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# Gas Impermeable Film and Sheet for Control of Methane and Odors in Agricultural Applications

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**Species:** Swine, Dairy, Beef, Poultry  
**Use Area:** Manure Storage/Treatment  
**Technology Category:** Cover  
**Air Mitigated Pollutants:** Odor, Methane, Ammonia

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## System Summary:

For many years, food packaging has incorporated barrier layers to contain odors, flavors, oils and moisture along with the food contents while excluding contamination and oxygen. Until recently, agricultural films and geomembranes were monolithic structures employing only a single polymer or blend. Recent advances in extrusion and lamination equipment allow the incorporation of these barrier layers in large scale agricultural structures and operations such as floating covers over animal waste storage, containment geomembranes for biogas generation, silage storage and fumigation films.

Co-extruding a thin layer of ethylene vinyl alcohol (EVOH) in a linear low density polyethylene (LLDPE) geomembrane dramatically reduces the permeability to a wide range of gases and volatile organic carbon molecules including: methane, ammonia, carbon dioxide, oxygen, aromatic hydrocarbons, aliphatic hydrocarbons, methyl bromide and most odorous compounds. Methane permeabilities for four geomembranes are given below.

### Methane Permeability (cc/(m<sup>2</sup>·day))

PVC	LLDPE	HDPE	Barrier LLDPE
0.76 mm (30 mils)	1.0 mm (40 mils)	1.0 mm (40 mils)	0.5 mm (20 mils)
900	690	300	<1

## Applicability and Mitigating Mechanism:

- Barrier to noxious gases and odors
- Useful in cover and containment systems

## Limitations:

- EVOH is a crystalline polymer and is not elastic. It is flexible but should not be used as part of an elastomeric structure.

## Cost:

Engineered floating covers with ballasted weight systems, gas extraction systems and rainwater removal systems costs vary greatly. For waste lagoon of about 1/2 acre in size, the cover system can cost from \$150,000 to \$200,000. Addition of the barrier layer to the geomembrane adds less than \$5,000.