

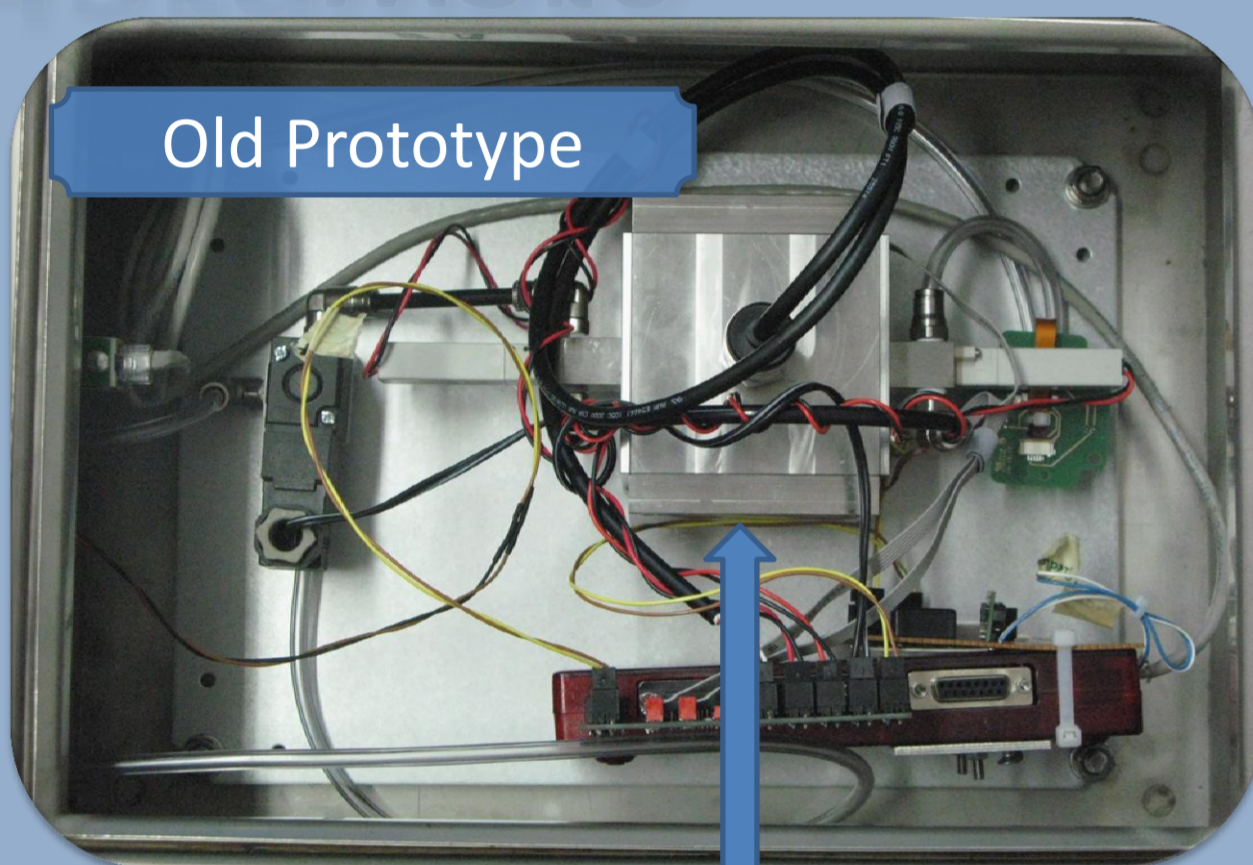
Automated H₂ and H₂S measuring device with intelligent overload protection

Udo Schmale, David Wehmeyer, Holger Mueller
BlueSens gas sensor GmbH, 45699 Herten Germany

Introduction

As part of the public founded (BMBF) program "BioProFi - BioEnergy - Process-oriented Research and Innovation" the aim of the project "MOST – model based process control in biogas plants" was to develop a compact measuring device with multiple parallel working sensors for the biogas analysis. For a better understanding of the bioprocess itself, the involved microorganisms and their interactions during the process a reliable stable mathematical model had to be designed. Regarding this new model a sensor based control of the process should be established. As part of this project a new modular sensor for H₂ and H₂S in the biogas of even small laboratory fermenters was developed. Beginning with the examination of different electrochemical detectors for H₂ and for H₂S the key problem for using these types of detectors in biogas is, that the amount of oxygen which is necessary for the electrochemical reactions inside the detectors cannot be provided by the anaerobe digestion the biogas process itself.

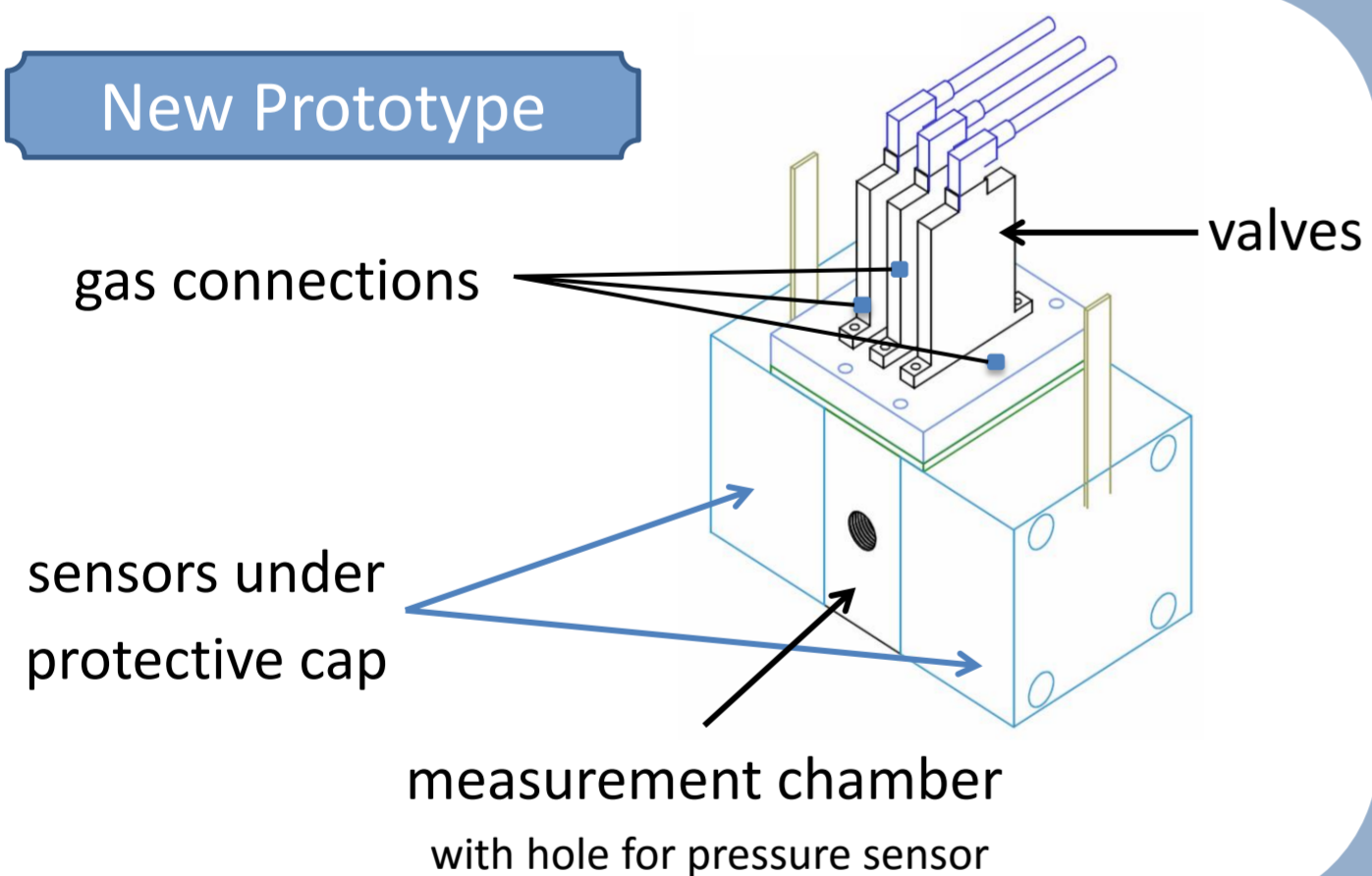
Hardware



Old Prototype

huge Measurement chamber :
Outer [mm] : 80x80x80 mm³
Inner volume > 100ml

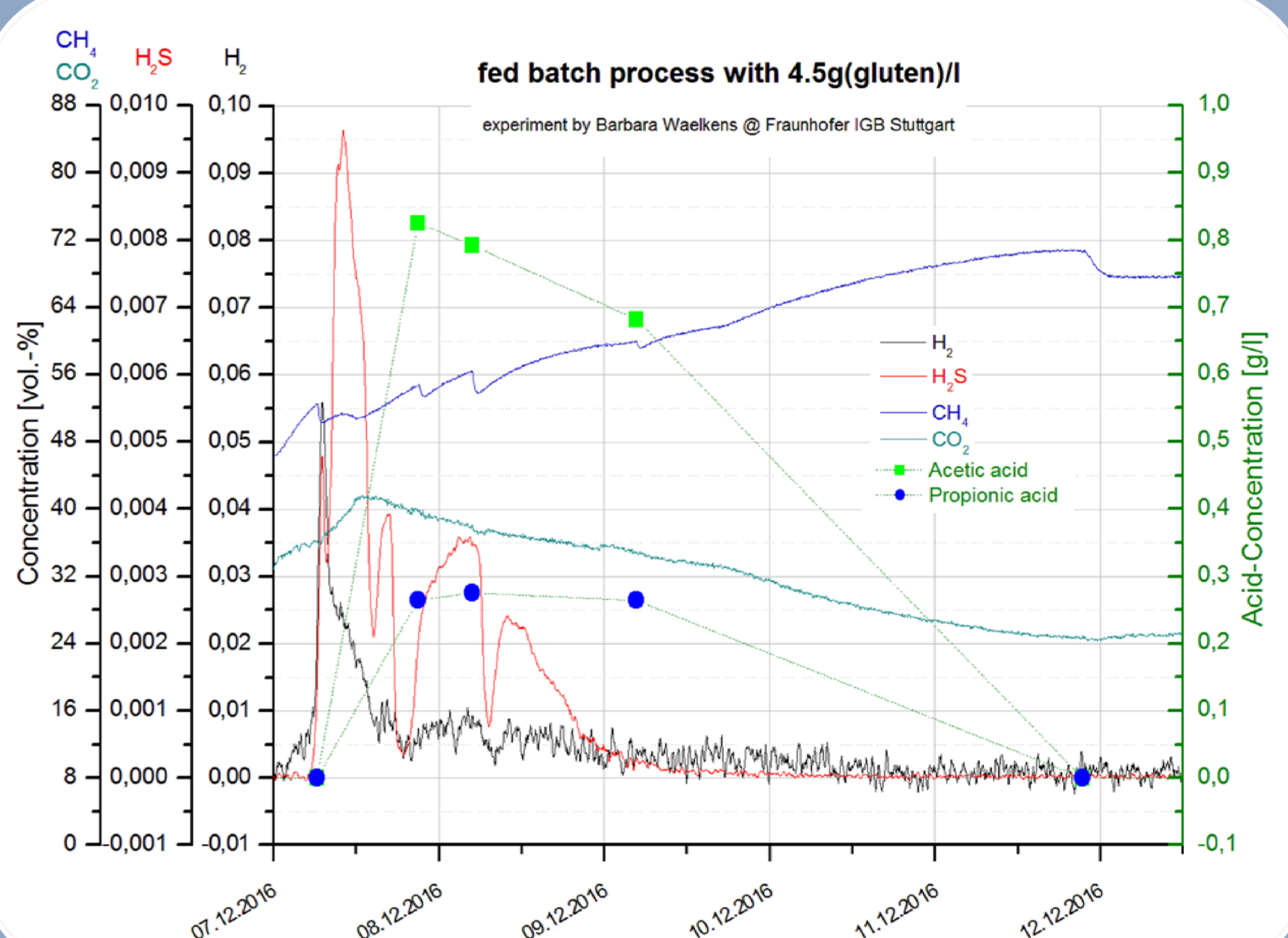
New System developed:



New Prototype

small measurement chamber :
outer [mm] : 50x60x25 mm³
inner volume ~ 8ml
No tubes inside the system

Measurement



An old prototype was used to detect the gas concentrations of a test fermenter at the Fraunhofer IGB in Stuttgart. A very small production rate of only 1-2 ml/min can be adequate to perform the measurements. The smaller the production rate, the longer the intervals of the device has to be set. The interval can be varied between 10 and 180 minutes.

Outlook

The new prototype provides a very small measurement volume. Therefore the measurement interval at same production rates can be decreased. The dilution of the biogas will be automatically adapted to use the optimal concentration range for the sensors, hence high concentrations can't damage the sensor-elements. The sensor will be integrated in the BlueVis software and a measurement can be automatically triggered by the increase of the production volume.