

University of Southern Queensland

Renewable Energy in the Australian
Red Meat Processing Industry
&
The Viability of Paunch
as a Biofuel

A Dissertation submitted by

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In fulfilment of the requirements of

Master of Science

2012

Abstract

This thesis has investigated the feasibility of using renewable energy sources at Churchill Abattoir in South-east Queensland. Three widely utilised renewable energy sources (algae for biodiesel production, solar photovoltaics and wind turbines) were assessed, and found to be not cost-effective at current electricity prices. However, the use of solar thermal energy to dry paunch (a waste product cumulated at the abattoir) seems a promising way to produce useful biomass to replace boiler coal for water heating and for pyrolysis to generate electricity.

The payback periods for photovoltaics were found to be 24 – 56 years depending on the capital cost of the photovoltaic system and the competing electricity price currently makes photovoltaics uneconomic. Photovoltaic research and development however, suggests the use of solar panels will become viable in the future. Wind turbines were found to have a payback period of 67 years, and due to the low wind speed at Churchill Abattoir wind power is unlikely to become feasible in the future. Algae photobioreactors were investigated, but the technology does not appear to be a feasible proposition for Churchill Abattoir at the present time. On the other hand, the drying properties of paunch waste produced at the abattoir were investigated, and average drying rates of 1.2 – 6.1 % reduction per hour in moisture content was measured. The drying rate of this paunch demonstrates that paunch waste from the abattoir can be dried to a useful moisture content thus, making it a viable biofuel. The drying rates also demonstrate that increased air temperature can significantly increase drying rates.

Certification of Dissertation

I certify that the ideas, experimental work, results, analyses, software and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

Signature of Candidate

Date

ENDORSEMENT

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Acknowledgements

I would like to thank Researchers in Business and Churchill Abattoir for funding part 1 of this study. I would also like to thank my supervisors for their support and belief in this project. A most heartfelt thank you goes to my family; Mum, Dad, Glenda, and most especially to the most beautiful girl in the world my daughter Alysha. Thank you also to my friends and the employees at Churchill Abattoir.

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Abbreviations

ADR	Average drying rate
BOD	Biochemical oxygen demand
CA	Churchill Abattoir
COD	Chemical oxygen demand
DAF	Dissolved air floatation
d.b	Dry basis
G	Giga (10^9)
GHG	Greenhouse gas
GJ	Giga Joule
GW	Giga Watt
kWh	Kilo Watt hour
L	Litre
M	Mega (10^6)
MC	Moisture content
Mg	Mega gram
MW	Mega Watt
MWh	Mega Watt hour
PV	Photovoltaic
RH	Relative humidity
t	Tonne
TS	Total solids
w.b	Wet basis