Commercial production of charcoal

from greenwaste

using BiGchar™ technology

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Presentation Outline

About BiG

Background to BiG and BiGchar

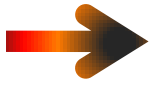
Features and Benefits of the technology

Potential Applications

About BIG

Black is Green Pty. Ltd.

- Private Australian company based in Mackay and Maleny, Queensland.
- Established specifically to develop and patent a process for the conversion of agricultural and animal wastes, to charcoal



Charcoal
Heat
Other energy byproducts

www.bigchar.com.au

Why make charcoal from wastes ?

- Charcoal increases crop yields by as much as 100%
- Wastes are a low cost, sometimes negative cost, feedstock
- Converts troublesome wastes to useful products and energy
  - For supplementary firing of furnaces/boilers
  - For generation of electricity
- Charcoal is a substitute for coal that can earn carbon credits
- Recovery of investment possible in under 12 months
  - Biochar revenues 65-100% of return
  - Heat/Energy/Fuel replacement revenue/savings up to 35% of return
  - Waste disposal service fees / carbon credits up to 25% of return

Background to the design process

Focussed on minimising charcoal production costs

1. Issues with production costs:
   - Dispersed and seasonal feedstocks
   - High cost of transporting biomass to/from centralised facilities
   - Handling costs – multiple handling steps are very costly
   - Typical costs 10-35% capital, 35-65% labour, 25-50% feedstock (incl. handling)

2. Need to reduce the size of the initial investment (barrier to entry)
   - Capital costs currently >$1M for 5 tonne/day of char from existing technologies

3. Chose a simple continuous processing concept with an objective of being easily mobilised/relocated.
   - Allows the equipment to go to the biomass to simplify the logistics
   - Continuous processes maximise throughput and minimise manning requirements

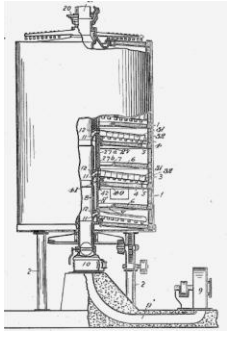
The old way

- Pits and batch ovens
- Unacceptable smoke emissions
- Labour intensive
- Low throughput

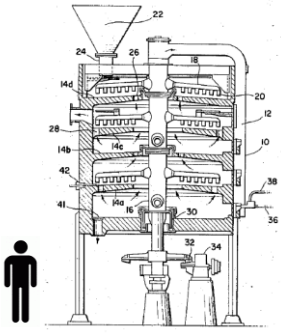
The BiGchar way

BiGchar Technology

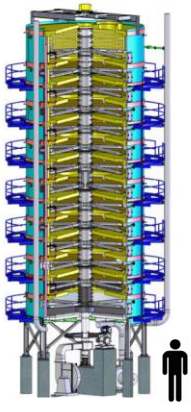
- A variation on the Nichols-Herreshoff rotary hearth furnace
  - A concept first patented by R.D. Pike in 1921
  - Mostly used for mineral ore roasting, but also used for charcoal manufacture since the late 1940's
  - Proven technology for a wide range of applications



Pike's Patent 1921



Von Dreusche, Jr. Patent 1968



A modern Herreshoff rotary hearth furnace
Source: Industrial Furnace Company Inc.

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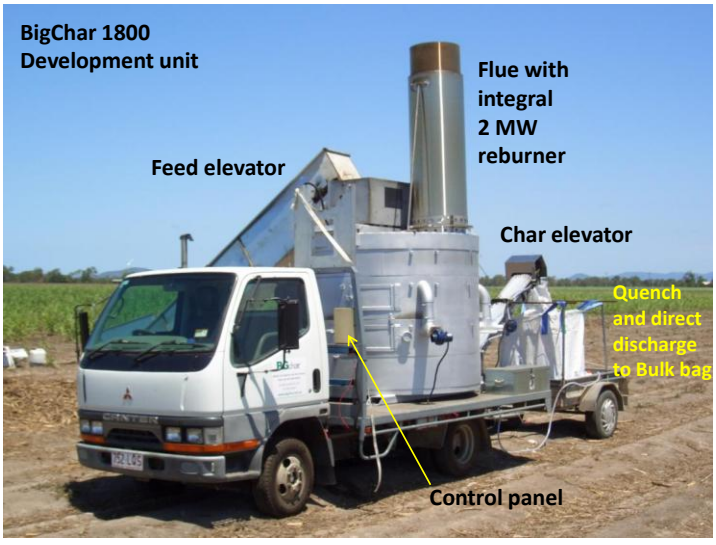
BiGchar 1800 Fast Rotary Hearth



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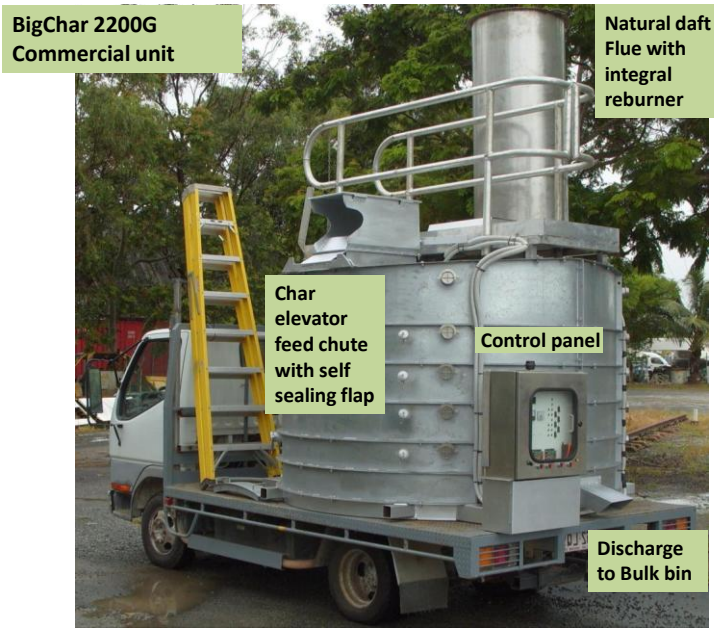
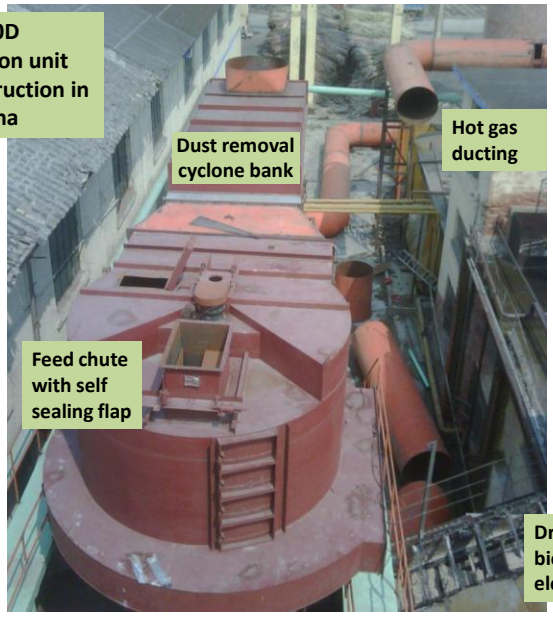
BiGchar 2200 Fast Rotary Hearth



BiGchar 3500 Fast Rotary Hearth



Capabilities and Features

- Designed specifically for biochar production from "difficult to handle feedstocks"
  - Grasses, leafy/trashy feeds
  - Partly shredded, mixed materials
  - High moisture materials (up to 40%)

- Scaleable

Mobile	⇨	Relocatable	⇨	Fixed
8–25 tpd		20-100 tpd		40-1000 tpd

- Efficient
  - Mobile units use DC power < 1200 Watts
  - Self fuelling, apart from flue gas pilot flame

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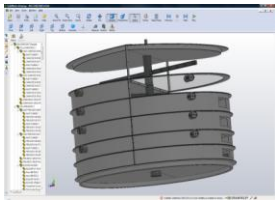
Capabilities and Features

- Flexible
  - Using swap out components for easy in-field maintenance.
  - Rotary hearth process very readily "tuned" to give a desired time-temperature pyrolysis profile
  - Readily adaptable to a wide variety of feedstocks and applications, including heat re-use, steam generation, and power generation.
- Safe
  - Designed by Australians to Australian industrial safety standards
  - Standard mobile units use only 24 Volt electrics.
- Technology developed and supported by Australians.



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Potential for biochar production from many feedstocks

IF IT CAN BE IGNITED IT CAN BE BiGCHARRED

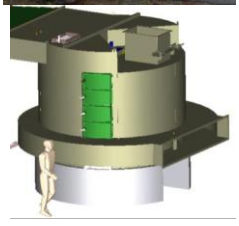
Any greenwaste

Any animal waste

- Prefer feed moisture <30%
  - can fire an external dryer for feeds up to 60% moisture.
- Prefer chipped to <25mm
- sand, rocks and steel contamination can be catered for.
- Cannot be used for not radioactive, explosives or materials that release aggressive chemicial fumes
- Even sorted garbage can be used.

Status and Plans

- Development unit (BiGchar 1800)
  - Operating in development mode since June 2009
  - Set up now on a permanent demonstration site
- First commercial BiGchar 2200 unit undergoing pre-delivery testing
  - Nominal 1.2 t/hr, 3 Megawatt thermal capacity
  - Seeking customers for the roll out of these units
- 500 tpd unit for biomass drying application soon to be commissioned in China
- Several demonstrations in preparation
- Seeking partners for technology roll-out



Potential applications

- **Soil fertility improvement**
  - Reduced loss of nutrients to run-off & percolation
  - Recycle of nutrients to the land they came from
  - Remarkable water holding capacity
  - Restore pH of acid soils
  - Improved microbial activity
  - Strong synergies with composting. Much better at retaining C in soil.
- **Remediation of contaminated, damaged or poor soils**
  - Including hydrocarbon and herbicide/pesticide contamination
- **Waste reduction**
  - Reduce or cease greenwaste volumes to landfill. Reduces mass by 60-80% and volume by 50-95%.
  - Dispose of manures and sewage solids without odour and disease issues. Process sterilises at 400-600 deg C.

Potential applications

- **Bushland fuel load reduction**
- **Weed control**
  - Charring process destroys most seeds
  - Roadside verges, bushland, scrubland, desert areas
- **Cogeneration of heat, steam and power**
  - For heating and drying applications, including pre-drying of feedstock
  - Energy independence for remote sites, including islands
  - Steam for rendering and food processing plants
  - Desalination
- **Fossil fuel replacement**
  - Coal and gas
  - Liquid fuels, yes ... but not easily.
- **Carbon sequestration**
  - Biochar process makes less methane than aerobic composting
  - 1 tonne of carbon = 3.7 Tonnes of CO_2 (2 tonne biochar ≈ 1 tonne carbon)
  - Retained in soil is 100's to 1000's of years (half life of compost is far less)
  - Can sequester carbon at the same time as achieving soil fertility benefits.

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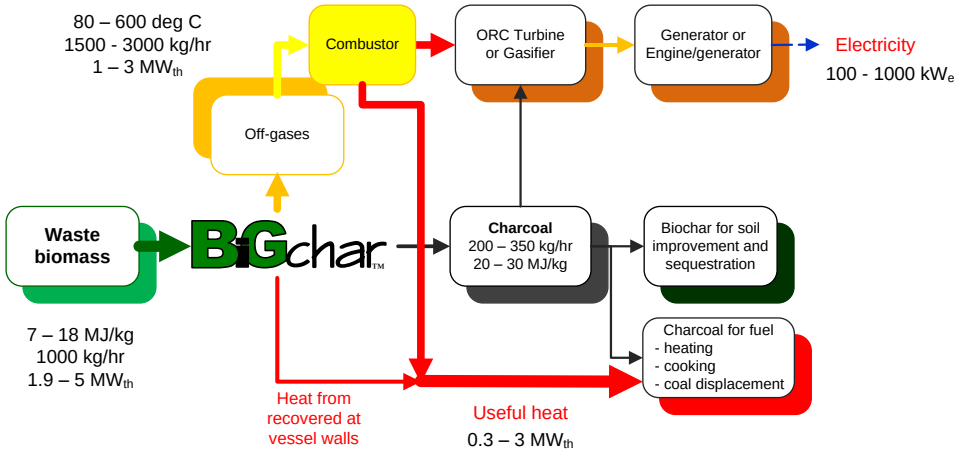
Summary of Application Scope



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BIGchar™ ... sometimes Black is Green

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