RESEARCH ABSTRACT

ENVIRONMENT

Title: Effect of Adding Sawdust and Corn Stover on Thermochemical Conversion of Swine Manure into Crude Oil – **NPB #08-076**

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Scientific Abstract

Thermochemical conversion (TCC) is a chemical reforming process of organic polymers in a heated enclosure, usually in an anoxic or very low oxygen environment. The products are liquid oil, char and gases, depending on operating conditions. The TCC process has been applied to the processing of livestock manure − a costless feedstock, not only for renewable energy production but also for waste reduction and treatment.

In previous research work, a batch TCC reactor was developed and a systematic investigation on process parameters, including operating temperature, type and initial pressure of process gases, retention time, total solids content and feedstock pH levels, was conducted (He, 2000). Effects of manure storage time and sources were also investigated.

As swine manure on a swine farm usually has a high water content (90% or even higher), heating it directly may be a huge waste of energy. Dewatering or concentrating may also be expensive. On the other hand, cellulosic biomass, a large portion of which is produced as wastes, could be a choice to increase the solid content of feedstock for the TCC process.

Blending cellulosic materials with swine manure varies the oil characteristics, but appears not to affect the conversion of the swine manure volatile solids to oil. The process was evaluated in terms of refined oil production efficiency. When KOH was added as a catalyst, it increased the refined oil yield, especially when the amount of sawdust fraction was predominant. A large portion of nutrients that have fertilizer value (nitrogen, phosphorus and potassium) remained in the post-process water (2/3 for N, 1/3 for P and about 100% of K), and thus, could be extracted as fertilizer with appropriate methods.

Biomass conversion studies in the early 1970's showed that conversion of wood sludge into renewable energy was technically sound, but not economical (Jones and Radding, 1978), primarily due to the low price of fossil oil and high cost of feedstock (wood sludge). Economic evaluations by the University of Illinois' licensee for commercialization of the technology suggest that the TCC technology may be economically feasible once the design and operations are perfected for production scale applications.