The challenges of anaerobic digestion

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DAIRY farmers confront a continually shifting slate of challenges. Anaerobic digesters hold a promise to address many of today's top priorities, including manure management, odor control, and environmental constraints. Yet, installing a digester is not without its problems. There are only about 100 digesters operating in the U.S., representing about 1 percent of the farms which could cost-effectively take advantage of their benefits.

Because this leaves a substantial renewable energy resource (as well as revenue potential) untapped, the California Energy Commission wanted to understand the factors that contributed to farmers' motivation to install an anaerobic digester and the challenges they encountered along the way. To do this, they sponsored a survey to collect firsthand information about the experiences of those farmers who took the initiative to install an on-farm digester.

This project interviewed farmers whose experiences ran the gamut from fully operational digesters to those who started but subsequently decided to abandon their projects. The survey consisted of the 64 farmers who were recipients of federal funding for digester systems in 2003 and 2004 under the Farm Security and Rural Investment Act of 2002.

As would be expected, the digester projects funded by the farm bill were most commonly found in dairy-producing states. Dairy farms comprised 61 of the 64 farms. Herd size ranged from 400 to 4,000 cows.

Why a digester?

The sampled farms had similar motivations to install an anaerobic digester. All of the farmers interviewed were looking for improved methods for coping with manure. Ninety-seven percent cited odor control as a top priority. Everyone regarded a digester as a way to increase herd size without making odors worse. Many farmers expressed concern about environmental protection. A common feeling among many was expressed by one who said, "One of the big priorities for implementing the digester is to preserve our natural resources."

The farmers in this sample received farm bill grants to implement an anaerobic digester specifically to produce renewable energy. However, generating electricity to sell or to offset electrical bills was one of their lowest priorities.

Surveying all grant recipients, regardless of the status of their digester project, teased out the stumbling blocks to a successful digester. Although producing electricity was a low priority for most of the farmers, it was a requirement under the farm bill grant. But negotiating an acceptable agreement with the local utility was reported to be a major challenge. Difficulties and delays in the negotiation process often resulted in cost overruns and higher payments on loan interest.

Electricity sales disappointing . .

On the whole, the farmers also weren't happy with the relatively low rate they were paid for the electricity they generated compared to what they paid to purchase electricity for farm use. Many were under the impression that sales of additional electricity would help recover some of the high cost of implementing a digester and were disappointed when this was not the case. They also were bothered by the long-term contracts the utilities offered that locked them into a fixed rate even if the price for the electricity they purchased went up.

Finally, many weren't pleased by the high cost of electrical upgrades that were often required in order to interconnect with the electrical grid. In particular, policies that required them to pay for installation of interconnection infrastructure — such as poles, transformers, and switches — that was not located on their land and would become the property of the utility were viewed as unfair.

At the time of the study, 40 percent of the projects were developed, 45 percent delayed, and 15 percent of the farmers refused the grant and discontinued their plans for an anaerobic digester. Each category portrayed a different experience.

Discontinued projects. The farmers who dropped their intentions to build an anaerobic digester were able to make their decision early in the process. They had problems securing financing and finding a suitable design. In general, they were in favor of using new technologies to manage their manure, but they found the limitations of a digester too great: poor design, time-consuming operation and management, and inadequate serviceability. As one said, "It should be as easy to operate as a milking machine." Another noted that the technology needs refining in order to operate efficiently in cold climates.

Looking back to their original motivations, this was the only group which showed motivation by the prospect of electricity sales. With the widespread concern over low milk prices at the time and a lack of available financing, they had concerns about profitability.

Delayed projects. Negotiating electricity sales and offsets was identified as the greatest challenge for those whose digesters were on hold. In many cases, these negotiations were the cause of the delay. Farmers in this group generally had passed the hurdle of selecting a system and designer, although arranging for project financing was rated somewhat challenging, particularly in locations where the local bank did not have experience financing digesters. Even in the top dairy states, farmers in this group were worried that lenders may be holding off while they evaluate the success of existing anaerobic digesters.

Developed projects. Overall, the farmers whose projects made it to either the construction stage or were fully operational were tenacious. These entrepreneurs sought out benefits beyond those traditionally derived in order to produce a profit center for the farm — from tipping fees for accepting food wastes from nearby processors to sales of digested solids as compost and bedding. Despite their generally positive experience, they identified working with the utility as their greatest challenge despite a prior good working relationship.

What it means . . .

Most farmers did not apply for the farm bill grants in order to produce energy. The farmers in this sample were motivated to install an anaerobic digester primarily as a way to address manure management, odor control, and environmental impact. These factors do not result in a monetary payback, but farmers seemed to accept them as necessary business practices for large farms and recognized their value in maintaining good neighbor relations. Most viewed the production of electricity as a welcome secondary benefit that could allow them to recoup some of the costs associated with the system. But many farmers found negotiating with the utility to be such a challenge that they did not move forward if financing the digester project depended on selling electricity.

Despite their difficulties, the farmers in this sample were overwhelmingly in favor of the technology. When asked if they were starting all over again would they still consider an anaerobic digester, 92 percent responded yes.

The authors are president of Resource Strategies, Inc., Madison, Wis., (www.rs-inc.com) which conducted the research, and project manager with the California Energy Commission PIER Renewables Program (www.energy.ca.gov) which funded the project EC-500-2006-115A X. The full report is available for download on both websites.