



Bio Oil from Bio Mass
Standby Electricity from Bio Oil

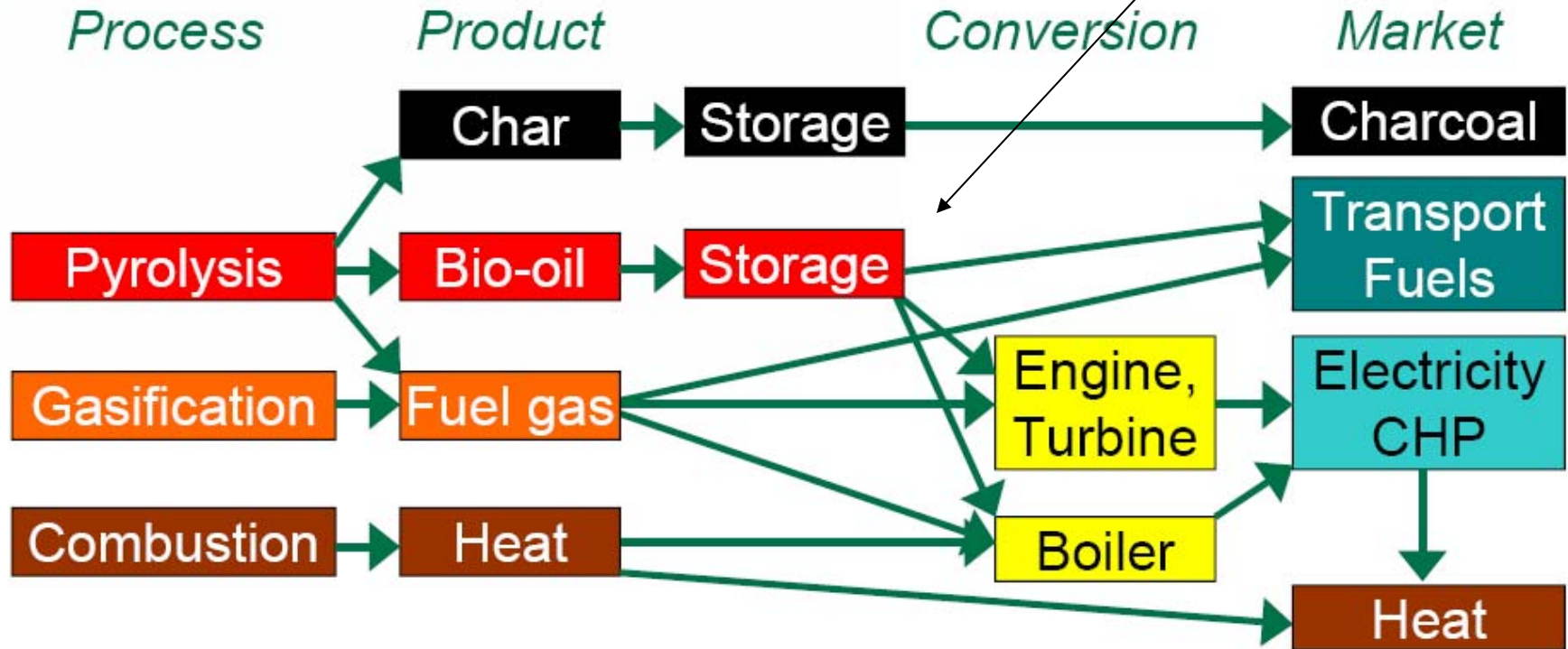


Alternative
Energy
Solutions



It's the storage that's the key here

Thermal Conversion



Pyrolysis, gasification and combustion plant size is limited by biomass availability.

Pyrolysis gives a **storable and transportable** liquid fuel.



EUROPEAN
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Community Research

Key facts about fast pyrolysis

- a new technology: “Invented” 20 years ago vs > 200 y gasification, > 2000 y combustion,
- gives high yields of liquid (bio-oil) that can be stored and/or transported.
- The liquid energy yield is about 70% compared to typical cold gas efficiency of 75% from gasification,
- Applications include fuel, chemicals, energy carrier, hydrogen, transport fuels,

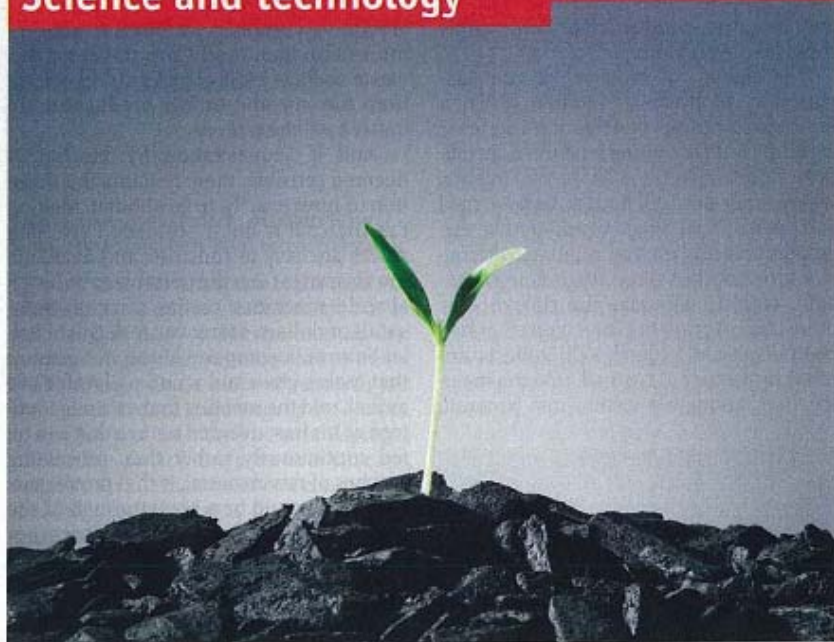
There is plenty of talk and basically no commercial production.

This project at least is producing reliably from a 1T per day Pilot plant
60% Oil, 20% each Char and Gas.

Next development phase is tuning Turbine to fuel + building 20T plant then 50T

Key is that commercial plants will be mobile – ie take to Bio Mass.





The virtues of biochar

A new growth industry?

BOULDER, COLORADO

Biochar could enrich soils and cut greenhouse gases as well

CHARCOAL has rather gone out of fashion. Before the industrial revolution, whole forests disappeared into the charcoal-burners' maw to provide the carbon that ironmakers need to reduce their ore to metal. Then, an English ironmaker called Abraham Darby discovered how to do the job with coke. From that point onward, the charcoal-burners' days were numbered. The rise of coal, from which coke is produced, began to erode the industry.

named Herbert Smith noticed that there were patches of unusually rich soils in the Amazon rainforest in Brazil. Most of the forest's soil is heavily weathered and of poor quality. But the so-called "terra preta", or "black earth", is much more fertile.

This soil is found at the sites of ancient settlements, but it does not appear to be an accidental consequence of settlement. Rather, it looks as though the remains of buried plants have been mixed into it.

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Tech.view, our online column on personal technology, appears on Economist.com on Fridays. The columns can be viewed at

Economist.com/techview

phosphate and potassium.

All of which is interesting. But it is the idea of using biochar to remove carbon dioxide from the atmosphere on a semi-permanent basis that has caused people outside the field of agriculture to take notice of the stuff. Sombroek wrote about the possibility in 1992, but only now is it being taken seriously.

In the natural carbon cycle, plants absorb CO₂ as they grow. When they die and decompose, this returns to the atmosphere. If, however, they are subjected instead to pyrolysis—a process of controlled burning in a low-oxygen atmosphere—the result is charcoal, a substance that is mostly elemental carbon. Although life is, in essence, a complicated form of carbon chemistry, living creatures cannot process carbon in its elemental form. Charcoal, therefore, does not decay very fast. But it

It is all, then, an intriguing idea. It certainly will not solve the carbon-dioxide problem, but it could be what Robert Socolow of Princeton University refers to as a wedge—one of a series of slices that, added together, do solve it. And there would be a nice historical justice in the substance that was displaced by coal playing an important role in cleaning up the mess that coal has left behind. ■

[Original article in the New York Times](#)

Hot waste to save planet, if we can get it

Asa Wahlquist
Rural writer

TIM Flannery thinks it could be the most important initiative for humanity's environmental future. Malcolm Turnbull supports it. Scientists are curious and farmers are enthusiastic, but can't get their hands on it.

Biochar is being held out as the environmentally smart way to reduce carbon emissions.

If natural wastes, such as woodchips, manure or municipal rubbish, are sent to landfill, they break down, releasing carbon in the form of the greenhouse gases carbon dioxide and methane.

But if the wastes are heated at high temperatures, with limited oxygen, they produce a synthetic gas that can be used in the heating process and biochar.

Instead of releasing carbon as a greenhouse gas, it is stored in biochar, which is very stable.

When biochar is added to Australian soils, which are largely low in carbon, it can improve crop productivity and reduce soil emissions of the greenhouse gas nitrous oxide.

However, Australian farmers cannot buy biochar.

Richmond Landcare group secretary Tony Walker has trialled biochar on his avocado farm and says local farmers want to try the product.

"Everyone wants to do it, but unfor-



Bean there: Lukas Van Zwieten at the Wollongbar research institute

tunately there is a tremendous shortage of biochar in Australia because no one has bitten the bullet and built a significant commercial plant," he said.

Mr Walker said the US had two large biochar facilities, "and even New Zealand is ahead of us".

Three years ago, the Richmond Landcare Group, along with the NSW

Department of Primary Industries, received funding to investigate biochar.

"Biochar is a very complicated product," Mr Walker said. "It depends what you make it from — it reacts differently.

"The biochar we have used up here has been made either of chicken litter or garbage green waste, and that works with the volcanic soils we have here."

Scientist Lukas Van Zwieten has been working with the landcare group at the Wollongbar Agricultural Research Institute. Among the benefits, he lists renewable energy production, waste management, better fertiliser use and drought tolerance, as well as sequestering, or locking up, carbon that would otherwise be released as carbon dioxide.

"The climate mitigation overlays a lot of the more fundamental benefits — things the community needs right now," he said.

Dr Van Zwieten said biochar had a lot of chemically reactive surfaces that could interact with soil nutrients, and also appeared to have good water-holding ability.

"Our early results are showing good evidence that is occurring," he said.

Biochar is being trialled in sugarcane, avocado and macadamias, and in small corn and legume trials at the Wollongbar institute.

"We applied biochar in the plots in November 2007, and we are on our fourth crop from that single biochar application," Dr Van Zwieten said.

"We have got, in some cases, double the yield of our corn and double the yield of the faba bean. The benefit-cost analysis of the biochar is in the \$200 to \$1000 a tonne of this material. That is the difference in profit you're getting when you're applying biochar."

Australian 4/5 July 2009

Returns and life cycle analysis.

Funding – France.