High temperature, air-blown gasification of animal waste for energy production on the dairy farm

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One of the primary difficulties facing the New York dairy farmer is the proper disposal of excess dairy manure. These challenges will be compounded by the tightening environmental constraints concerning non-point pollution from farm runoff. New York State boasts the third largest dairy herd in the nation. Seven hundred thousand dairy cows produce 1.7 billion dollars worth of milk amounting to 56 percent of the agricultural cash receipts of the state. With debt to equity ratios averaging over 18 percent, a profitable, low overhead solution is required.

The advanced high temperature, air-blown gasification system investigated in this study addresses all of these concerns. Excess dairy waste is converted into low BTU fuel gas while minimizing additional overhead for the farmer. The clean syngas can be utilized to supply the farm's energy needs, or could be sold as another income source. This gasification method is particularly suited to this application for a number of reasons. Dairy manure presents many challenges as a feed stock because of its high variability and low heating value. The fixed, ceramic pebble bed contained in the gasifier provides the flexibility in retention time required to properly process a biomass fuel. The high temperature air preheater facilitates high conversion efficiencies despite the low heating value of the feed fuel.

A moderate size New York State based dairy farm (100-200 head) was used as a case study for this analysis. The study found that gasification of dairy waste allowed the farm to be energy self-sufficient, eliminated many environmental constraints on the farm, and created opportunities for increased herd size.