

STANDARDIZING EVALUATIONS OF PERFORMANCE OF SYSTEMS USED BY LIVESTOCK PRODUCERS FOR BIOGAS PRODUCTION AND UTILIZATION.

Background

Anaerobic digestion of livestock manures under controlled conditions to produce biogas (a mixture of methane and carbon dioxide) can provide livestock producers with the opportunity to increase net farm income typically by using the biogas captured to generate electricity for on-site use or delivery to the local electric utility or both. This biogas utilization approach also provides the opportunity for the utilization of captured engine-generator set waste heat to reduce on-farm demand for conventional fuels (e.g. fuel oil and propane) for water and space heating. Although the direct combustion of biogas for on-farm water and space heating in place of conventional fuels also is an option, use of direct combustion as a biogas utilization option has been rare primarily due to diurnal and seasonal variation in demand. An added benefit of the anaerobic digestion of livestock manures is the reduction of the potential negative impacts of these wastes on air and water quality including but not limited to reducing the emissions of methane, a greenhouse gas with approximately 21 times the heat trapping capacity of carbon dioxide. Therefore, producing, capturing, and using manure biogas as a fuel reduces both the emissions of carbon dioxide from fossil fuel combustion and the naturally occurring emissions of methane that occur during livestock manure storage.

After a hiatus of about 15 to 20 years, interest in the anaerobic digestion of livestock manures with biogas capture and utilization reemerged during the mid to late 1990s. This was due, at least partially to the efforts of the U.S. Environmental Agency's AgSTAR program to promote the air and water quality benefits of anaerobic digestion as a component of livestock waste management systems. Also contributing to this reemergence of interest has been the availability of financial assistance from federal and state sources. In FY 2003, financial assistance for the anaerobic digestion of livestock manures under Section 9006 of the Farm Security and Rural Investment Act of 2002 (PL 107-171) was approximately \$9,000,000 and increased to about \$12,000,000 in FY 2004. In addition, the Natural Resources Conservation Service (NRCS) provided approximately \$500,000 for the construction of anaerobic digestion systems for livestock manures in FY 2004 under Section 2301 of PL 107-171 and about \$10,000,000 over several years to the California Chino Basin centralized digestion project. Concurrently, several states; including New York, California, Wisconsin, and Colorado; have developed programs that actively encourage livestock producers to utilize anaerobic digestion in livestock waste management systems to provide a renewable source of energy.

Currently, the AgSTAR program estimates that there are about 180 anaerobic digestion systems for livestock manures either in operation or in some stage of planning or construction. Of those systems currently in operation, many have been operating continuously for several years

demonstrating that the technical difficulties experienced with the first generation of this technology in the late 1970s and early 1980s have been successfully resolved. However, many livestock producers remain reluctant to make the necessary financial investment, which is significant, due to uncertainty about process performance and the ability to recover the capital invested. The primary source of this uncertainty is what at least appears to be seemingly conflicting information about process performance and generally minimal and incomplete information about costs and revenues to offset costs. This is a reflection of the lack of a generally accepted methodology or protocol for assessing and characterizing performance and assessing financial viability. Thus, livestock producers currently lack the basis for making a fully informed investment decision regarding biogas production and utilization and to rationally evaluate available system design options. In addition, anecdotal information suggests that commercial lending institutions also have been reluctant to provide financing because of the inability to rigorously assess financial viability. Therefore, the ability to realize the potential value of livestock manures as a renewable source of energy as well as the associated environmental quality benefits is being unnecessarily constrained.

Proposal

Discussions about the need for a generally accepted methodology or protocol for quantifying the performance of anaerobic systems for manure biogas production and utilization and the need to establish minimum performance standards began at the AgSTAR National Conference in March 2004 and continued at the Association of State Energy Research and Technology Transfer Institutions (ASERTTI) October 2004 meeting. At both meetings, the attendees agreed that a generally accepted protocol for quantifying performance is a critical need and is a necessary prerequisite for establishing any national database that provides useful information. The discussion at the ASERTTI meeting concluded with the recommendation that a workshop be organized to initiate the process of establishing generally accepted performance assessment protocols for manure biogas production and utilization systems and to explore options for establishing a national database. With the establishment of standard methods for quantifying the performance of manure biogas systems, questions about the validity of the data assembled in a national database should be addressed.

In recognition of the need for general acceptance by the various stakeholders with interest in manure biogas production and utilization, the ASERTTI Digester Performance Partnership was created.