Rural Electrification with Stirling Engines at Small Biogas Plants

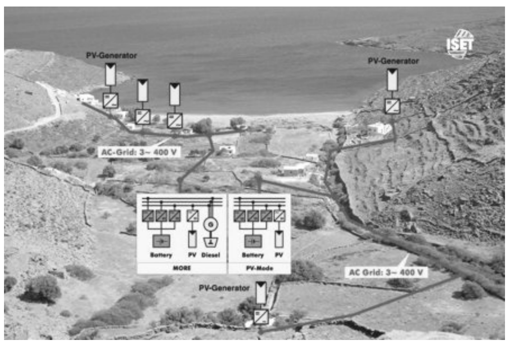
- Areas of application

- Problem fields

- First realisations

Supply of remote areas

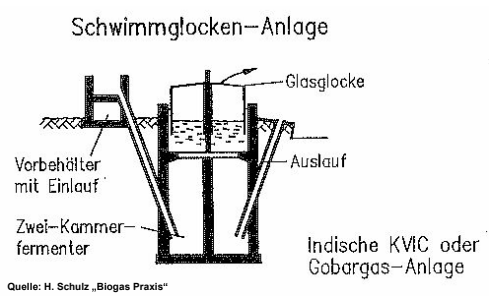
Hybrid Utility Systems:
- modulare setup
- photovoltaic systems
- combustion engine
- accumulator



- inverter module
- coupling on the AC side
- expandable structure

Biogas as an energy supplier


Quelle: H. Schulz „Biogas Praxis“

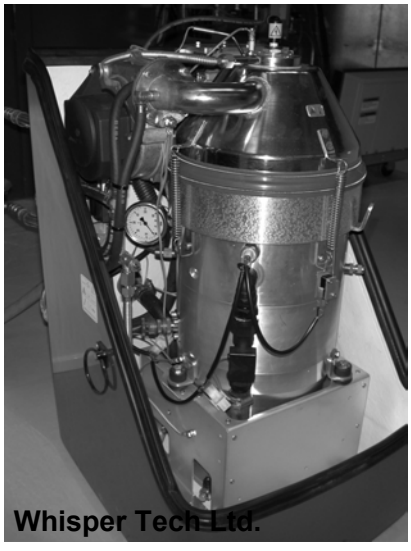


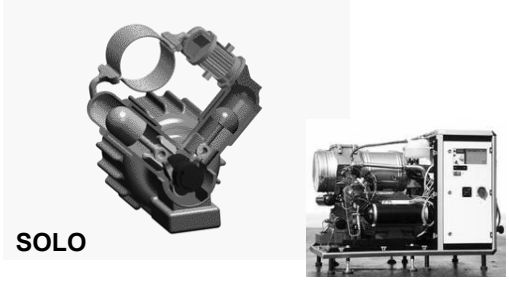
Quelle: H. Schulz „Biogas Praxis“

Small Biogas Plants

- **multiple availably**
- **established procedure**
- **logistic benefits**

Combustion Engine



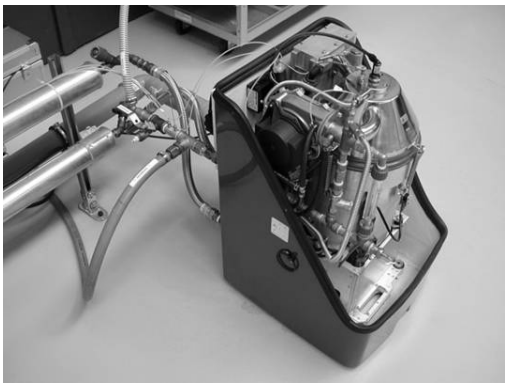


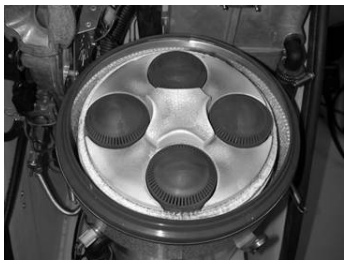
Stirling Engine:

- **external heat input**
- **sturdy technology**
- **continuous combustion**
- **low noise emissions**

Stirling Engine

WhisperGen MCHP

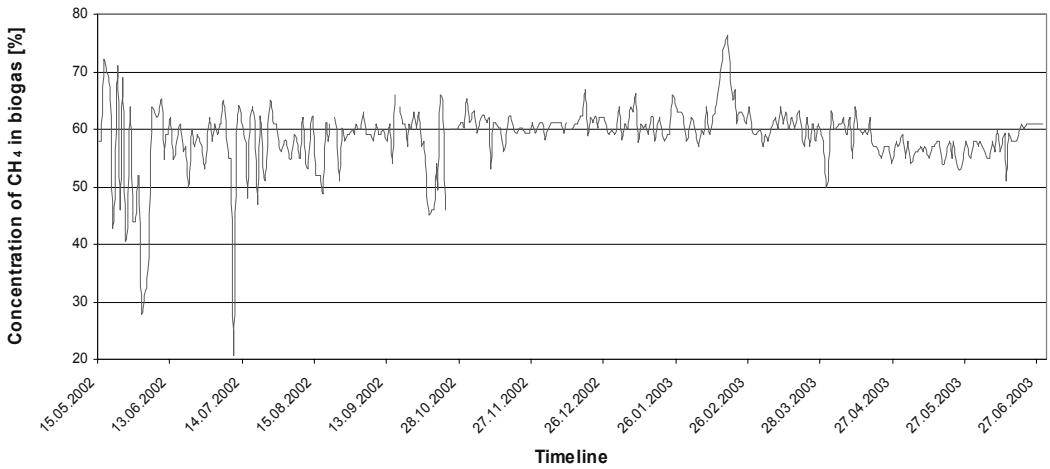




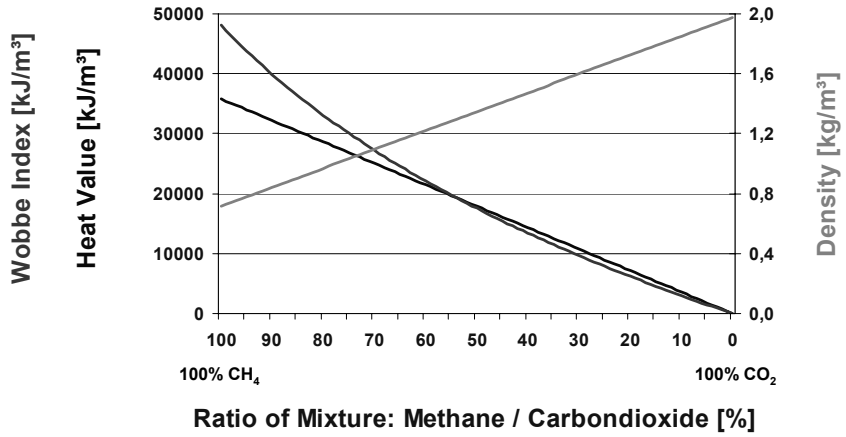
Technological Data:

- **electrical output 750 W**
- **thermal output 6 kW**
- **fuel provided 8 kW**
- **1,4 m^3/h biogas (60/40)**
- **pressure 20 $mbar_ü$**

Varying Gas Quality



Change of fuel characteristics



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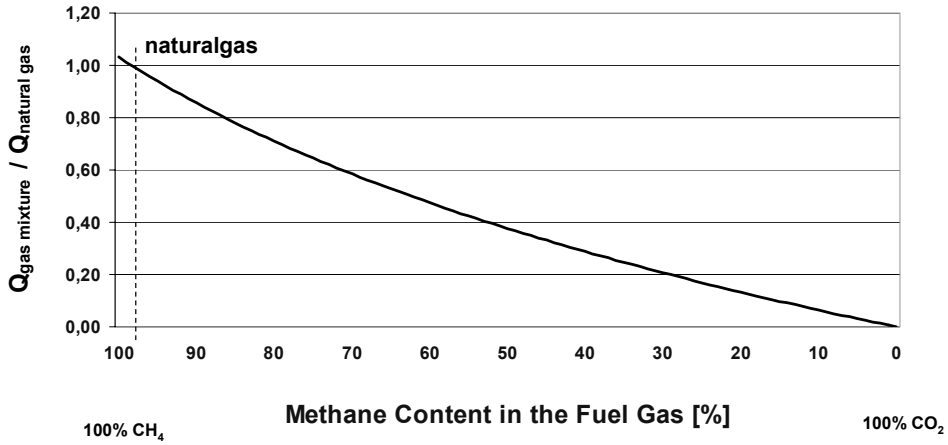
Decrease of the transferable heat energy



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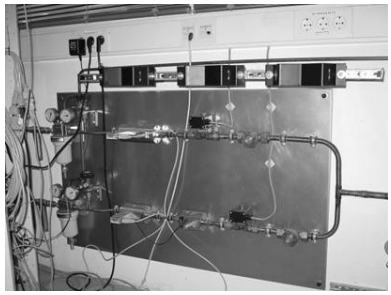
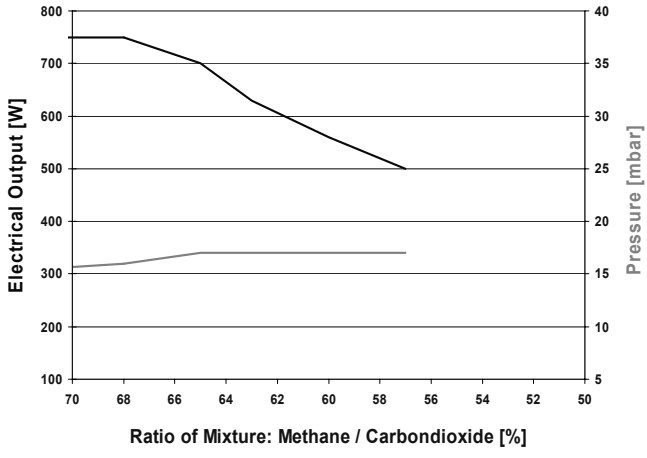
Workpackages



- limit for stable operation as a function of the heating value
- limit for starting ability as a function of the heating value
- engine output variation as a function of the heating value

First Realisations

Change of power output with variation of the gas quality



Possible Measures

Adjustments to the varying gas quality:

during operation adjustment of the fuel mass flow

- **increase of the fuel pressure**
- **use of a variable nozzle**

during start-up

- **preheating of the combustion air**
- **determination of the starting fuel mass flow**