final report

Project Code: P.PIP.0138

Prepared by: JBS Australia Pty Limited

Date published: December 2007

PUBLISHED BY
Meat and Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

Dewatering pilot scale trial for Reduction in fossil fuel derived energy demand in a processing facility

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government and contributions from the Australian Meat Processor Corporation to support the research and development detailed in this publication.

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1 Overview

The Fossil Fuel Reduction Project being undertaken at a red meat processing plant has the ultimate goal of eliminating the removal of organic waste from the site, and instead using it for energy on-site. The project has four main stages, with the first being the recovery of valuable fat from the kill floor effluent via a hydro-cyclone system and transferring it to the by-products for processing into tallow; the second being a mixing and dewatering stage of a processor's treatment plant solid waste to a level which will be suitable to be used in the fourth stage of energy production by combusting it in a boiler, whilst the third stage is covering the anaerobic ponds and utilising the biogas as an offset for natural gas consumption on site. The first and third stages are deemed viable, but the viability of the fourth stage is reliant upon the successful dewatering of the solid waste to less than 50% moisture.

From the outset of the project, it was recognised that the mechanical dewatering to reach this 50% moisture target was one of the most critical and presented the most technical risk to achieve. To date, there are ongoing issues with achieving this objective in stage 2 of the program. Various pieces of equipment have been trialled in an attempt to complete stage 2, in this trial, an FAS Compactor was used to try and lower the moisture level. The manufacturer claimed it could achieve 15% moisture on animal manure and believed it would readily meet our target for the wastes specified.

Trials were held at a red meat processing plant on two occasions to assess the use of the FAS Compactor in reducing the moisture content of the waste material to below 50%. Previous trials with the FAN Press Screw Separator (PSS) equipment had demonstrated some moisture reduction, but not nearly enough to progress past Stage 2 of the Fossil Fuel Reduction Project for the processor's site.

Whilst the FAS Compactor has proved successful in some applications overseas, it was yet to be determined if the waste, particularly the belt press sludge, would successfully pass through the compactor and result in a satisfactory moisture level.

In the previous PSS trials, the belt press sludge has proved to be a major problem, with the sludge passing through the equipment with very little moisture loss. This is due to the very nature of the sludge, which has polymer added to it before the belt press to help bind the solids. This also holds the moisture, and has proven to behave consistent with the Project Team’s original beliefs that the sludge would be difficult to mechanically dewater in the Fossil Fuel Reduction project to date.

Both trials with the FAS Compactor proved unsuccessful. The belt press sludge behaved as it had in the previous trials with the PSS, and retained high levels of moisture. Even when trials were run without the addition of the belt press sludge, the required moisture level of below 50% was unattainable.

2 Trials

The first set of trials was held in December 2005. The same ratio of waste product was used as in all previous trials. On day 1 (7th December), one mix had grass fed paunch material, and the second mix used grain fed paunch material. The mix of waste was fed through the PSS separator as the first stage of the project. This mix consisted of the following wastes:

500kg Paunch material

200kg Saveall #2 solids

200kg DAF float (unflocculated)

100kg truckwash solids

After being mixed and fed through the PSS separator (photo 1), the trial 1 solid cake was mixed with belt press sludge. This proved to be a difficult step in previous trials, as it was hard to get the solid cake to mix with the sludge. On this occasion, the solid cake was fed into the belt press screw and mixed with the sludge as it travelled along the screw (photo 2).

Photo 1: Solid cake from the PSS separator.

Photo 2: Addition of PSS solid cake to belt press sludge.

After mixing with 300kg of the sludge, the mixed waste was fed through the FAS Compactor. As with previous trials, it was immediately obvious that the belt press sludge would not reduce greatly in moisture, as the 'plug' from the FAS compactor would not form properly, and the cake from the compactor was the same as the feed to it.

For the next trial with the grain fed paunch in the mix, the belt press sludge was eliminated. The waste mix of paunch, Saveall #2 solids, DAF float, and truck wash solids was pressed in the PSS separator, and then through the FAS compactor. This was more successful than the trial with the belt press sludge, as a solid 'plug' formed at the end of the compactor (see photo 3)

Photo 3: FAS compactor solid cake

On day 2 of the trials (8th December), the waste mix was made up again with grass fed paunch grass (as in trial 1, day 1). This mix was then passed through the PSS separator, and then the FAS compactor (the previous day it had belt press sludge mixed in before the FAS compactor).

Results from this trial showed that more moisture still needed to be removed from the solid cake. An additional piece of equipment, a star wheel, was brought into the country to add into the FAS compactor. This was meant to help remove even more moisture from the waste, so when this arrived, another set of trials was conducted.

On Jan 24th 2006, three more trials were conducted with the additional equipment added to the FAS compactor. These mixes were the same as in the previous trials, with one lot using grass fed paunch material, and one of grain fed paunch material.

No belt press sludge was used in any of the trials, due to the failure of it in all of the previous runs through this machinery. The third trial was with grass-fed paunch material only. The results from these trials were the same or slightly better than the previous trials.

3 Results

The results table below shows the moisture levels from all of the trials.

Dec-05			Jan-06		
		Moisture			Moisture
Trial 1	stage 1 feed	84.3	Trial 1	stage 1 feed	83.2
grass fed mix	stage 1 cake	71.2	grass fed mix	stage 1 cake	69.4
	w/ belt press	77		stage 2 cake	68.7
	stage 2 cake	77.7			
Trial 2	stage 1 feed	81.9	Trial 2	stage 1 feed	81.1
grain fed mix	stage 1 cake	69.2	grain fed mix	stage 1 cake	71.9
	stage 2 cake	65.1		stage 2 cake	56.3
Trial 3	stage 1 feed	82.9	Trial 3	stage 1 feed	80.1
grass fed mix	stage 1 cake	73.2	paunch grass only	stage 1 cake	60.5
	stage 2 cake	67.4		stage 2 cake	58.1
	re-run stage 2	62.6			

The results table shows that there was no instance where the target of below 50% moisture was achieved. The best result from the trials was with the additional equipment in the FAS compactor on trial 2, where a moisture level of 56.3% was reached. Trial 1 from December 2005 had the belt press sludge added, and it can be seen from the results that the moisture level did not reduce after being put through the FAS compactor. When the grass fed mix was run through the FAS Compactor twice (Dec-05, trial 3) the moisture level still did not reduce significantly.

The filtrate from both the PSS separator and the FAS Compactor was also sampled and tested, to measure the impact on the current Waste Water Treatment Plant at AMH. In both cases the loading on the system proved to be similar to previous trials with the FAN PSS separator.

4 Conclusion

It is clear that the use of the FAS Compactor is not a viable option to achieve the objectives of Stage 2 of the Fossil Fuel Reduction Project. The results show that the moisture levels achieved were not able to reach 50% moisture or less. Repeat trials with the FAS Compactor on the different mixes using both grass and grain fed, and even with paunch grass only, cannot achieve the required moisture levels. The fact that the belt press sludge, a major component of the generated waste at a red meat processing plant, was not included in the trial further shows the failure of the FAS Compactor in this application.

An alternative type of dewatering equipment, such as thermal drying, may need to be trialled to achieve the required outcomes from Stage 2 of the Fossil Fuel Reduction Project.