innovas News

Biogas Application 19/16

Improved Performance of Biogas Plant Gera ~ Optimizing of Two-Stage Digestion

The biogas plant Gera, township Aga, was completed in 2011 as a typical agricultural biogas plant with Main Fermenter, post fermenter and storage tank for digestate.
The feeding was carried out over a mixing tank which should also act as hydrolysis. The CHP power was initially 250 kW. Two years later a second cogeneration unit with 250 kW was bought.
But on the intended increase of biogas production it was seen that with the existing plant configuration the biological performance limit was reached. A more of biogas was associated with a disproportionate more supply of input material.
The mixing tank, which was thought to be the hydrolysis, was too small for the increased mash flow and had insufficient air exchange. The effective retention times in the fermenter, one behind the other, was too short.

In short, the biological degradation of the fed organics became worse and worse and one tried to compensate this with even more feed. A vicious circle which has had also disturbed the biological balance of the plant.

After a careful investigation and failure analysis, we developed an optimization concept for the plant and have implemented it step by step during the normal operation without any breaks from 2015 to 2016.
By using of a screw press separator and the separation of non-digested solids from the digestate, the recyclate for dilution the mash comes to be thinner and thus the mash quantity was reduced again.

As a first measure to improve biology, the air extraction from the mixing tank / hydrolysis was optimized and additional some air was also blown into the mash.
Also a second mash / hydrolysis tank was built and thus measure extended the hydrolysis time to a sufficient level.
The piping to and of the main fermenter and post fermenter has been modified so that both tanks are now operated in parallel as main fermenters. This gives now an optimal retention time for the methanation stage.
Not at least the storage volume for the digestate was expanded, but this was also due to the legal requirement for a sufficiently long storage capacity for fertilizer.

Technical Data <u>before</u> Modification

Substrate mix from maize, grass and rye silage, bruised rye, solid manure:	ca. 5,110 t/a
Digestion volume (in serial):	
Main fermenter	1,570 m³
Post fermenter	1,727 m³
Biogas production:	ca. 950,000 m³/a
Methane content of biogas:	ca. 55 % CH_4
CHPS unit:	500 $kW_{el.}$
Power production:	ca. 2,150,000 kWh/a
Utilized capacity of CHPS:	ca. 50 %

Technical Data <u>after</u> Modification

Substrate mix from maize, grass and rye silage, bruised rye, solid manure:	ca. 8,760 t/a
Hydrolysis volume:	337 m³
Digestion volume, in parallel	3.297 m³
Biogas production:	ca. 1,825,000 m³/a
Methane content of biogas:	ca. 62 % CH_4
CHPS unit:	500 $kW_{el.}$
Power production:	ca. 4,200,000 kWh/a
Utilized capacity of CHPS:	ca. 97 %

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