



A Fully Integrated Energy System for Dairy Farming

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New Spirit Challenge

- Annual competition of the IEE
- Independent judging panel
- IEE is a global organisation based in the UK
- 130,000+ members worldwide
- Professional Network - Engineering for a Sustainable Future



End of Cheap Oil

- "The beginning of the end of cheap oil on which everything we have come to take for granted depends - even food and water - presents a great challenge and an opportunity to find more fulfilling and sustainable ways of conducting our lives"



New Spirit Challenge

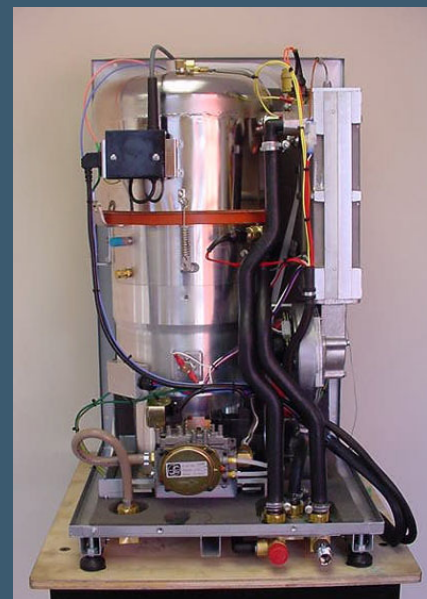
- Development assistance given to award winner
- No direct cash prize
- Award has prestige & news value
- http://www.iee.org/OnComms/PN/sustainability/nsc_index.cfm

The



Technology Package

- Three (four) technologies combined
- Ice-bank
- Stirling engine (heat & power)
- Biodigester (CO₂ scrubber)





A Distributed Resource

- Diversity of fuel sources is a beautiful thing
- 3,500,000 dairy cows in New Zealand
- 10^6 litres of biosolids!
- 15% = 2PJ



A Solution to Problems

- Disposal of effluent
- Kyoto Protocol & Climate Change
- Pollution of Waterways
- Energy & Energy Demand

The

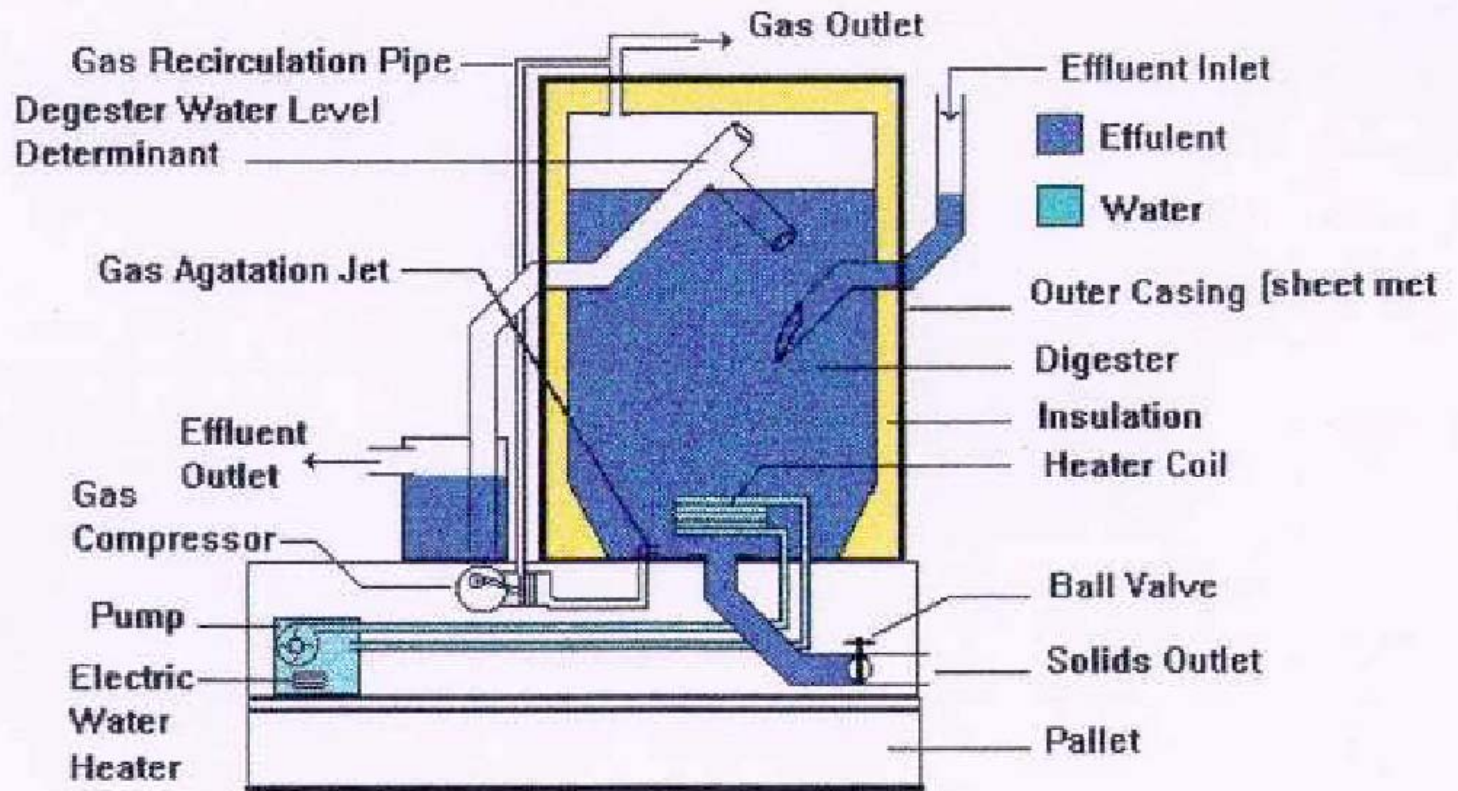


Biodigester



- ✓ Lower CH₄ emissions
+10% used as fuel
- ✓ On-site energy
- ✓ Digested biosolids

Biodigester

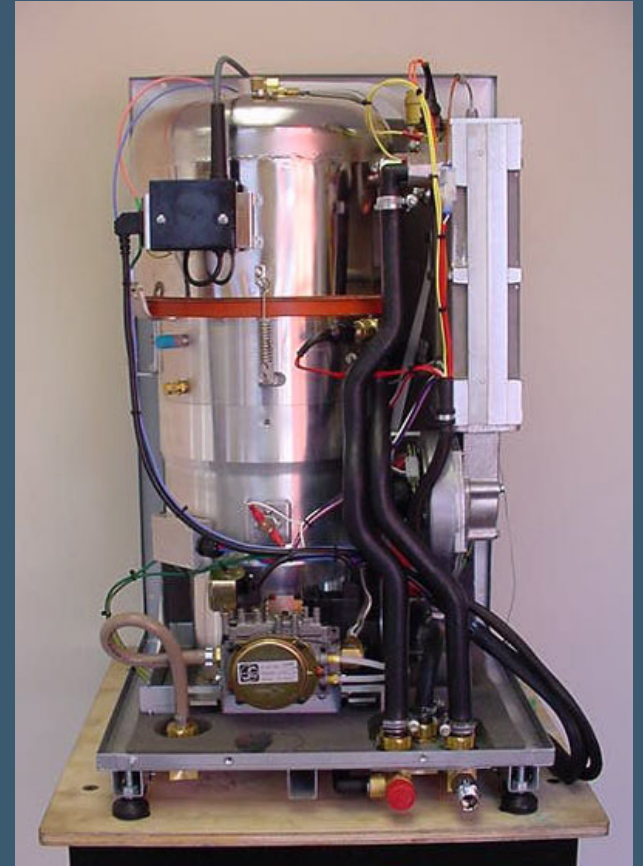


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Stirling Engine

- ✓ Raw biogas
- ✓ Hot water
- ✓ Electricity
- ✓ Continuous running



The



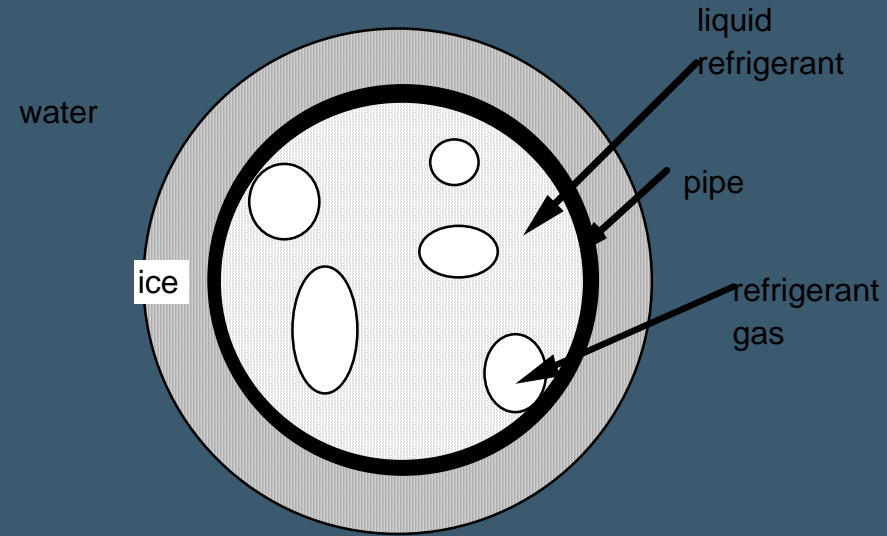
Ice-Bank



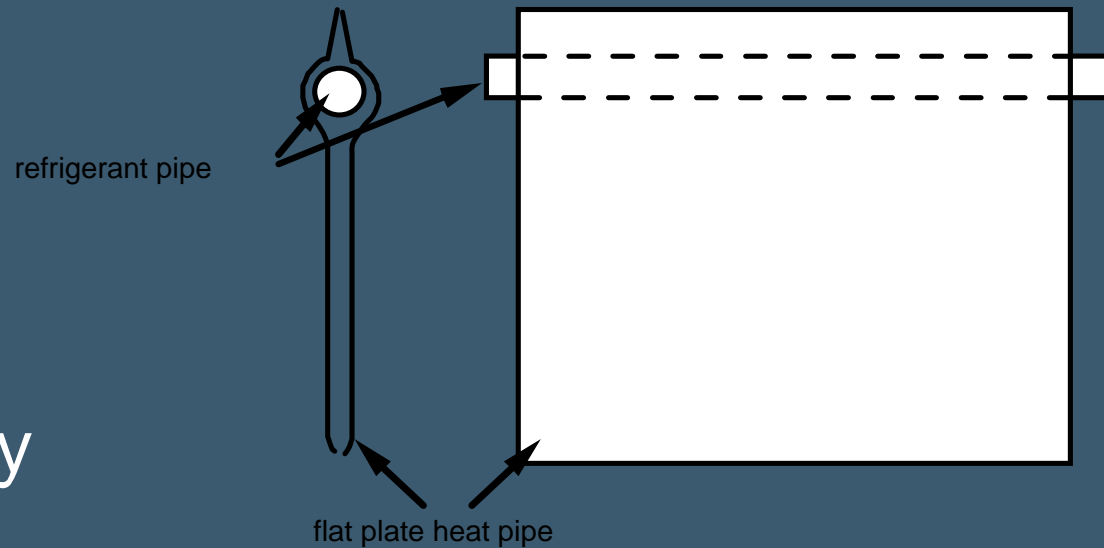
- ✓ Continuous running
- ✓ Ice-cold water
- ✓ Smaller size plant



Ice-Bank



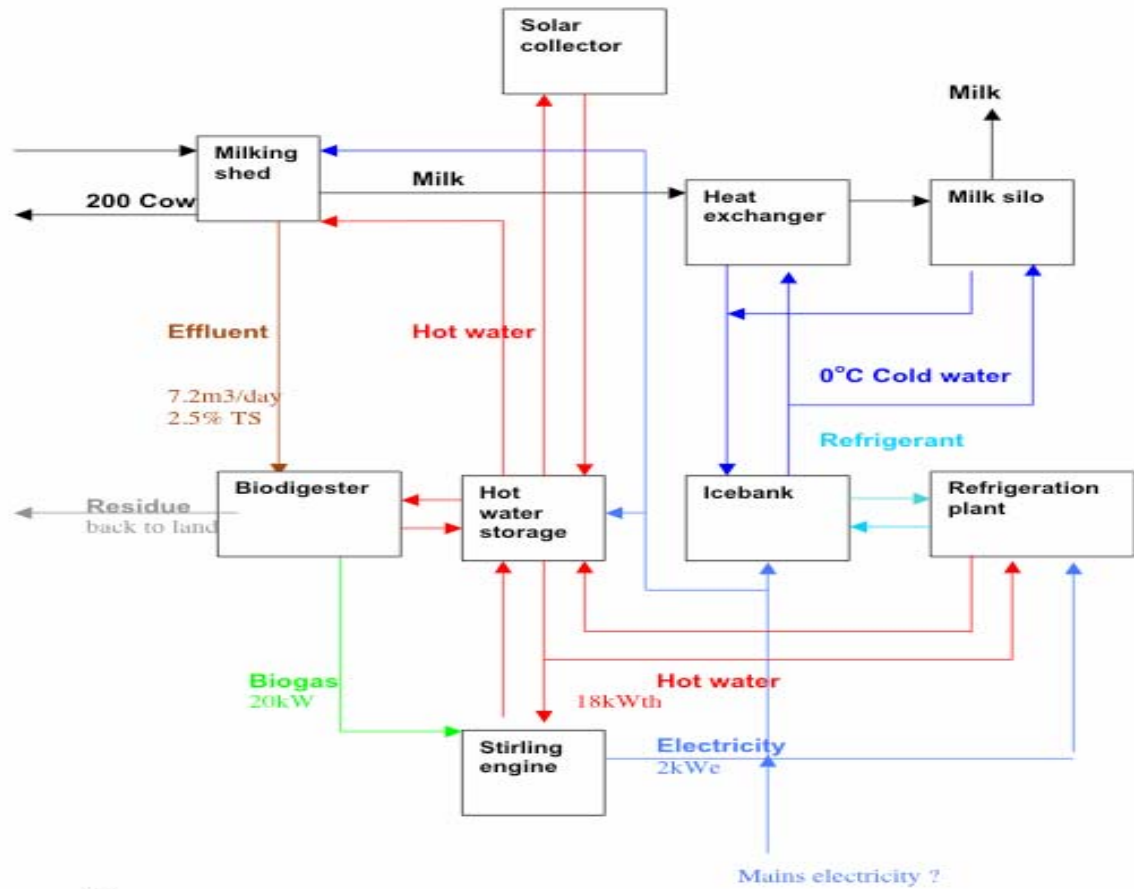
- ✓ High efficiency design
- ✓ Flat-plate heat pipe technology





Stirling Engine

- Whisper Tech Limited
- Micro-CHP
- 93% fuel efficient
- 18kW_h
- 2kW_e
- Stirling Engine
- Absorption cycle refrigeration



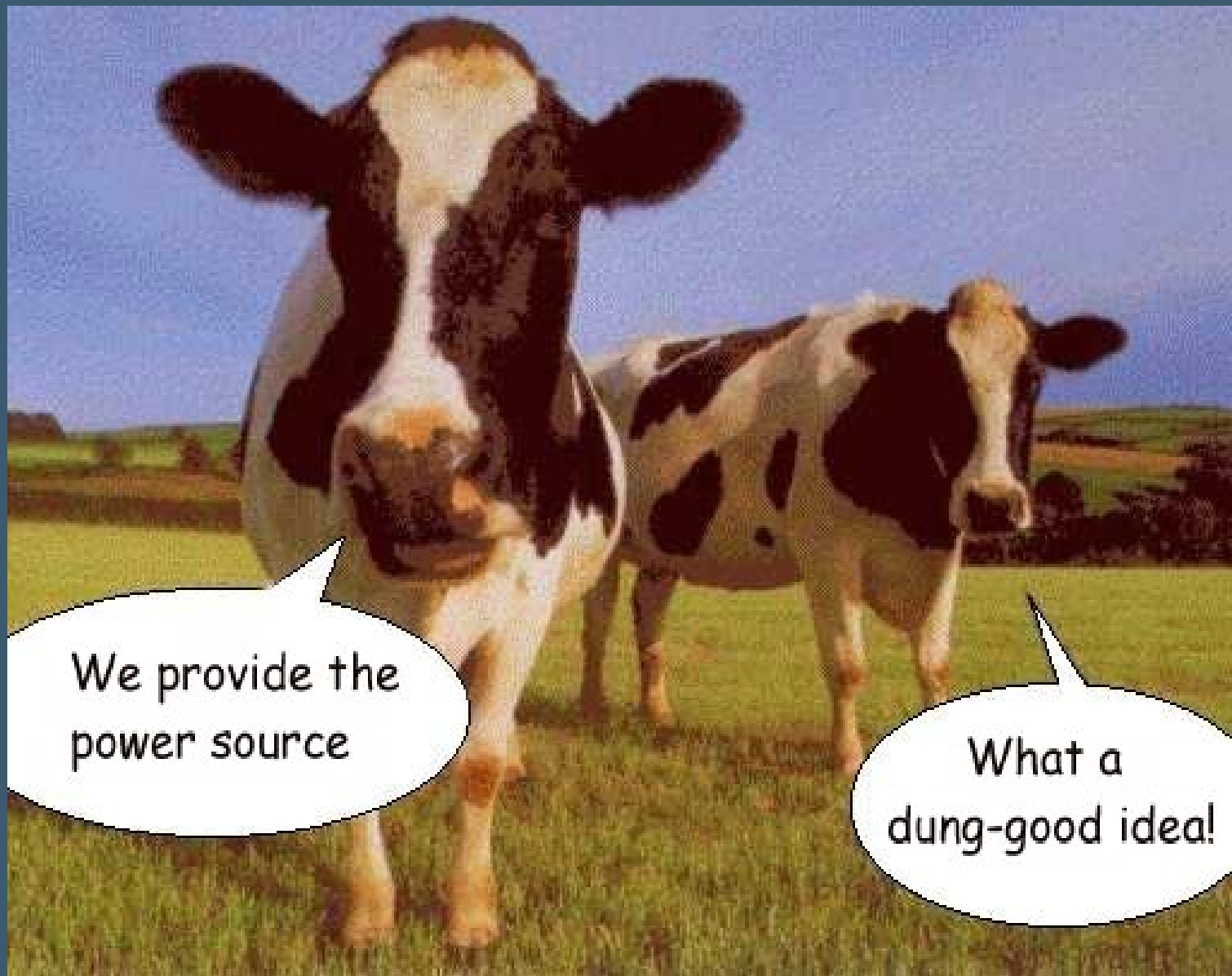
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Overall Benefits

- ✓ Water savings
- ✓ Energy savings
- ✓ Demand reduction
- ✓ Higher milk quality

The



We provide the
power source

What a
dung-good idea!