Small Scale Anaerobic Digestion by PENERGY Solutions

Overview
For most farmers in Pennsylvania, the growing season ends in November. For greenhouse growers, the environment must be maintained to promote plant growth, usually by wood-fired boilers. By generating biogas through anaerobic digestion of swine manure, fuel can be collected and burned in a gas furnace, providing radiant heat for hydroponic greenhouses and pig stalls.

Objectives
The goal of this project is to create an inexpensive and easy-to-build system that will serve as a model for potential use on small farms to benefit food production, both on plants and animals. This would provide a means for owners of small-scale and hobby farms to produce valuable food products with less feed cost outlay and with little or no fossil fuel consumption and hence energy costs. Ideally, the system would not require any fossil fuels for energy consumption to run the operation. Energy would be generated and used in the system by products (feedstock, manure, plant debris) produced on the farm. Energy (biogas) and products (manure compost and effluent) gained from the system, would then be recycled back into the farm.

The PENERGY Solutions Approach
- Initial Sponsor Meeting and Project Description
- Drafting of Team Charter and Assigning of Roles
- Define Customer Needs and Analyze Engineering Specifications
- Development of Risk Plan
- Concept Design Generation
- Reassess Customer Needs and Concept Selection
- Prototype Manufacturing Process Plan
- On-Site Manufacturing and Testing
- Develop Recommendations for Project Improvement

Outcomes
The engineering team has designed and built the following, using the PENERGY Solutions approach:
- A mechanical anaerobic digester to handle organic farm waste.
- A complete biogas collection system with hook-ups to a gas burner.
- A radiant solar collector to provide heat without biogas burning.