New Choices to Improve Long-Term Gas Collection Well Performance

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Vertical gas collection wells are the most widely used method of landfill gas collection, but there are challenges to this method that reduces their long-term performance and make expanding vertical wells difficult.

One common challenge is vertical wells filling with liquid, which results in a slow decline in collection performance—often to the point that maintaining Title V compliance and providing enough gas for a landfill gas-to-energy (LFGTE) project becomes difficult.

Another challenge is extending vertical wells up as waste-filling progresses, which is often done with solid pipe and, ultimately, reduces the gas collection area.

Although both problems have partial solutions, fixes are expensive and labor intensive. Like many landfill operators in Florida and across the country, the New River Solid Waste Association, with assistance from Jones Edmunds and Dr. Tim Townsend’s research team at the University of Florida, has worked to resolve these problems.

Eliminating the Need to Dewater
To eliminate the need for long-term dewatering, a bottom-up approach was devised—allowing liquids to constantly drain to the bottom liner and directly into the leachate collection system. This new drainage system has been named the “i-well” to represent the inverted nature of the well itself.

Traditional vertical wells are difficult to raise as waste-filling progresses. Solid, non-perforated, well piping is added to extend the well vertically. Although this provides a temporary solution, as the amount of solid pipe increases, the well’s ability to collect gas from freshly placed waste is virtually eliminated. I-wells, however, are constructed using solid pipe that is vertically extended as waste is added to the area (see Figure 1).

The i-well should be constructed at a relatively low elevation in the filling plan to maintain a good drainage connection to the leachate collection system and allow the well to drain freely. As a result, its use must be planned in advance of waste filling.

Ideally, the initial construction of the i-well is completed as part of a new bottom liner system so that the horizontal piping is on a solid foundation and will not settle; however, this is not a requirement. At the NRRL, whole tires are allowed by FDEP to be used as an alternative to gravel and provide a much larger void space around the perforated pipe than traditional gravel, thereby increasing the path for gas to migrate. During the initial phase, the i-well can be used as a horizontal collection

Figure 1 - Configuration of i-well at New River Regional Landfill.

Figure 2 - The Termite in use.
point; once waste-filling above the i-well reaches the final elevation, it can be used as a vertical collector.

Maximizing Gas Collection
To realize its full potential as a gas collection well, solid vertical pipe needed to be converted to perforated pipe as the landfill rises. This was not a viable option until recently. A common practice in using traditional vertical wells is to extend vertical wells with solid pipe as waste-filling progresses. A well will often have several vertical extensions that could result in 40 to 60 linear feet or more of solid pipe in the well. This practice effectively eliminates the well’s ability to collect gas from more recently placed and high gas-producing waste. The only practical way to solve this problem is to drill new wells that cost $100 to $125 per linear foot. In practice, frequent drilling of new wells is cost prohibitive, and new well construction is usually delayed until final elevations in the area are reached. This results in delayed landfill gas collection from the most productive area of gas generation.

Rather than drilling a new well, the existing well or i-well can be modified to perforate a portion of the solid pipe. ENERGYneering Solutions Inc., based in Sisters, Oregon, developed a new tool called the Termite Well Perforator™ specifically to perform this function (see Figure 3). The Termite is placed down the well, much like a pneumatic dewatering pump. The device is set to predetermined elevations and drilling patterns.

Once the setting for a well has been input, the device functions semi-automatically to complete the drilling in each well. It is then removed and inserted into the next well in the refurbishment program.

The ability to perforate an extended solid pipe in this manner after installation is a true milestone in landfill gas collection system design and operation. The device is being used for the first time in Florida at the NRRL and has produced promising results.

As wells are modified, NRRL staff carefully documents well performance to provide verified field data to determine the value of using the device.

The estimated cost to perforate the solid pipe in the i-well or refurbish a well is $25 to $35 per linear foot. This provides greatly reduced construction costs and the opportunity to collect gas as soon as possible.

Concluding Thoughts
Like any new technology, the i-well and the Termite have pros and cons and their full capabilities and limitations have yet to be determined. One potential limitation to modifying vertical wells is that the wells were not constructed with this intent and lack a gravel pack around the solid well pipe. The ability to extract gas in these cases will vary from site to site.

Data collected at NRRL and Baseline Landfill will help predict the modified wells’ performance when not using a gravel pack. In the future, wells could be extended using a gravel pack to avoid this problem.

It is exciting to see new innovative technologies being evaluated to help Florida’s solid waste industry find ways to increase landfill capacity while maintaining and expanding landfill gas collection efforts. We hope to continue to share and be a part of this work to find solutions that reduce costs and make operations even more effective throughout the state.

For more information, contact Joel Woolsey, at (352) 377-5821 or visit www.jonesedmunds.com.

Photos courtesy of Jones Edmunds & Associates, Inc. and ENERGYneering Solutions Inc.

Figure 3 - Close-up of the Termite Well Perforator™.
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