

A practical guidance for earlier landfill gas capture

The SWANA Applied Research Foundation provides an updated guidance on horizontal landfill gas collection systems.

This report was originally prepared by the SWANA ARF staff and the SWANA Landfill Gas and Biogas Technical Division with input and guidance provided by the ARF Disposal Group Subscribers. In addition to the primary authors, this report was reviewed by Bill Dillon, SCS Engineers; Nicole Burkhardt, Delaware Solid Waste Authority; and Michael Jensen, WM.



Photo courtesy of SWANA.

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Horizontal landfill gas collection systems have long been used as a practical tool for collecting landfill gas during active filling, before final grades are reached and before conventional vertical wells can be installed. As landfill operators face continued pressure to

solution if properly designed and maintained.

A recent SWANA **Applied Research Foundation** (ARF) report on horizontal landfill gas (LFG) collection systems provides updated guidance for solid waste managers, engineers and landfill operators seeking to design, install and operate these systems more effectively.

Subscribers to the SWANA ARF collectively determine topics for research to support the industry. This research topic, submitted by ARF member Sarasota County, Florida, sought to understand the “durable design and practical application of horizontal landfill gas extraction wells that incorporate best practices for implementation methods and operational considerations.”

Overview of horizontal collection systems

The report responds to an industry need for practical best practices, particularly for systems that also promote passive liquids conveyance to the leachate control and recovery system (LCRS). Starting with an overview of horizontal landfill gas collection systems, the report describes the pros and cons of these systems, the types of horizontal collectors and design considerations including material selection and how to account for site-specific circumstances. It also reflects input from landfill operators and technical experts who have used these systems in real-world operating conditions.

Horizontal landfill gas collection systems are engineered gas extraction systems installed laterally within the waste mass, typically in active or advancing waste lifts. They generally consist of perforated or slotted collection piping placed in shallow trenches, surrounded by permeable backfill, such as gravel and connected to header piping and the landfill’s active vacuum system. Unlike vertical wells, which are typically installed after sufficient waste depth has accumulated, horizontal collectors can be placed during filling. This allows operators to begin collecting gas earlier in the life of a landfill cell.

That early access to landfill gas is one of the main advantages of horizontal collectors. They can be installed quickly, often with an excavator and a relatively small construction crew, without the need for a drill rig. This makes them useful in active areas where conventional wells may not be practical, where waste depths are still shallow or where operators need to respond quickly to odors or surface emission monitoring exceedances. They can also help bridge the gap between initial waste placement and the later installation of a permanent vertical well network.

Horizontal collectors are not a replacement for a full landfill gas collection system, but they can be an important complement to one. In many cases, they are used in combination with vertical wells and other extraction components as part of a broader gas collection and control strategy. They provide strong value when planned in coordination with the landfill’s fill sequence, interim grades, drainage conditions and future gas system layout.

performance depends heavily on design details. Drainage is one of the most important design factors. Landfill gas contains moisture and condensate forms as warm gas cools within the collection piping.

Leachate also can enter from surrounding waste, particularly in wetter areas. If liquids accumulate in the pipe or trench, they can reduce gas flow, block vacuum transmission and significantly diminish system performance. For this reason, horizontal collectors are typically installed with a positive grade to direct liquids toward a defined removal point.

Liquid management strategies vary. Some collectors are sloped toward the wellhead, allowing condensate and leachate to drain to an accessible location where liquids can be removed. Others are sloped away from the wellhead toward a designed low point, sump, stone column or connection to the leachate drainage layer.

In many installations, a stone column or similar feature is installed at the low point of the trench to allow liquid removal and reduce the likelihood of flooding. Where feasible, tying these features into the leachate drainage layer can improve long-term drainage and help protect gas collection performance.

Advantages and limitations to horizontal collectors

The report identifies several common types of horizontal collectors—including slope collectors, toe collectors and floor collectors—and describes how each is suited to different operating conditions. Each configuration has advantages, but all require careful coordination with landfill operations.

There are several advantages to horizontal collectors. They can be deployed quickly, support earlier gas collection and provide a cost-effective means of improving emissions control in areas where vertical wells are not yet feasible. They can also help operators manage gas in shallow waste areas, advancing fill zones and interim slopes. For facilities working to reduce methane emissions, minimize odors and maintain compliance during active filling, these benefits can be substantial.

The limitations are equally important to recognize. Liquid accumulation is a recurring challenge and can cause lines to become ineffective if not addressed. Clogging and pipe damage are also risks. Because horizontal collectors are generally installed during cell development or near the surface, they are less effective as a long-term extraction method once a landfill approaches final grades and has little remaining airspace.

Case study input from landfill operators reinforces these lessons. Landfill operators emphasized the importance of considering the waste surrounding and covering the collectors, since fines, certain waste types, pipe damage and calcium carbonate deposits can

Wellhead design is a key factor. Wellheads are often placed on exterior slopes, benches or other stable areas outside active filling zones to improve access and reduce damage risk. There are different types of wellheads and connection options and the selection will depend on the site needs and site geography. Trench and backfill design also influence performance. Because landfill conditions change over time, designs should account for settlement and avoid creating unintended low points that can trap liquids.

Configuring the gas collection system

Horizontal landfill gas collection systems work best when they are designed for the specific site. They are most effective when liquid management is built into the design from the beginning, when wellheads and removal points remain accessible and when the collector layout is coordinated with filling plans, cover placement and the future vertical well network.

The report provides practical steps and guidance for design best practices to support your system. For landfill operators, the practical takeaway is not simply that horizontal collectors can be useful, but that their success depends on planning. They should be treated as part of an integrated gas collection strategy.

With appropriate pipe selection, drainage features, trench design, wellhead access and operational monitoring, horizontal collectors can help capture gas earlier, reduce fugitive methane emissions and improve environmental performance during active landfill development.

As methane reduction remains a priority across the waste and resource management sector, updated guidance on horizontal landfill gas collection systems is timely. These systems have been used for decades and modern landfill operations require more deliberate design and more attention to liquids, settlement and long-term adaptability. When applied thoughtfully, horizontal collectors can give operators a flexible and effective tool for managing landfill gas before permanent infrastructure can be fully deployed.