

Improved Performance of Biogas Plant Parkstetten Optimizing of Two-Stage Digestion



The biogas plant Parkstetten was completed in 2006 as a typical agricultural biogas plant, system Lipp.

The construction was classic for this kind of biogas plants with mixing tank, storage tank (hydrolysis phase), one round steel tank as main fermenter and a substrate storage tank. In 2012 the Biogas plant was enlarged with an UDR fixed bed fermenter.

The CHPS consist of one gas engine with 400 kW_{el} installed power and two engines with each 172 kW_{el} power as stand-by units.

The performance of this system was unsatisfactory in the long term and was particularly susceptible to overloading. End of 2012 the biology into the main fermenter disrupt by very high propionic acid concentration. The entire fermenter content had to be exchanged. By order of a consulting contract, we evaluated the installation and examined the current state of the process technology.

The outcome of the investigations showed that the biological disturbances were caused by a wrong working of the hydrolysis and therefore it hasn't had effect as a two-stage biogas plant.

For solving the problem there were no structural extensions required, but only a change of the operating procedure. The mixing and storage tanks in which the hydrolysis takes place are now operated pH optimized.

Already within a couple of days the biology has developed in the hydrolysis tanks and the pre-digestion of the contents fat, protein and carbohydrates up to fatty acid works well. Those fatty acids could be now easily transferred to Biogas into the fermenter.

The degradation of the organics has been significantly improved; the biogas yield has increased by nearly 60% with the same feed quantity.

Propionic acid in the fermenter is no longer detectable analytically.



Technical Data before Modification

Fermentation substrate mixture:
 Ensiled corn (pulp in "Ligavator" DM 40%): ca. 9 t/d
 Silo maize (whole crop DM 32%) ca. 4 t/d

Fermenter volume:
 Main fermenter 1 x 1,100 m³
 UDR-Fixed bed fermenter 1 x 65 m³
 Degradation rate of fed organic: ca. 52 %
 Specific biogas yield: ca. 0.52 m³/kgOTS

Biogas production: ca. 2,400 m³/d
 Methane content of biogas: ca. 52 % CH₄

CHPS unit: 400 kW_{el}
 Power production: ca. 2,150,000 kWh/a

Utilized capacity of CHPS ca. 62.5 %

Technical Data after Modification

Fermentation substrate mixture:
 Ensiled corn (pulp in "Ligavator" DM 40%): ca. 9 t/d
 Silo maize (whole crop DM 32%) ca. 4 t/d

Hydrolysis volume: 2 x 80 m³
 Main fermenter 1 x 1,100 m³
 UDR-Fixed bed fermenter 1 x 65 m³
 Degradation rate of fed organic: ca. 84 %
 Specific biogas yield: ca. 0.84 m³/kgOTS

Biogas production: ca. 3,840 m³/d
 Methane content of biogas: ca. 642 % CH₄

CHPS unit: 400 kW_{el}
 Power production: ca. 3,440,000 kWh/a

Utilized capacity of CHPS ca. 98.2 %

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