



**Technical and economic assessment of high pressure biogas
upgrading system
Metener Ltd**

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Biogas upgrading technology

- High pressure water scrubbing technology in batch absorption columns
- Raw biogas pre-compressed to 10-15 bar in a buffer column
- Pre-compressed gas is pressurized to ~ 150 bar by filling water
- CO₂ and H₂S are absorbed into water.
- After scrubbing cycle, wash water is regenerated in flash tank



Upgrading technology

- Biomethane is further compressed from 100-150 bar to 250 bars using a hydraulic booster
- Compressed biomethane is stored gas bottles
- Product gas
 - 92-99 % CH₄
 - 1-5% CO₂
 - <2% inert gases
 - <1 ppm H₂S



- Methane enrichment, trace compounds removal and biomethane compression takes place simultaneously

Upgrading technology

- Simplicity and compact technology
- Complete automation
- Touch screen operation
- Process parameters and settings can be optimized easily



Upgrading technology

- Suitable for 20 to 100 Nm³/h raw biogas capacity.
- Upgrading unit is built into a 9-12 m container
- Refueling station requires additional base



Water and electricity requirement

- Average electricity consumption
0.5-0.6 kWh/Nm³ raw biogas
or 1.2-1.4 kWh / kg CBG
 - Compression, upgrading, water regeneration, refueling, site lighting and heating
- Average water consumption
6-25 l /Nm³ raw biogas
or 15-60 l / kg CBG
- Good quality surface water can also be used
- Wash water is generally regenerated
- 5-20% wash water is replaced with fresh water



Upgrading costs

Electricity consumption (kWh / Kg)	1.30
Electricity price (€ / kWh)	0.11
Water consumption (m ³ / Kg)	0.035
Water price (€ / m ³)	3.90
Maintenance costs (€ / Kg)	0.04
Total cost (€ / kg upgraded and compressed (250 bar) biomethane)	0.32
<i>or Total cost (€ / m³ upgraded gas)</i>	<i>0.23</i>
<i>or Total cost (€ / m³ raw biogas)</i>	<i>0.13</i>

- Electricity and water are the main running costs
- Water regeneration or use of surface water is important
- Average biomethane selling price – 1.2 € / kg (0.8 € / l of petrol)

References

- University of Jyväskylä, Finland
Located at the (Mustankorkea)
landfill site, High pressure and
counter current water scrubbing
systems (6 Nm³/h)



- High pressure system was
commissioned in northern China
(40 Nm³/h)
Vehicle fuel and cooking fuel



- 25- 40 Nm³/h unit at Kalmari farm (Central
Finland) with modern automatic fueling station
30 vehicles are fueled



www.valorgas.soton.ac.uk

Valorisation of food waste to biogas
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