

UHI Research Database pdf download summary

Performance of 10 kW Power Pallet Gasifier and its Potential for Small-scale Off-grid Electricity from Biomass

Rollinson, Andrew

Publication date:
2014

The re-use license for this item is:
CC BY-NC

The Document Version you have downloaded here is:
Peer reviewed version

[Link to author version on UHI Research Database](#)

Citation for published version (APA):

Rollinson, A. (2014). *Performance of 10 kW Power Pallet Gasifier and its Potential for Small-scale Off-grid Electricity from Biomass*. Poster session presented at 2014 International Bio-energy Conference, Manchester, United Kingdom.

General rights

Copyright and moral rights for the publications made accessible in the UHI Research Database are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights:

- 1) Users may download and print one copy of any publication from the UHI Research Database for the purpose of private study or research.
- 2) You may not further distribute the material or use it for any profit-making activity or commercial gain
- 3) You may freely distribute the URL identifying the publication in the UHI Research Database

Take down policy

If you believe that this document breaches copyright please contact us at RO@uhi.ac.uk providing details; we will remove access to the work immediately and investigate your claim.

Performance of 10kW Power Pallet gasifier using P45 woodchip and its potential for small-scale off-grid electricity from biomass.

Dr Andrew Rollinson*, Prof Michele Clarke‡, Dr Hao Liu*, Prof Colin Snape*
*Faculty of Engineering, ‡Faculty of Social Sciences, University of Nottingham, NG7 2RD

andrew.rollinson@nottingham.ac.uk michele.clarke@nottingham.ac.uk liu.hao@nottingham.ac.uk colin.snape@nottingham.ac.uk

1 Background

An estimated 4.1 million tonnes of wood waste in the UK goes to landfill¹
- Much more is left to decompose where felled
4.5 Million households in "fuel poverty" in the UK - A 125% increase since 2002²

Gasification is an ancient technology. The same principle as charcoal production.

Woodchips in

Electricity out



During World War 2, many vehicles operated with wood fuelled gas engines.

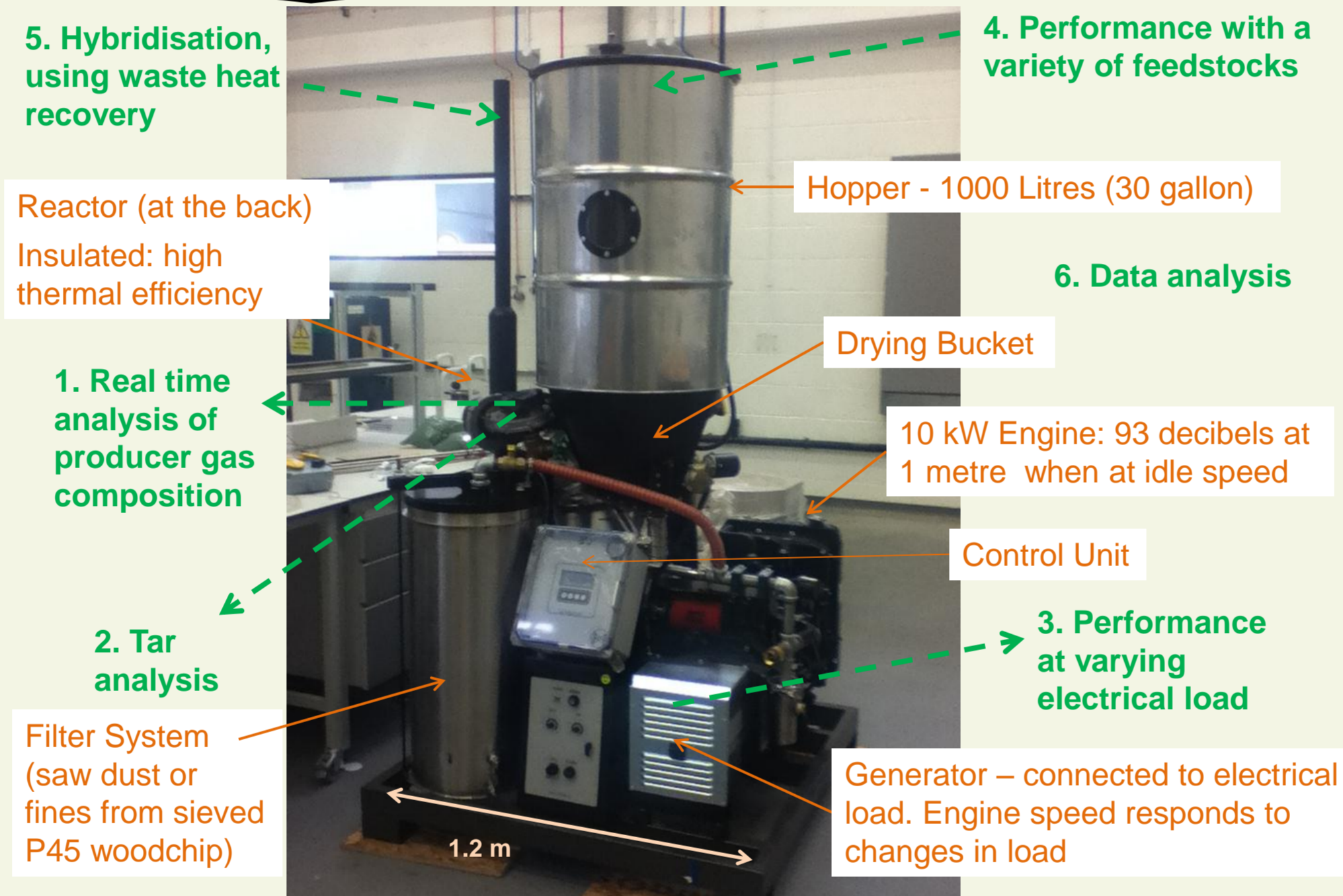


- Sustainable
- Power on demand
- Compact and easy to maintain
- Gas fed into an engine
- Engine drives electricity generator

Small-scale Biomass Gasification demonstration of performance is required

2 Research

- Assessment of potential and challenges for rural small-scale biomass gasification in the UK and India.
- Experimentation and evaluation of small-scale gasification system with a range of feedstocks.
- Hybridisation with anaerobic digestion.



The Power Pallet is ideal for small rural situations, with access to local waste biomass

3 Experiment

10 kw Power Pallet tested using P45 mixed species woodchips

BS EN149-1:2010 Specification of Properties for Wood Chips

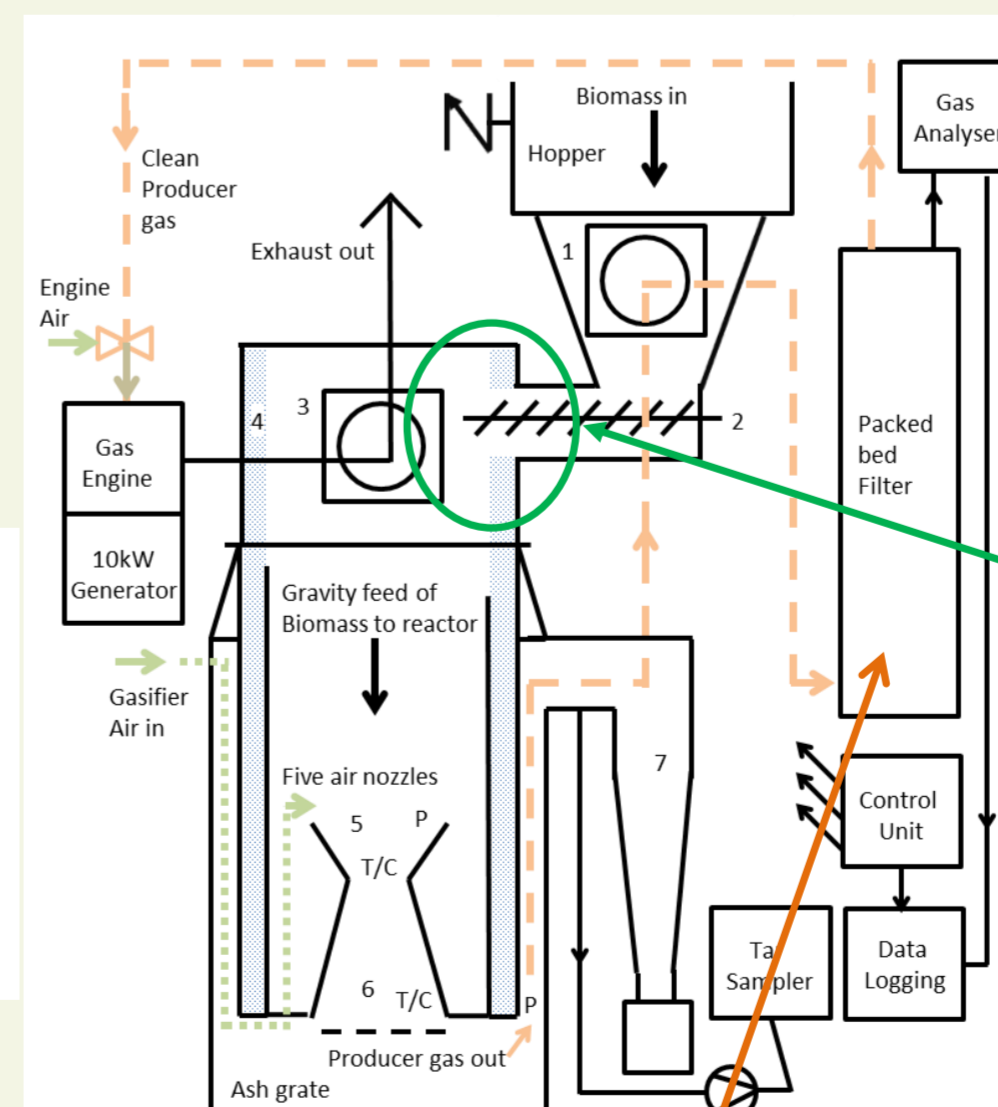
Origin:	Woody biomass (1)		
According to 6.1 and Table 1.			
Traded Form	Wood chips		
Dimensions (mm) ^a			
	Main fraction > 80 % of weight	Fine fraction < 5 %	Coarse fraction max. length of particle,
P16	3,15 mm ≤ P ≤ 16 mm	< 1 mm	max 1 % ^b > 45 mm, all < 85 mm
P45	3,15 mm ≤ P ≤ 45 mm	< 1 mm	max 1 % ^b > 63 mm
P63	3,15 mm ≤ P ≤ 63 mm	< 1 mm	max 1 % ^b > 100 mm
P100	3,15 mm ≤ P ≤ 100 mm	< 1 mm	max 1 % ^b > 200 mm
Moisture (w-% as received)			
M20	≤ 20 %		
M30	≤ 30 %		
M40	≤ 40 %		
M55	≤ 55 %		
M65	≤ 65 %		

High concentration of fines in "as supplied" P45 mixed woodchip.

Fuel tolerance of Power Pallet
Size: 1.3 ≤ cm ≤ 3.8
Moisture content of < 30%
Fines < 10%

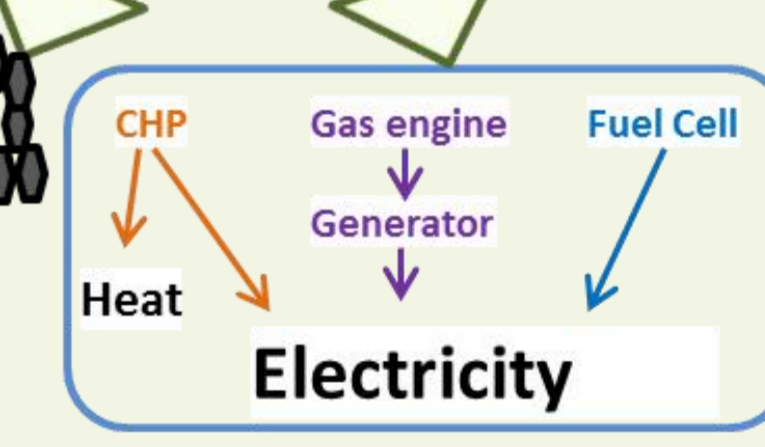
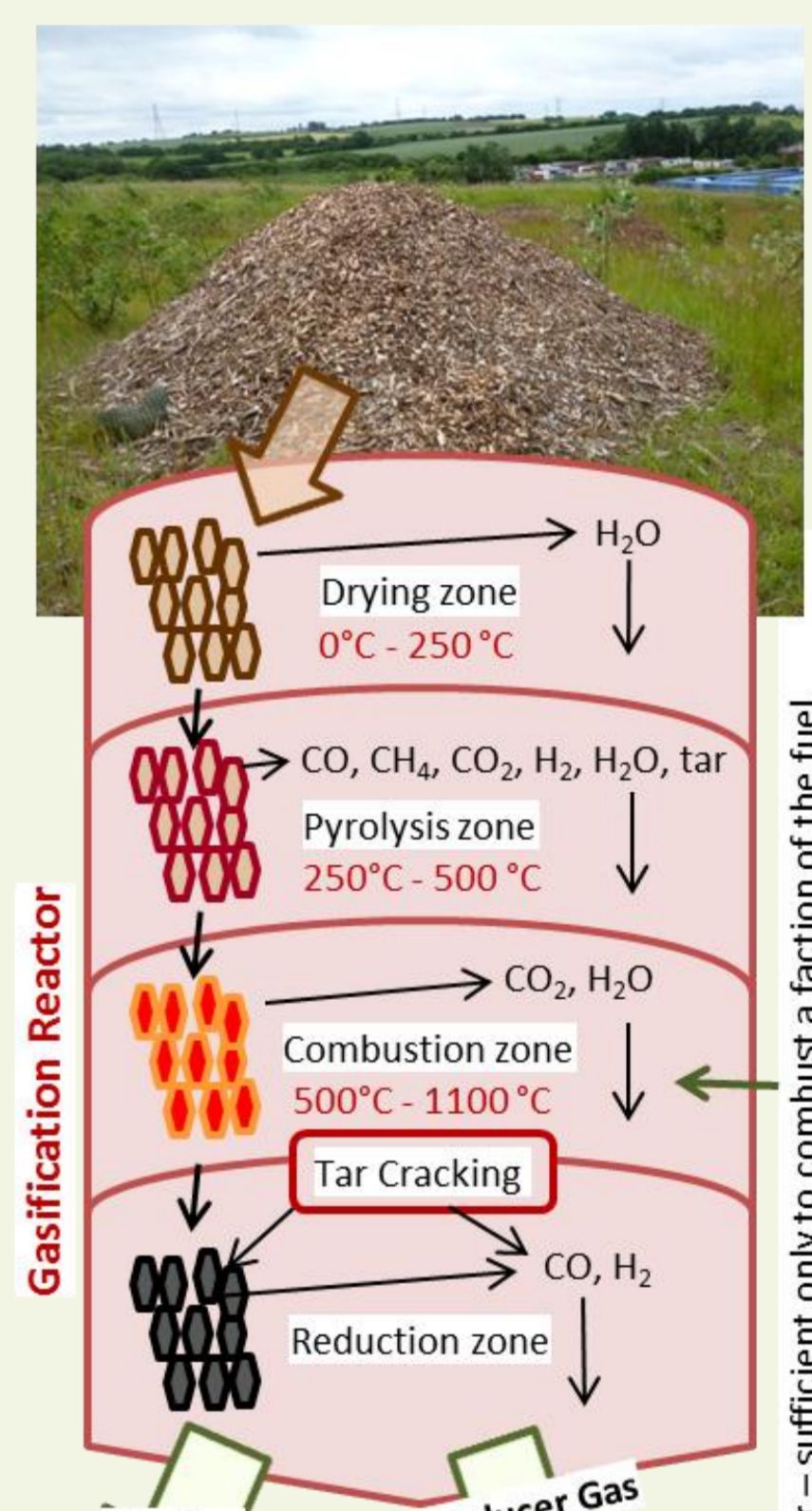
Most wood chips are produced using drum chippers. Screw/cone chippers create a more uniform chip with less fines but are expensive.

6 mm sieving of P45 woodchip is effective. Residue can be used as filter media



Fines generated at base of hopper and in automatic auger feed.

Downdraft Gasification



1. Department for Environment Food and Rural Affairs, 2012, Wood waste landfill restrictions in England call for evidence, 2012, DEFRA: London
2. H.M. Government, Annual Report on Fuel Poverty Statistics 2013, Department of Energy and Climate Change: London

This work was funded via EPSRC Grant: Rural Hybrid Energy Enterprise Systems(EP/J000361/1)