Dr Mike Hancock

Director
DEE ASSOCIATES

presents

- Hydrogen and power from waste hydrocarbons
- Combines gasification, fuel cells and electrolysis
- Patented technology

TEAM

DEE ASSOCIATES

Established 1989. Technical specialists including chemical engineers, chemists and energy professionals, with specific skills in the required fields. Accredited with the Carbon Trust and Energy Institute for energy efficiency investigations.

Mike Hancock (Director)

Ph.D. in Chemical Engineering from Cambridge UK

Petrochemicals	- Shell, GrowHow, ICI
Consulting	- EON, Carbon Trust, Tech Strategy Board, Euro Commission
Other	- Det Norske Zinkkompani, Odda, CEGB power station trainee

Contractors

Centre for Process Innovation, Wilton Centre, Teesside, UK

Contact: Dr Keith Robson, Thermal Technologies Centre

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MARKETS

1. Oil spill clean-up
2. Energy from waste
3. Distributed power generation
4. Distributed hydrogen production
5. Large scale power and H2 co-generation with carbon capture

Huge global markets with high growth fuelled by

1. Harsh financial penalties for pollution
2. Legislation on incineration, and demand for renewables
3. Feed-in tariffs enabling remote flexible power generation
4. Future fuelling of fuel cell vehicles requires H_2 distribution system
5. Carbon pricing & permits. Slow progress on membrane separation

Solving the problems

Of pollution, waste, energy inefficiency and climate change
Ensuring cheap coal can safely play a role in the future energy mix

OIL SPIL CLEANUP

DISTRIBUTED HYDROGEN

CARBON CAPTURE

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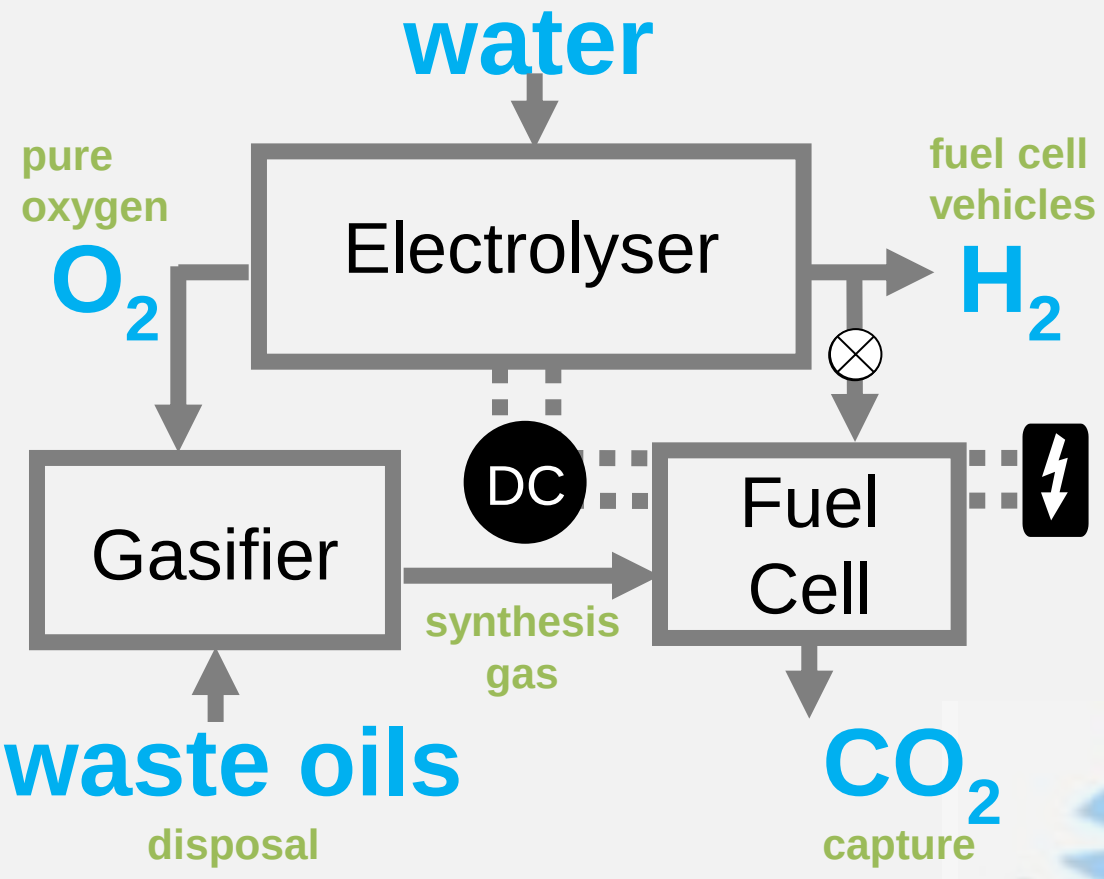
UNIQUE PROCESS



Oxygen for gasification is co-product of electrolysis

- O_2 speeds reaction and helps carbon capture (no N_2)
- Solid oxide fuel cell uses syngas to make power
- Pure hydrogen co-product and electricity have value
- Flexibility to feed hydrogen to fuel cell for more power
- Self-sustaining, high efficiency fuel cell systems

Competitors

Wastes: Incineration, digestion, Cement fuel

Power: cryogenic air separation for IGCC &Oxy-fuelling

Membrane gas separation

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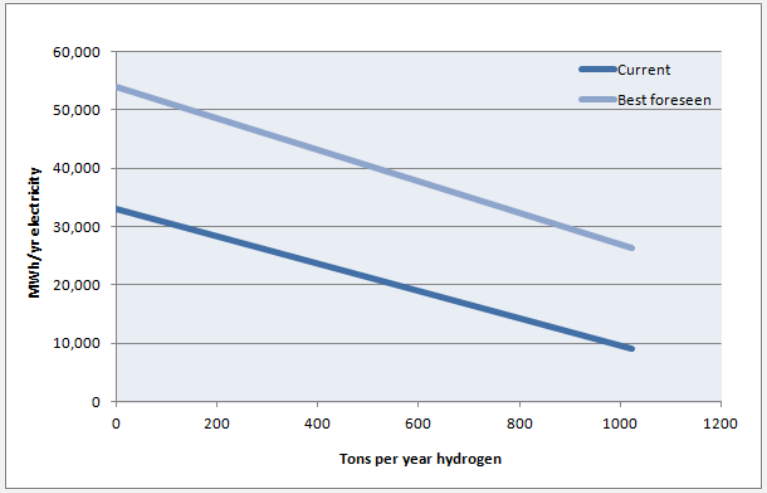
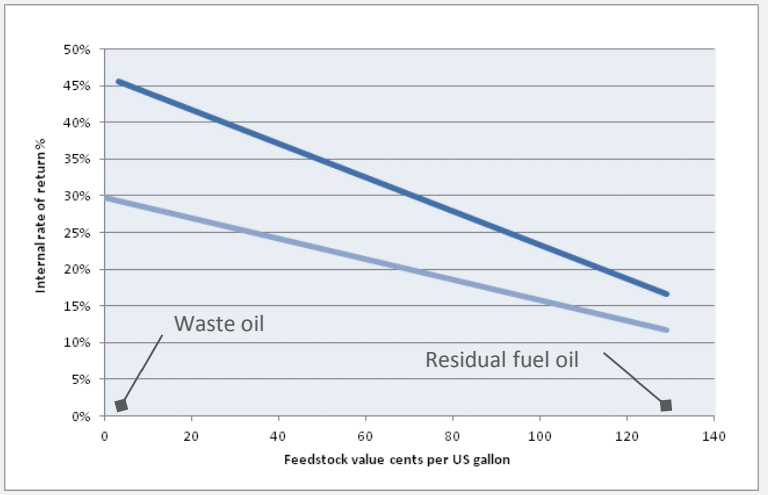
ECONOMICS

10,000tpy waste motor oil feed gives 1000tpy H_2, 9000MWh/y

1. Power and hydrogen output ranges

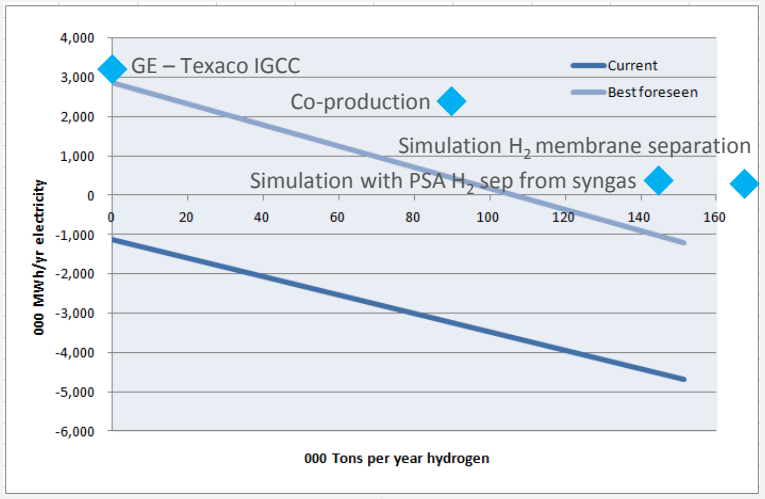


2. Impact of feedstock value on IRR

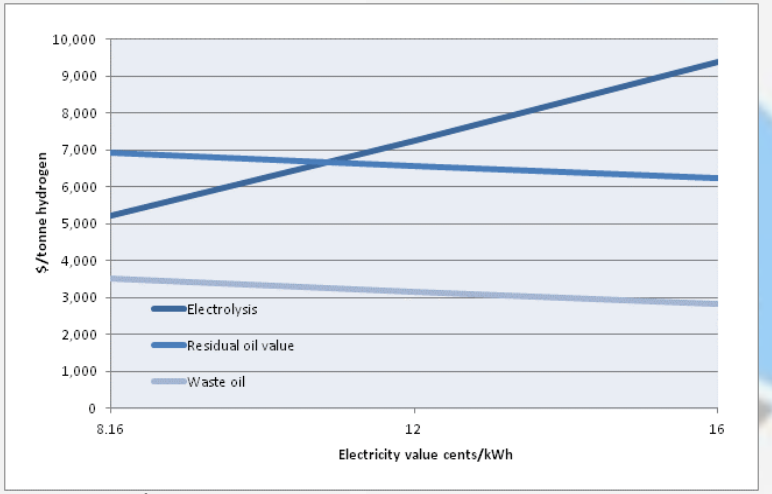


Coal station could outperform IGCC with lower capital, flexible sizing + ops

3. Power and hydrogen output ranges



4. Comparison with electrolysis



Based on 1,453kt/year coal input. ◆ *US DoE Hydrogen from Coal Program 2005 studies*

CUSTOMERS

- Oil exploration companies – clean-up system
- Waste oil processors, oil companies, refineries
- Biomass processors, forestry, timber mills
- Water companies for sewage sludge disposal
- Electro-chemical processors (synergies)
- Power generators

US


EUROPE


MIDDLE EAST

Sales approach

- Demonstration system needed to establish feasibility
- Trials results will confirm economics and effectiveness

We will then propose to engineer bespoke solutions in partnership with clients (e.g. BP, EON) and experts in the component technologies (e.g. Siemens for Solid Oxide/gas turbine hybrid systems)

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NEXT STEPS

1. Design, build and test a prototype system based on motor oil disposal

2. Trials data to validate and update kinetic models

Cost £600,000 **Duration 24 months** **Contractor CPL**

3. Models used to evaluate specific applications and develop design options

4. Secure IP for a range of applications and innovations

5. License technology to clients

6. Seek partnerships with component developers

7. Secure contracts for engineering specific applications

Profits: 3 years post-project £1m, 5 years £10m

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