

Urban waste for biomethane grid injection and transport in urban areas

Project No: IEE/10/251



Good practice projects for biogas production from waste, upgrading and utilization

- **Economic figures of biogas production and upgrading processes -**



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Economic figures of biogas production and upgrading processes

INVESTMENT COSTS OF BIOGAS AND UPGRADING PLANTS

Figure 1 gives an overview about average specific investment costs for biogas plants. The costs include substrate storage and feeding installations, digesters as well as digester residue storages, pumps, gas pipelines, stirrers, control installations and the gas utilization unit (CHP). All costs are related to the installed raw gas capacity (x-axis, in m^3/h). The y-axis (in $\text{€}/(\text{m}^3/\text{h})$) represents the specific investment costs.

Investment costs for waste digestion biogas plants generally include additional costs for feedstock pre-treatment installations (crushers, sieves, mixers, and others) and hygienization systems which are individually designed for each type of organic waste. This cost can vary in a wide range depending on the type of organic waste and its degree of pollution. Thus, waste digestion biogas plants should have higher specific investment costs than standard biogas plants.

The economy of scale is clearly visible. Smaller plants start with specific investment costs of app. € 12,000 per m^3/h of biogas produced whereas big installations are available for € 4,000 per m^3/h .

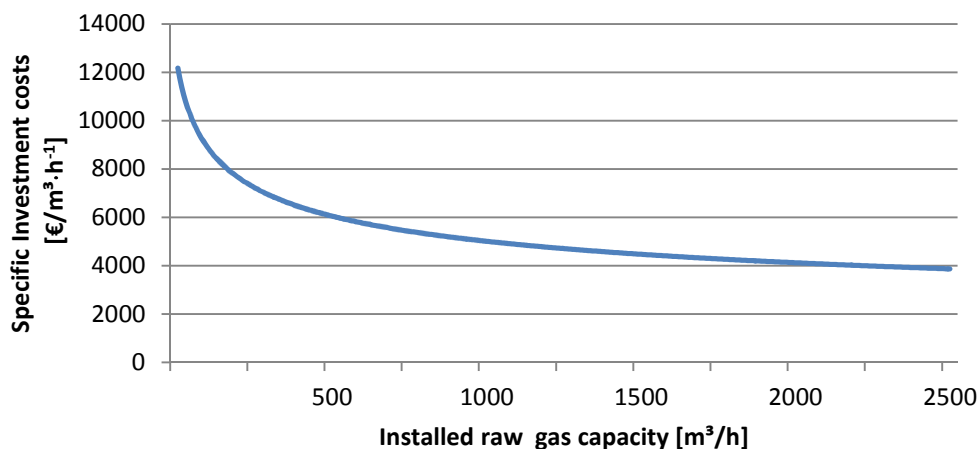


Figure 1: Specific Investment costs of (agricultural) biogas plants [according to KTBL 2009 and own assumptions]

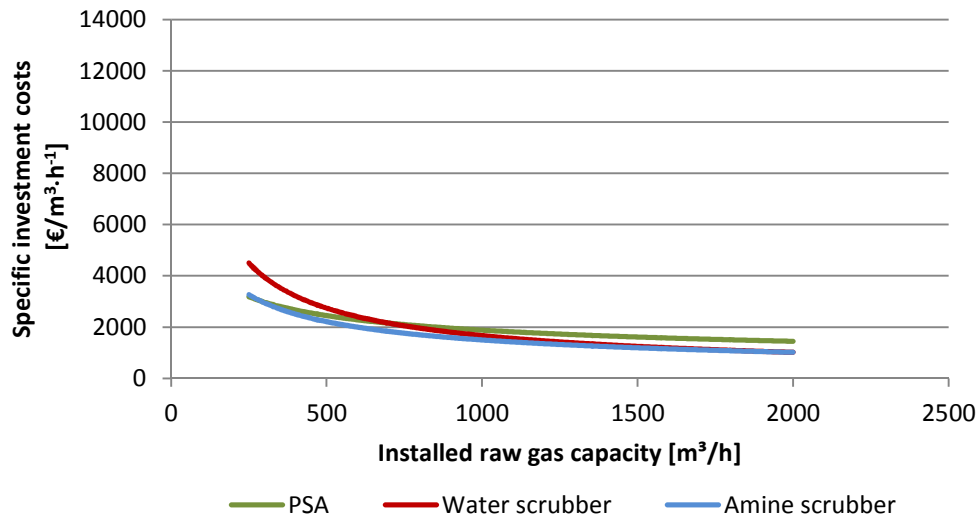


Figure 2: Specific Investment costs of upgrading plants [according to DWA 2011 after Urban et al. 2009]

Figure 2 gives an overview about specific investment costs of three different upgrading systems. All costs are related to the installed raw gas capacity (x-axis, in m³/h). The y-axis (in €/m³/h) represents the specific investment costs.

The economy of scale is clearly visible too. Smaller plants start with specific investment costs of app. € 4,000 per m³/h of crude biogas input whereas big installations are available for € 1,000 per m³/h. The upgrading unit alone sums up to 30-50% of the total investment costs.

BIOMETHANE PRODUCTION COSTS

Average costs of biogas production and upgrading for (agricultural) biogas plants are shown in Table 1. Biogas production costs of waste digestion can in general be reduced by revenues for the disposal of waste and money for feedstock procurement can be saved. Thus, biogas production costs of biogas produced from organic waste materials are often lower than costs of biogas produced from energy crop digestion.

Table 1: Average costs of biogas production and upgrading

	Production costs [€/kWh H _s]
Biogas production – energy crops digestion	5 - 6
Biogas production – organic waste digestion	<6
Upgrading costs	1.4 - 2.3