

## ASSESSMENT OF SMOULDERING AS AN EFFICIENT AND LOW-COST ALTERNATIVE FOR MANAGEMENT OF AGRICULTURAL SOLID WASTES

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### Project Description

Smouldering combustion has emerged as an alternative treatment option for organic solid wastes with high moisture contents (80-85% wt). The key advantage of smouldering technology is that stable process performance can be achieved at very high moisture content without the need for external fuel and/or energy input. This key feature allows for treatment of problematic wastes such as paunch solids where alternate treatment methods (e.g. anaerobic digestion) are currently not economically attractive. As a guide, smouldering can reduce 1 ton of dewatered paunch waste (moisture content 75-80% wt and organic solids at 90% DM) to approximately 20-30 kg of ash, without the need for external fuel or heat input.

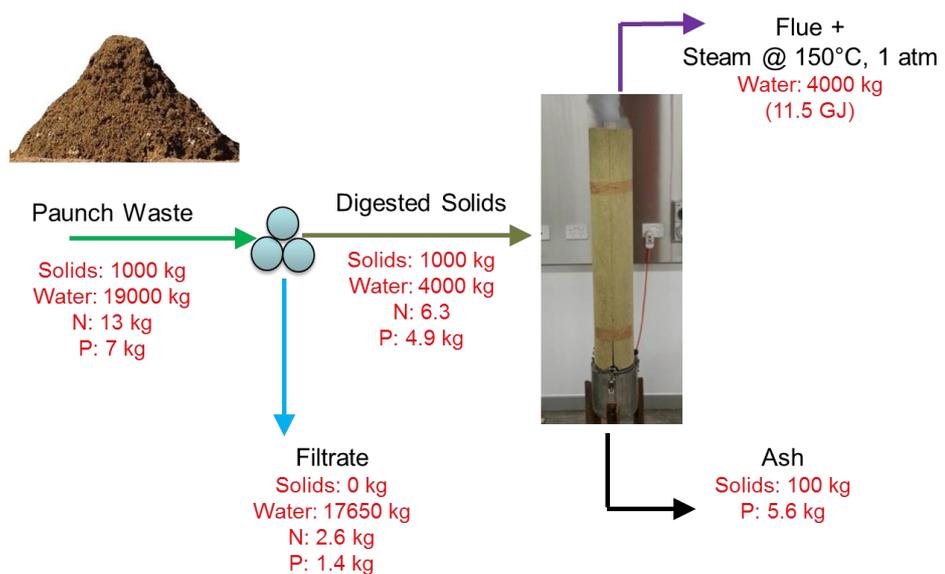
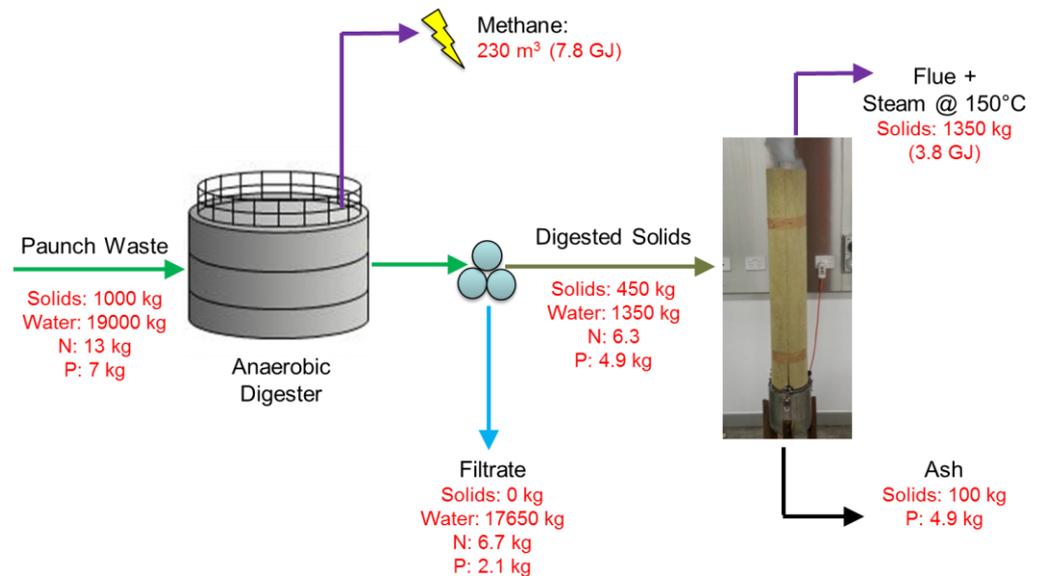


Figure 1: Example mass and energy balance for smouldering applied to dewatered paunch

Importantly, smouldering can be applied to paunch wastes directly, or after anaerobic digestion. Anaerobic digestion of paunch is not currently economically attractive, however this may change in the future and allow improved energy recovery from paunch - in the order of 8GJ/dry ton paunch.



**Figure 2: Example mass and energy balance for smouldering applied to dewatered paunch after anaerobic digestion**

### Project Outcome

This project focused on Proof-of-concept testing with the following outcomes:

- Proof-of-concept testing at laboratory scale was highly successful. Self-sustaining smouldering was achieved at moisture content up to 75%. This result demonstrates that smouldering can work with current paunch dewatering technologies, no additional pre-drying is required.
- Scale-up and batch field experiments conducted during the project were less successful. Reactor designs require a degree of modification during scale-up to ensure moisture is removed from the process efficiently and does not lead to combustion quenching.
- Odor was identified as a major barrier that must be addressed in order to continue onsite development of smouldering technology at Australian RMP.
- A conceptual flue-gas treatment system might contain i) after burner, ii) wet scrubber, iii) bag filter and iv) activated carbon, however this treatment train was not constructed for testing and odor management remains a critical area for continued development.

### **Benefit for Industry**

Solid waste management is an industry wide problem. The volume and composition of paunch waste varies according to individual animals and site handling practices but is reported at approximately 60 kg of wet paunch waste per animal (5-7 kg solids), corresponding to approximately 10% of the total weight of the live animal.

Smouldering technology is focused on minimizing the cost of solid waste disposal, rather than the specific generation of value. The operating costs for processing paunch waste are \$8-18/wet ton and include the costs of leasing the smouldering equipment (gas treatment costs excluded and not yet determined). Potential benefits from smouldering will depend on current disposal costs.

Common existing methods for managing solid wastes, such as composting, direct land application and/or anaerobic digestion are either expensive, facing increasing environmental regulation or not applied. Cost associated with paunch disposal are also highly variable ranging from less than \$10/wet ton or over \$100/wet ton.

### **USEFUL RESOURCES**

Project final Report:

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