

Pfalzgas GmbH and Stadtwerke Pirmasens Holding GmbH as Business Partners

PFI Founds Biotechnology Marketing Company

Technologies recently developed by PFI in cooperation with regional companies will in future be marketed by the Pirmasens-based company PFI-Bioraffinerietechnik GmbH which began operating in April 2015.

On 29 December 2014, the Test and Research Institute Pirmasens set up the limited company “PFI-Bioraffinerietechnik GmbH” to handle future marketing of PFI know-how in the areas of biotechnology, energy optimisation, and engineering. Participation of PFI’s long-standing cooperation partners, the gas supply company Pfalzgas GmbH and the public utility company Stadtwerke Pirmasens Holding GmbH, as shareholders in the new company has strengthened its market position and enhanced its expertise. Benjamin Pacan (PFI) and Martin Weinzierl (Pfalzgas GmbH) were appointed to the management board.

PFI-Bioraffinerietechnik GmbH started business operations on 1 April 2015 and is currently working on plans to develop Pirmasens Energy Park. The new company was presented to the public at a press conference convened in the municipal offices of Pirmasens on 9 July 2015.

Innovations in Biotechnology: Milestones along the Path to the Energy Turnaround

In recent years, the Test and Research Institute Pirmasens has enjoyed the support of Pfalzgas GmbH and Stadtwerke Pirmasens Holding GmbH in developing a series of innovative concepts helping to drive the energy turnaround championed by the German federal government and the European Union.

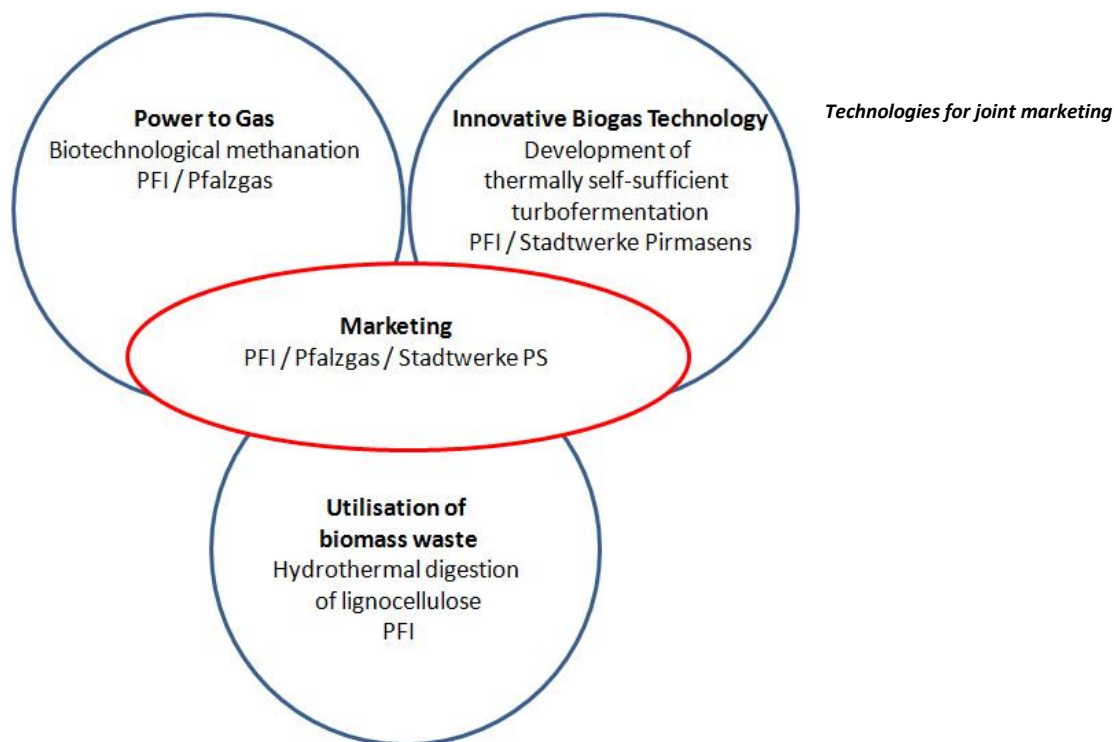
While Pfalzgas GmbH focussed its attention on the storage of excess electric power in the national gas grid, the planning activities of PFI together with Stadtwerke Pirmasens Holding GmbH concentrated on implementation of energy-optimised and resource-conserving biomass utilisation at Pirmasens-Winzeln Energy Park.

In addition, PFI has developed meanwhile patented processes for material- and energy-based utilisation of waste biomass such as straw. In discussions between representatives of the participating institutions it became abundantly clear that coupling of the technologies developed in parallel could well contribute to attainment of Germany’s energy policy goals. Innovative technology, flexibility of application (modular plant construction), and Germany’s unique range of pilot plants in

operation at Pirmasens-Winzeln Energy Park are strong arguments in favour of joint marketing by the three business partners.

PFI has spent over ten years working on the optimisation of biogas production with the following objectives:

- 5 to 10-fold increase in the rate of biogas fermentation depending upon the biomass feed
- effective utilisation of waste biomasses (activated sludge, straw) for biogas production
- reduced energy requirements for operating plant



In 2007 a *pilot plant for Thermal Pressure Hydrolysis (TPH) of activated sludge* was built at the Blümeltal sewage treatment plant in Pirmasens in order to optimise the digestion process developed at PFI. It can process up to 10,000 t/a of activated sludge at 140 °C and the methane yield was increased by up to 50 percent.

In 2009 a *Process-controlled Enzymatic Hydrolysis (PEH) unit* developed by PFI was installed at the Wallhalben biogas plant. Thanks to the upstream fermentation step, the throughput of the biogas plant could be doubled and the process simultaneously stabilized. The experience gained led to

development of a “turbofermenter” constructed as a research plant by PFI at Pirmasens Energy Park in 2013.



PFI Pilot plants: Sewage treatment plant at Pirmasens (left), biogas plant at Wallhalben



Biogas plant at Pirmasens-Winzeln Energy Park

A multi-chamber system (patent applied for) permits highly flexible substrate storage, hydrolysis, fermentation, and digestate storage. This has the following advantages for biogas production:

- approximately 50 percent smaller land footprint compared to conventional biogas plants
- straightforward integration in industrial areas thanks to substrate/digestate handling by means of closed tanker vehicles and appropriate pumping technology
- improved acceptance by residents owing to avoidance of noise and odour in outdoor areas
- use of the biogas at other locations connected via a gas pipeline (up to 10 km distance for biogas; any distance after gas purification)

At the same time, PFI devised a concept for storage of excess power in biogas. In collaboration with Pfalzgas GmbH, PFI developed an innovative process on an engineering lab scale which is currently undergoing industrial scale trials in a newly built power-to-gas pilot plant at Pirmasens-Winzeln Energy Park. In contrast to other development and demonstration projects performing industrial methane synthesis, methane is produced in a bioreactor by special methanogenic microorganisms at Pirmasens-Winzeln Energy Park. Since methanogenic bacteria show no end-product inhibition, unpurified biogas can also serve as a source of CO₂.

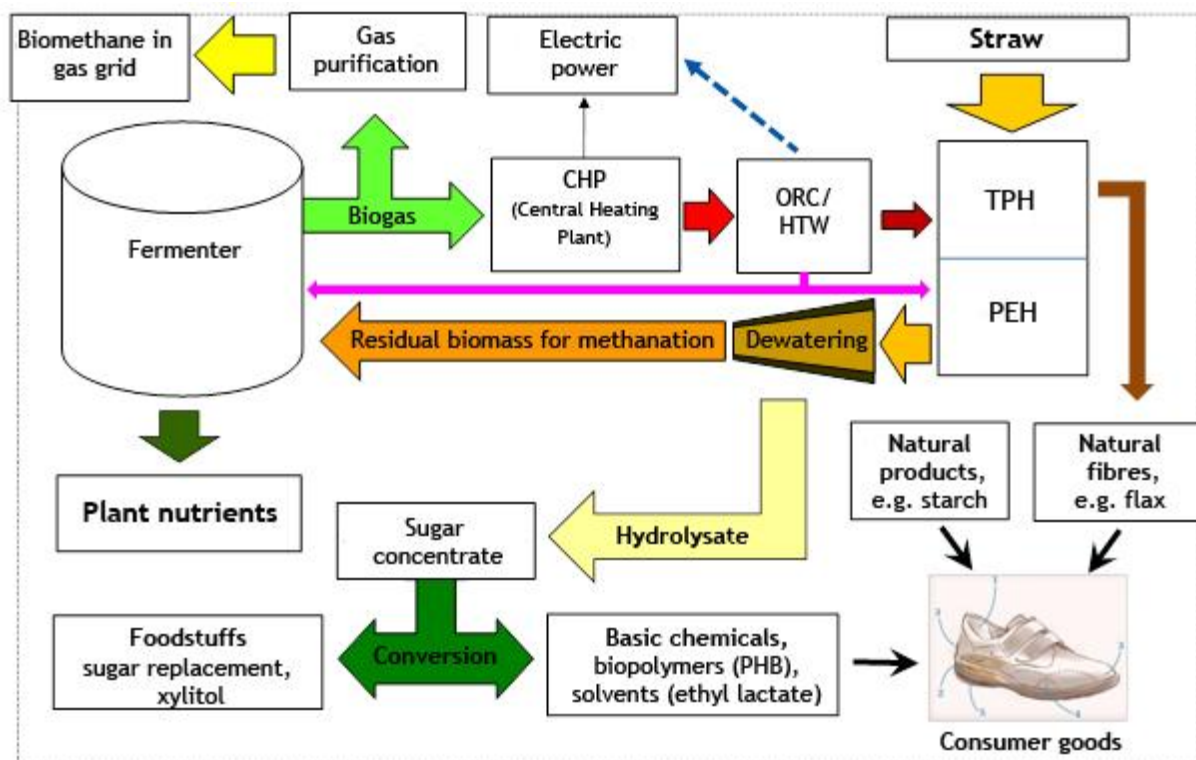
Microbial methane synthesis has a number of advantages over conventional methods of industrial methane synthesis. Thus biological methane formation from CO₂ and H₂ has a high energy efficiency of over 80 percent. Given the efficiency of electrolysis (over 80 percent), an overall efficiency of about 65 percent can be calculated. In contrast, today's industrial processes have a maximum overall efficiency of 60 percent.



PFI engineering lab scale plant for methanation and power-to-gas pilot plant built at Pirmasens Energy Park

In view of current developments in energy markets resulting from the energy turnaround in Germany, it is a logical step to market the innovative technologies developed at PFI as new products in the energy and carbon-based raw-material sector. Thus individual modules of the biorefinery

concept (energy-optimised turbofermenters, biotechnological methanation of biogas CO₂ with hydrogen produced electrolytically from excess energy, thermal pressure hydrolysis of activated sludge and straw, etc.) will be offered, e.g., to operators of power generation plants or power supply companies. The long-term aim of the newly founded company is to plan and market turnkey biorefineries for production of biomethane from excess power produced from renewable sources (wind, solar, biomass) and carbon-based raw materials (bioplastics, fuels, basic chemicals) from agricultural residuals and biowaste.



Overall concept of the biorefinery developed at PFI

Further information

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