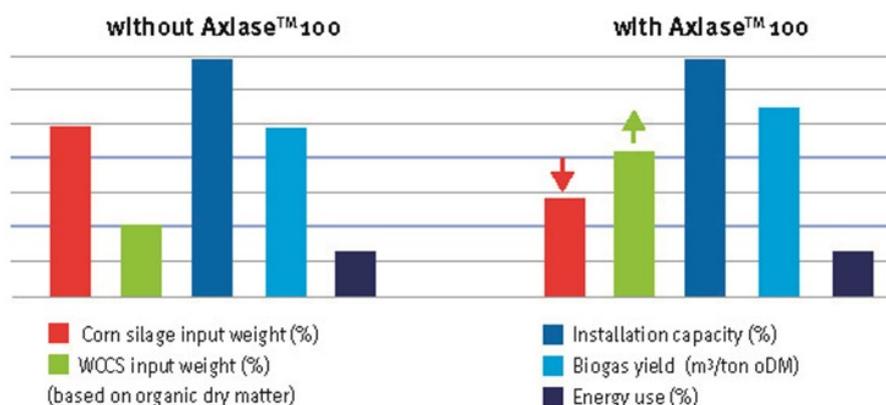


Development of new enzyme product Axiase™ 100

SUCCESS STORY



Operator

DSM Food Specialties B.V. -
DFS Enzyme Solutions - Biogas

Location of the project

Zeven, Germany



Contact details

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Project results

Biochemical

- Higher biogas/methane output
- Increased process stability
- Application of whole crop silages from cereals (WCCS)

Physical:

- Optimised feedstock use
- Improved mixing

Socio-environmental:

- Renewable electricity or heat supply

Economical:

- Cultivation of WCCS on for maize– inappropriate sites
- Balance out the crop rotation
- Equalisation of peak workload
- Feasibility of using substantially more cereal based fibre substrates, increase of specific energy production, replacement of maize silage by WCCS without reducing the methane yield

Project outline

In general, all organic substances are suitable for anaerobic digestion processes, but some are better than others. To run a biogas plant efficiently and without pre-treatment the best substrates are considered easily degraded materials, like: sugars, starch, fat and proteins. More complex material containing more non-starch-polysaccharides (NSP) increases viscosity and risk of scum layer formation; mixtures of hydrolytic enzymes are added to improve the use of whole crop cereal silages (WCCS) in the biogas process.

Having this issue in mind, Dutch life sciences company DSM have developed and tested together with MT-Energie GmbH (German biogas plant builder) and IASP/Berlin Humboldt University, the enzyme Axiase™ 100, which should allow plant operators to use a wide range of cereal-based fibre substrates, and consequently to increase the cost-effectiveness of biogas plants.

Technical data

Year of performed service:

2011 - today

Plant size: 625 kW_{el}

Digester volume:

2 x 2.285 m³

Gas storage: 2.450 m³ nett

HRT : ~145 days

Process temperature: Mesophilic

Type of raw material:

Corn silage, whole crop cereal silages (WCCS) from triticale, chicken manure

Utilisation of biogas:

Conversion into electricity by CHP

Utilisation of digestate:

Fertiliser



Picture: DSM Biogas

Performed actions

The application study was designed in different phases, in which the share of the cereal based fibre substrates was increased step by step. The goal was to increase the rye-WCCS input up to 60% of the total substrate input without using manure or other liquids. In each period of the enzyme application, the conditions of the process were compared with the starting conditions in the reference period. For the balance and the study evaluation the following process data were taken into account: gas yield/energy production, substrate input, rheological behaviour of the fermentation mass and the own energy consumption of the stirrers/total biogas plant.

Results of performed service

Axiase™ 100 was developed and field tested in close cooperation of DSM, MT-Energie GmbH and IASP/Berlin Humboldt University. During the field trial, German and Dutch companies were able to validate that when using the enzyme biogas producers can increase use of cereal silage (rye-WCCS) from 25% of total substrate mass to over 60%. This was achieved, thanks to hydrolytic enzymes contained in enzyme mixture, which improve degradation of non-starch-polysaccharides in the biogas process. The key benefits of using the enzyme in cellulosic materials are:

- Replacement of maize silage by more cereal based fibres without reducing the methane yield
- Cultivation of more cereal-based fibres for maize-inappropriate sites
- Better agitation (reduced scum layer)
- Less stress and damages of stirring units and pumps
- Less own energy consumption
- Improved utilization of the substrate and methane yield