HyPerFerment

Increasing the Efficiency of Biogas Plants

MicroPro GmbH
Microbiological Laboratories

Fraunhofer
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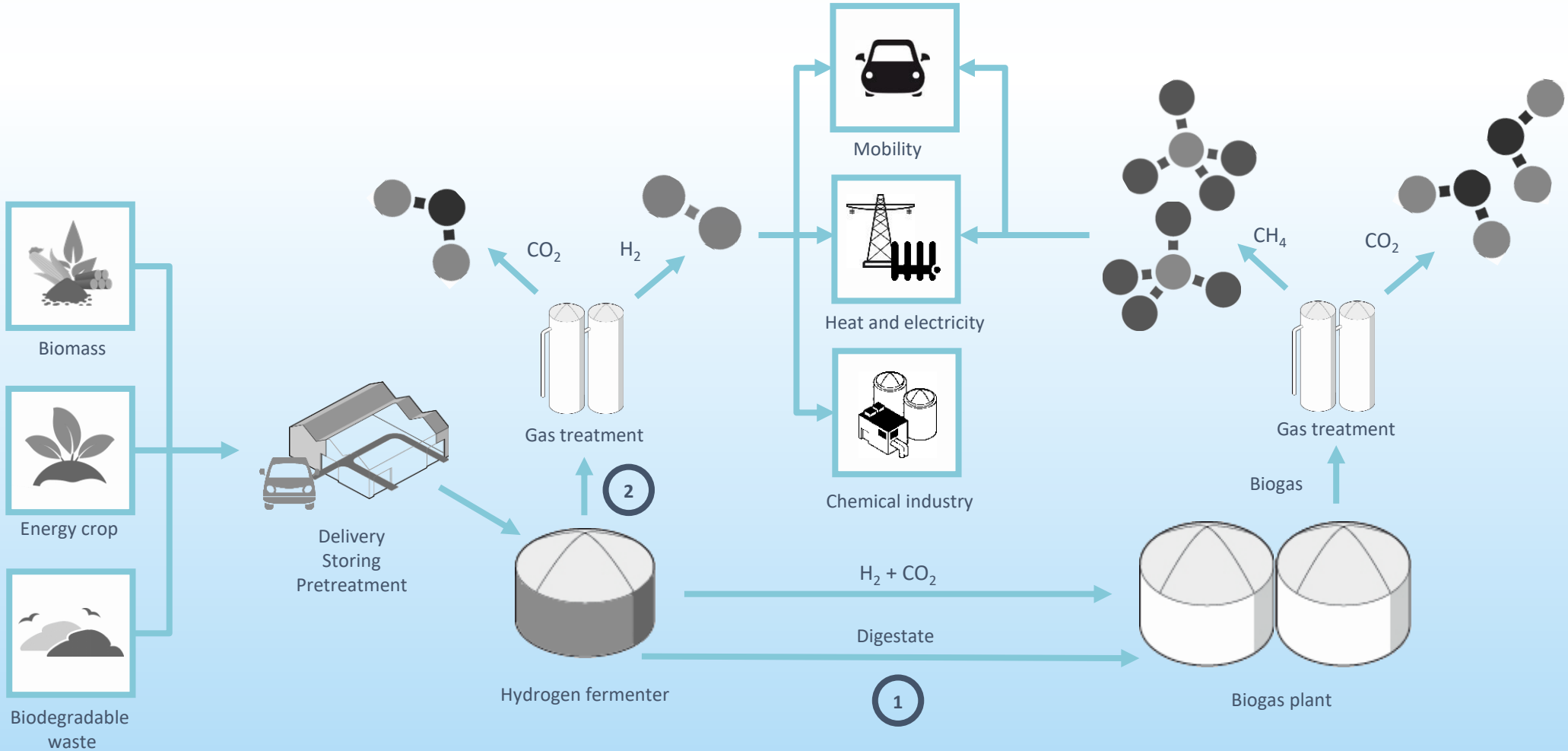

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What does HyPerFerment mean?

Hydrogen **Per** *(via)* **Ferment**ation

The Story Behind HyPerFerment

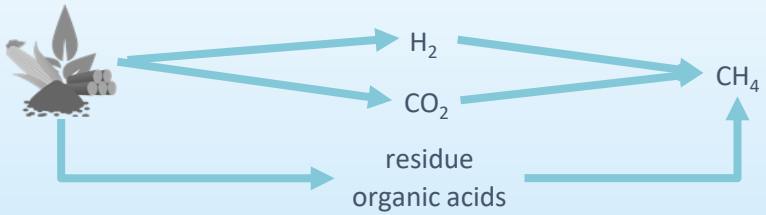
In 2006, the idea of producing renewable hydrogen from waste and residual materials arose when hydrogen forming organisms were found during research work on alcohol production from wood wastes. At that time, however, the market was not yet ready for a hydrogen economy and the project idea could not convince any investor. Therefore, research on this exciting topic had to be reduced to a minimum. With the search for green and CO_2 deficient energy sources, bacterial hydrogen formation got an updraft which finally allowed the initiation of the HyPerFerment project.

Fundamentals of Dark Fermentation

Dark fermentation is a microbial process which allows the conversion of organic substances (e.g. carbohydrates, proteins, lipids) to hydrogen (H_2) and carbon dioxide (CO_2). The whole process takes place at temperatures of 30 °C - 80 °C in absence of light and air. If the conditions are chosen correctly, a fairly clean gas mixture of ≈ 50 % H_2 and ≈ 50 % CO_2 is produced, which does not contain methane or interfering components such as hydrogen sulfide.

The Idea of HyPerFerment

Since the biodegradation of the organic substances in a dark fermentation is incomplete and usable intermediate products such as organic acids accumulate, it is worthwhile to combine the process with other methods. In HyPerFerment we propose the combination of conventional biogas production with dark fermentation. It does not only allow a thorough degradation but also a conversion of the intermediates, resulting in a surplus of methane. By combining both processes, numerous synergies (e.g. substrate, logistics, heat, water) can be exploited and the overall efficiency can be improved.



Two Ways of Increasing the Efficiency

By integrating dark fermentation into existing biogas plants, the substrate can be used more efficiently. There are two options for improving the process through dark fermentation:

1. Increase biogas outcome by directly conducting the H_2 /CO_2 mixture produced by dark fermentation into existing biogas plants
2. Produce additional hydrogen without obtaining any less methane than in the usual biogas process