Hitachi Zosen INOVA

Dietikon / Switzerland

Green Gas from Waste and Wastewater

450 Nm³/h hydrogen, 100 Nm³/h methane gas

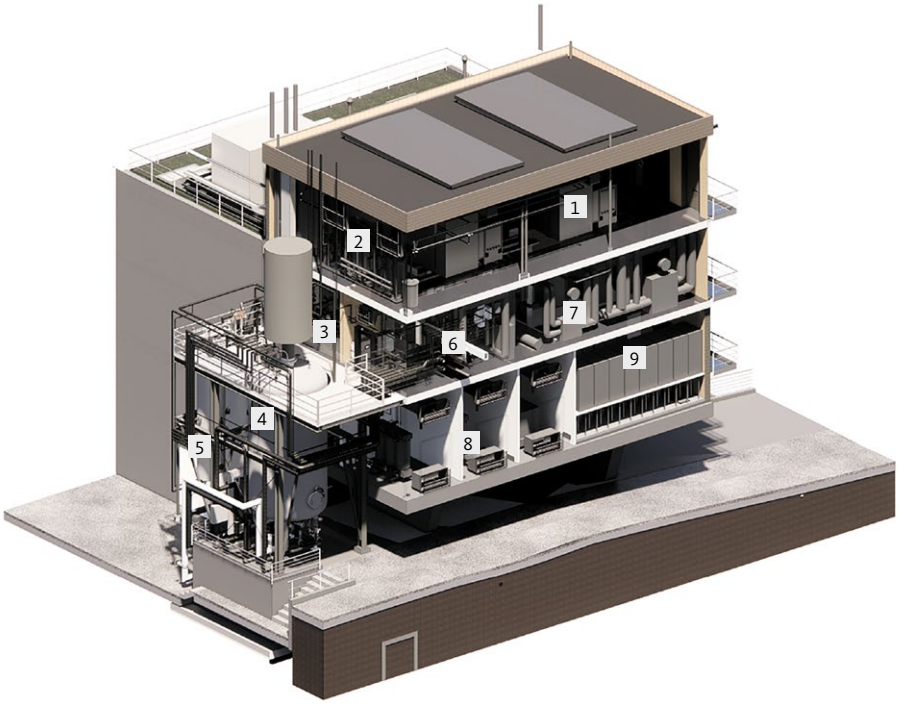
Waste and Wastewater Treatment Efficiently Combined

The Power to Gas plant in Dietikon makes a pioneering contribution to efforts to remodel the Swiss energy system. Electricity generated from the treatment of waste and carbon dioxide (CO_2) from digester gas are used to create a new carrier of energy: synthetic methane. This lighthouse resource recycling project is the first in Europe where a natural gas substitute for commercial use is produced on the basis of Hitachi Zosen Inova's biological methanation technology.

Limeco, the Limmat Valley's intermunicipal utility, had the ideal location for the first industrial Power to Gas facility in Switzerland. On its site in Dietikon it operates both a Waste to Energy (WtE) plant and a wastewater treatment (WWT) plant. This combination provided the ideal conditions for the Power to Gas plant, which was constructed in collaboration with eight Swiss energy utilities and the Swisspower municipal alliance, and went into operation in early 2022. It consists of an electrolyser, the BiON® methanation reactor, a gas upgrading system and a unit for managing heat and cold. The green gas produced by the plant represents a reduction of around 5,000 tonnes of CO_2 emissions, as much as generated by around 2,000 households.

Optimum Combination of Processes

Achieving this involves an efficient combination of existing treatment and upgrading processes. The WtE plant treats more than 95,000 tonnes of household and industrial waste a year to produce regenerative electrical energy. Instead of being fed into the public grid, this electricity is used in the Power to Gas plant's electrolysis unit to split potable water from the wastewater treatment plant into hydrogen (H_2) and oxygen (O_2). The hydrogen is used in the biological methanation process, where microorganisms convert it into methane by feeding in biogenic gas from the wastewater treatment unit containing CO_2. In the digestion towers of the wastewater treatment plant, anaerobic microorganisms first break down the sewage

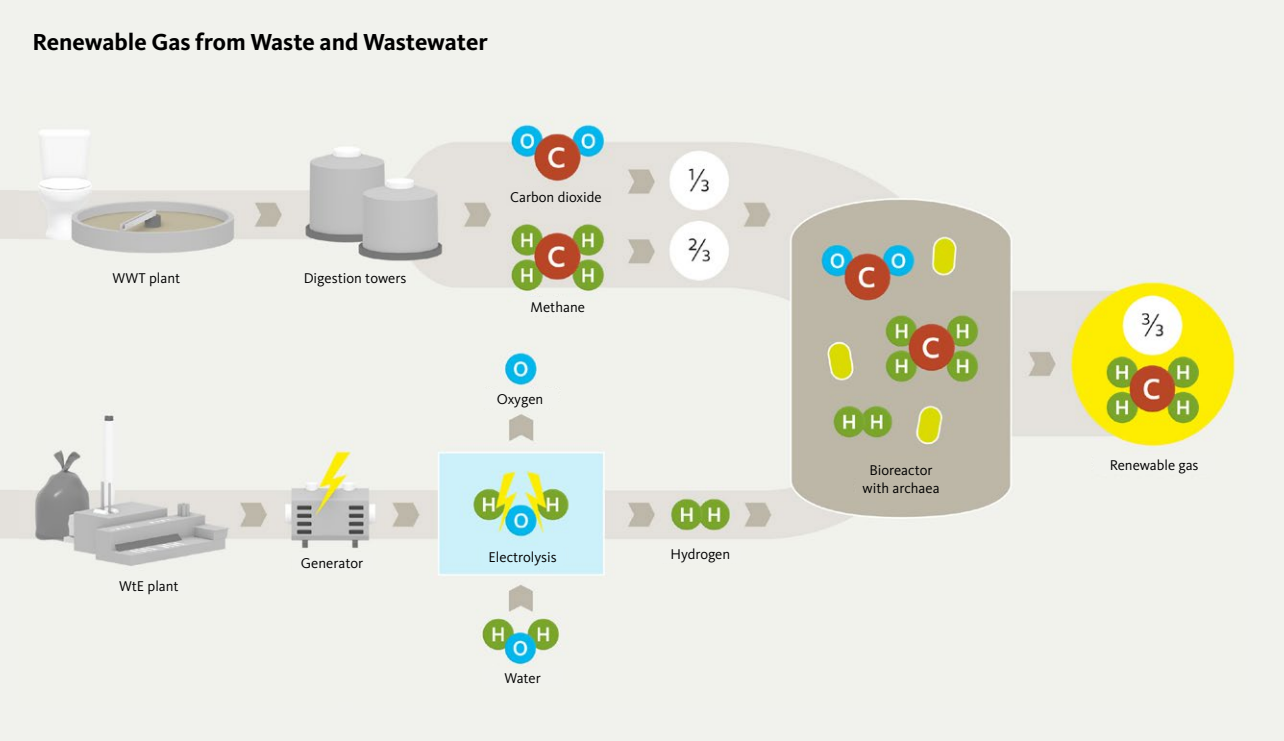


Electrolysis
1 Electrolysis stacks
2 Water treatment

Biological Methanation
3 Gas upgrading unit
4 Methanation reactor
5 Gas cleaning unit

Distribution Unit
6 Distribution systems
7 Heat/cold distribution

Electrical System
8 Transformer
9 Control unit (EMSR)



sludge into biogas, which consists of about two-thirds methane and one-third carbon dioxide. It is compressed and fed into the bioreactor, which is three-fifths full of digested sewage sludge from the wastewater treatment plant. In the BiON® process developed by HZI Schmack, archaea metabolise the CO_2 with the hydrogen from the electrolysis unit under anaerobic conditions to produce additional methane. A multi-stage upgrading process brings the product gas from the methanation reactor to the required quality for feeding into the gas grid. This produces up to 18,000 MWh of natural gas substitute a year.

Robust and Flexible Technology

The BiON® anaerobic technology used in the process has key advantages over conventional technologies. Impurities in the raw gas do not affect the process. In addition, momentum is maintained in on-off operation: after a quick stop, the system starts up again just as reliably. This way production rates can always be flexibly controlled, from standby to full capacity. And since almost no energy is needed for slow start-up of the reactors or rinsing of the systems, BiON® also scores in terms of environmentally friendly operation. The technology is also easily scalable and available in various sizes.

BiON® technology, methanation reactor

General Project Data

Owner and operator	Limeco Regiowerk Limmattal
Commissioned	2022
Scope of delivery	Biological methanation with BiON® technology

Technical Data: Electrolysis

Power consumption	2.5 MW
Operating temperature	60 °C
Operating pressure	35 bar
Water consumption	approx. 2 l/Nm³ H_2

Technical Data: Methanation

Reactor	50 m³
Temperature	approx. 65 °C
Pressure	approx. 7 bar
CO_2 in sewage gas	approx. 35%
Sewage gas volume flow	140–270 Nm³/h
Hydrogen volume flow	200–450 Nm³/h
Synthetic methane	100 Nm³/h

Technical Data: Gas Upgrading

Feed-in rate	140–270 Nm³/h
Feed-in pressure	5 bar
Dew point	–8 °C
CH_4	> 96 vol%
CO_2	< 5 vol%
H_2	< 2 vol%
H_2S	< 5 mg/Nm³

Output

Electricity from WtE plant	10,000–15,000 MWh/a
Hydrogen	up to 450 Nm³/h
Green gas	18,000 MWh/a
Usable waste heat	0.8 MW/a

Emission Reduction

CO_2	4,000–5,000 t/a

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