

# Microturbine Experience



## UK Horticultural Industry

Yan Evans – Advantica Technologies Limited

# MiniGen™



Powered by  
**Capstone MicroTurbine™**

*Power when and where you need it.  
Clean and simple.*



- The Advantica Fleet of Microturbines
- Horticulture Application – W.J. Findon & Son
- Horticulture Application – L.F. Geater and Sons
- Project Economics

# The Advantica Fleet of Microturbines



Units ordered and/or installed as at 18/01/02 :-

- 6 off in horticultural applications
- 1 off in a civic hall
- 1 off in a nursing home
- 1 off in a leisure centre
- 6 off in a prestigious hotel
- 2 off in a laundry
- 2 off at a waste recycling plant
- 3 off at a broadcasting company
- 1 off in a office block



Majority are CHP applications operating in parallel with the local electricity supply network running between 17 and 24 hours a day, 365 days a year

Fleet comprises a total of 23 Capstone microturbines

- 12 off Capstone Model 330 microturbines
- 11 off Capstone Model C60 microturbines

Accumulated Running Hours – around 25,000 for whole fleet

Fleet Leaders – 7,000 and 6,000 running hours

# W.J. Findon & Son

## Customer Requirements

- Energy cost savings
- Climate Change Levy exemption
- Requirement to upgrade “off-site” power infrastructure

## Solution

- 1 x 30kWe MiniGen CHP Package
- Approximately 7,000 hours run
- Over 190MWh electricity generated
- Around 500MWh heat generated
- Around 115 Tonnes of CO<sub>2</sub>



## W.J. Findon & Son - Site



Site Location: Bordon Hill, Stratford-upon-Avon, UK

Site Size: approximately 13 acres of covered area



Propagation of plants from seed and cuttings

Production of plug and pot plants

Growing of poinsettias towards the Christmas period



# W.J. Findon & Son – MiniGen Plant Room

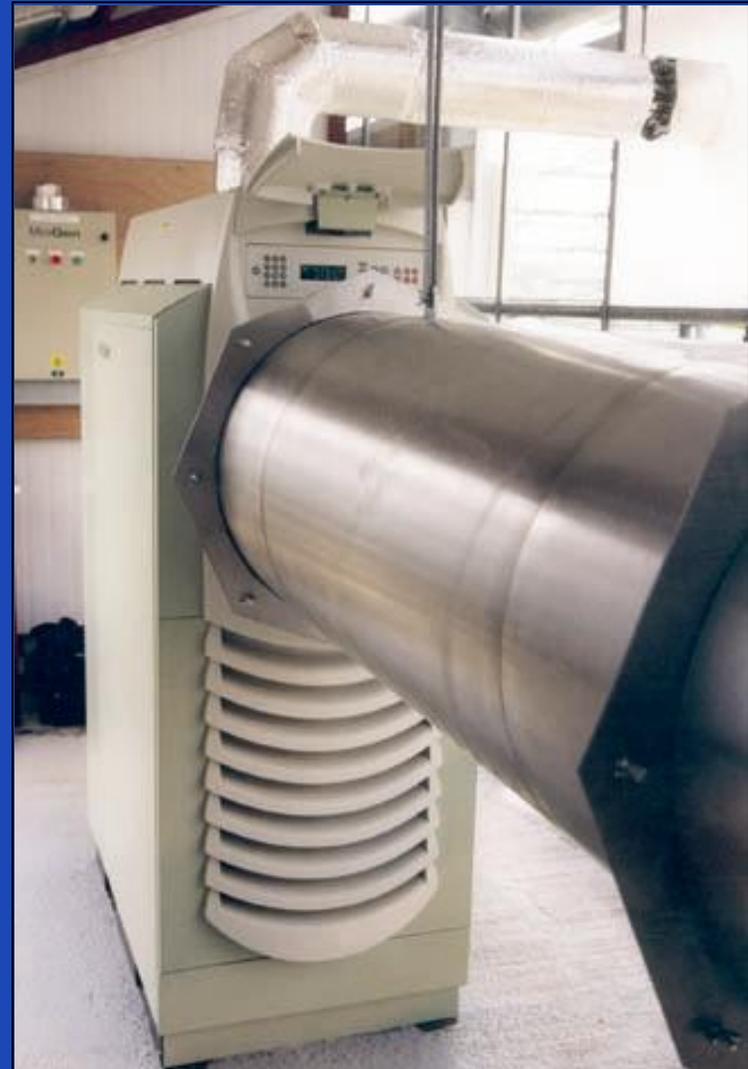


30kWe MiniGen Unit

Gas Booster Compressor



# W.J. Findon & Son – MiniGen Plant Room





Microturbine Exhaust Outlet Arrangement

Glasshouse Bay with Supplementary Lighting



# W.J. Findon & Son – Installation Issues

## Plant Room / Environment

- Well ventilated plant room for both the microturbine and the gas booster compressor
- Ventilation to the power electronics is a key issue to avoid loss of performance
- Air drawn from outside plant room to maximise output from microturbine
- Free from dust to prevent early replacement of air intake filters
- Access for maintenance purposes

## Electrical Connection

- Parallel operation with local electricity supply network
- Separate G59.1 grid relay panel although software functionality is onboard microturbine
- Harmonic content of microturbine output waveform

## Gas Connection

- Separate booster compressor to raise gas pressure from site (typically
- Rotary vane compressor – low maintenance – aligned with microturbine maintenance

## Flue Connection

- Twin-walled stainless steel to prevent heat loss and maximise heat output at point of use
- Sufficient flue diameter to avoid excessive back pressure reducing microturbine output

# L.F. Geater and Sons

# Application – L.F. Geater and Sons

## Customer Requirements

- Extend winter growing season
- Avoided cost of “off-site” power infrastructure upgrade
- Climate Change Levy avoidance
- Low temperature hot water space heating
- Use of final flue gases for CO<sub>2</sub> enrichment
- Avoid need to export power

## Solution

- 120kWe MiniGen CHP Package
- 5,000 hours a year operation
- Commissioned November 2001



## L.F. Geater and Sons - Site Activity



11 acre site, around 4 acres under glass

1.7 Million Lisianthus stems per annum

20% of the UK production

Also grows bedding and pot plants

# L.F. Geater and Sons – MiniGen Installation



4 x 30kWe Capstone Microturbines

1 x 200kWth Unfin Heat Recovery Unit

1 x Gas Booster Compressor

1 x Grid Relay Panel



# L.F. Geater and Sons – MiniGen Installation



“Night Shift”



# L.F. Geater and Sons – Installation Issues

## Plant Room / Environment

- Well ventilated for both the microturbines and the gas booster compressor
- Sufficient air circulation within the plant room for microturbine ventilation and combustion
- Free from dust to prevent early replacement of air intake filters
- Limited access for maintenance purposes – use of pallet truck for moving units in and out

## Electrical Connection

- Parallel operation with local electricity supply network
- Separate G59.1 grid relay panel common to all four microturbines
- Load following relay fitted in main incoming switchgear to facilitate automatic part load operation

## Gas Connection

- Separate booster compressor to raise gas pressure for combustion – one compressor feeding all four microturbines
- Rotary vane compressor – low maintenance – aligned with microturbine maintenance

## Water Connections

- CHP Package heat recovery unit connections into low pressure hot water circuit
- CHP Package acting as lead boiler for greenhouse space heating
- Existing condensing boiler acting as top-up and back-up heat provision

## L.F. Geater and Son – Installation Issues

### CO<sub>2</sub> Enrichment

- Flue gases from the existing condensing boiler used for CO<sub>2</sub> enrichment
- CHP Package flue gases at around 90°C ducted into the same CO<sub>2</sub> recovery system

### Greenhouse Management

- The MiniGen CHP Package is one element of a Total Greenhouse Management System
- Links to the UK Met Office for ambient air temperature predictions for greenhouse temperature control

### Exhaust Flue

- Exhaust bypass damper for flue gas discharge to atmosphere

## Project Economics

- Difficult market conditions within the UK CHP sector
- Electricity prices have fallen by 15-20% in the last twelve months
- Gas prices have risen by 40-50%
- Payback periods extended (typically) from say 4 years to 6 years
- For projects to be economically viable need 3 reasons to purchase:-
  - o Savings on electricity (1<sup>st</sup> leg of savings)
  - o Savings on heating fuel (2<sup>nd</sup> leg of savings)
  - o 3<sup>rd</sup> leg of savings:-
    - CO<sub>2</sub> for enrichment in case of commercial growers
    - CO<sub>2</sub> savings in line with Government Kyoto commitments
    - Avoided cost of off-site power infrastructure upgrades
    - Security of electricity supply is of paramount importance
- Need project drivers other than energy cost savings

## Reaping the Benefits



## MiniGen™



## Cultivating Energy Cost Savings

