partner.



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The system supply includes:

- GORE® Cover
- In-floor aeration
- Oxygen and Temperature sensors
- Aeration system
- Controllers/data loggers and software
- Mobile Winder Machine
- Operation Manual
- Remote Wireless (Optional)
- Web Based System Monitoring, Inventory Management and Technical Support

The service supply includes:

- Experience gained from GORE® Cover System Global Users
- GORE® Cover System Guarantees and Warranty on covers and system components
- Engineering and System Design Consultation
 - Installation and Start Up Services
 - Post Commissioning and On Going Technical Support
- Comprehensive Training for Site Management and Operators
 - Classroom and On-site training
 - Training I – at a GORE® Cover System reference plant
 - Training II – during system check and start-up
 - Training III – 12 weeks after commissioning
- Additional Customized Trainings upon request
- Periodic Site Visitation and System Performance Check Up

GORE® Cover System

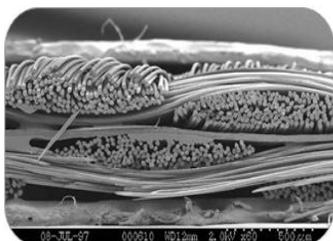
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W.L. Gore & Associate's "GORE® Cover" is centered on membrane laminate technology similar to that of its world famous GORE-TEX® fabrics used for outerwear and footwear. The integrated system includes the GORE® Cover, in-floor aeration, aeration blowers, oxygen and temperature sensors, controllers, computers, software, cover handling systems, training, engineering guidance, installation support and the experience gained through the many installations over the last ten years. Official certificates and approvals have been granted to the GORE® Cover as delivering "in-vessel" performance and approved in several countries, including USA and Canada, meeting strict PFRP and high quality compost standards, obtaining Animal by Product Approval as well as meeting strict regulatory compliance standards worldwide. In the United States, according to the EPA, for biosolids, the GORE® Cover heap model is currently categorized as a covered aerated static pile (CASP).

Facilities using the GORE® Cover technology experience a reduction in odor and is California compliant for reduction of VOCs through the GORE® Cover as recently proven in a demonstration for the Los Angeles County Sanitation Districts, CA USA (pictured right). Taking the odor dispersion modelling of a defined location with the same throughput into consideration the GORE® Cover System has been assessed as equal or better to a tunnel/building system using a biofilters as air treatment. The German Environmental Protection Agency showed that the GORE® Cover technology compared to other in-vessel and open windrow technologies showed lowest GHG emission, Gore having the best control. Other system attributes include a small facility footprint, low energy requirements, low operating costs, short installation times, greater than 99% containment of bio-aerosols and particulate matter, and the production of stable compost in 4-8 weeks.



Making the right choice of membrane impacts the air permeability and the extraction of moisture during composting. The membrane influences the composting process; it prevents the compost product from being too dry or too wet. The membrane allows for an even distribution of air through the entire volume of material, thus ensuring temperatures are achieved throughout the heap. The micro-porous structure of the GORE® Cover membrane practically avoids the penetration of microbes and particulate matter through the membrane.



Microbiological tests have proved that microbes can be reduced by > 99%, thus ensures that workers and nearby residents are protected and safe. The insulating effect of the GORE® Cover and the pressurization by which the system ensures even temperature distribution mean that achieving the necessary temperature for sanitizing (PFRP) the material across the entire cross section of the heap can be assured, even during the winter months and extreme climates. Pathogenic microorganisms are safely destroyed throughout the entire composting material.

Operating Process Description

Composting process can be as short as 2 weeks to as long as 8 weeks depending on the local regulations and end user finished product specification. Described below is typical 6-8 week 3 phase process.

Phase 1: High Rate Active Composting –21-28 Days (step 2)

The composting process begins with a front end loader moving the material from the mixing area to a heap in the Phase I section to begin the 3 phase – 8 week composting period. Once a heap is built, it is covered, the temperature and oxygen probes are installed and the software is turned on, which then controls the rate of aeration.

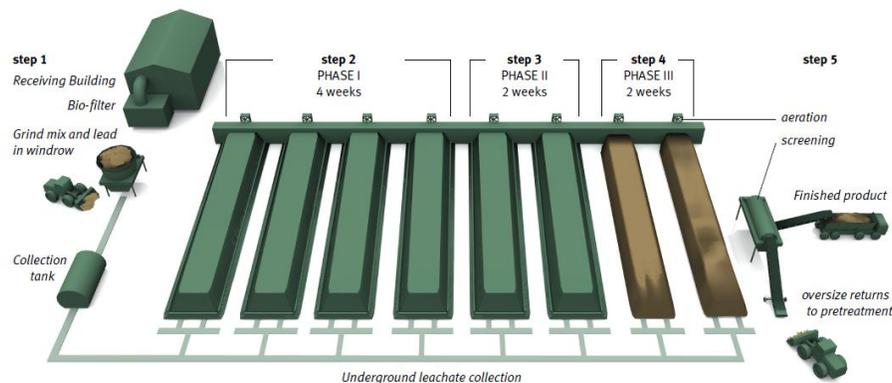
Phase 2: Maturation Curing Composting – 14-21 Days (step 3)

After 28 days in Phase I, the GORE® Cover is removed from the heap and the compost is moved by front end loader to a heap in the Phase II area. The material remains in the Phase II area for 2 weeks.

Phase 3: Finishing – 14 Days (optional) (step 4)

After 14 days in Phase II, the GORE® Cover is removed from the heap and the compost is moved by front end loader to a heap in the Phase III area. By the time the material reaches Phase III the compost is sufficiently stable such that the cover is not required. In some cases, such as extreme hot or cold climates, some facilities may option to cover Phase III. The material remains in the Phase III area for 2 weeks.

Typical Composting Operation Layout:



Process flow chart

The GORE® Cover heap model utilizes composting with forced aeration coupled with a semi permeable membrane cover. A standard heap is 26 feet (8m) wide at the base, 165 feet (50m) long and 10-12 feet (3 – 3.5m) in height, each heap contains approximately 1,000-1,200 cubic yards of composting material. The size and number of heaps is determined based on the total capacity of the project. The heaps are the same size in each of the three Phases. GORE® Covers are used only in Phase I and II. Each heap may have a concrete head wall and side walls to retain the material in each heap on the compost pad. Two aeration trenches are under each heap. These trenches serve as ducts to provide air to the heap and also to collect leachate coming from the heap. Each heap has a blower to provide air to the composting material via the aeration trenches. The trenches are cast in concrete to provide a solid impervious surface. The entire compost pad consists of a concrete slab or asphalt, which allows for the collection of all storm water and leachate.

Power Requirements/ Energy Consumption

The energy demand by the GORE® Cover system is calculated at 1.5 - 2.0 kWh per ton of throughput, plus the energy used for adjacent equipment, facilities and fuel used for the movement of material. The mobile winder used to deploy the GORE® Cover meets regulatory emission control standards (including California) and is capable to operate in extreme cold climates. The GORE® Cover process is known for having the total lowest cost to operate as compared to other technologies.

Process Control Mechanism – Positive Aeration in Combination with GORE® Cover

GORE® Cover is based on positive aeration in combination with the GORE® Cover. Composting is a biological process with naturally occurring batch to batch variations in input material. The processing technology has to flexibly adapt to these changing conditions. The oxygen controlled aeration of the GORE® Cover System reliably adapts the aeration intensity to the batch by batch variations as well as to the changing oxygen demand in the course of the composting cycle.

- The GORE® Cover has unique physical properties in regards to air permeability which is selectively designed into the membrane and allows evenly distributed air and pressure within a heap.
- The GORE® Cover has unique physical properties in regards to control of moisture transportation which is selectively designed into the membrane and allows specific control of moisture to optimize the composting process.
- The GORE® Cover is weighted (sealed), creating a complete in-vessel enclosure the entire pile can then be pressurized ensuring an even distribution of air throughout the pile.
- The GORE® Cover has even distribution of temperatures across the composting volume.

