

# BI GAS Journal

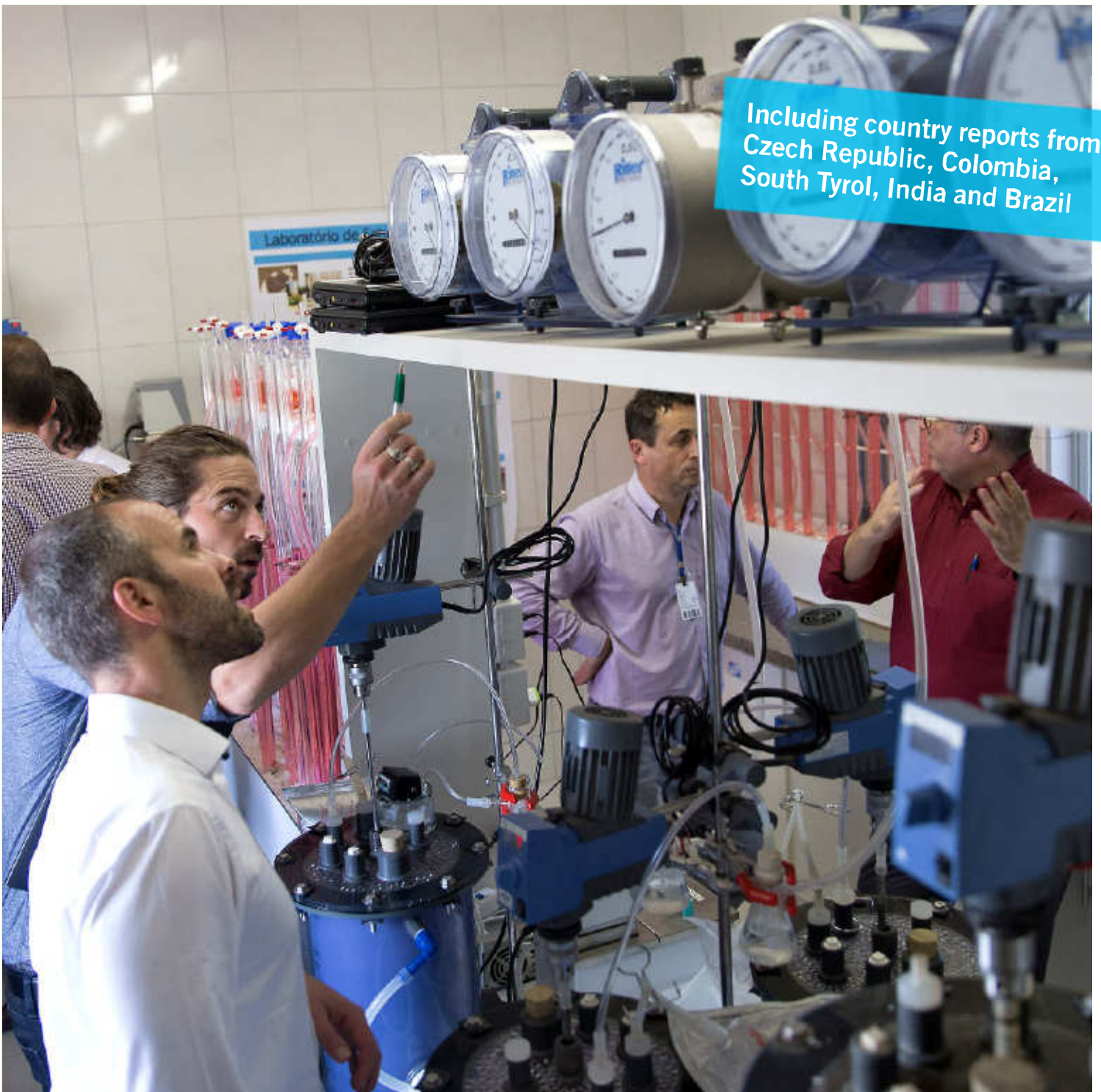
The trade magazine of the biogas sector

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FOTOS: ÖKOBIT



Bogotá

## COLOMBIA

# The art of downsizing

**ÖKOBIT GmbH, from Föhren, designs and constructs big, technically sophisticated biogas plants. Three years ago the company developed a plant which will fit into any garden. How did it come about and who will benefit from this compact plant?**

By Claudia Lohmann

**T**o begin with it was sort of a bet. In 2012 Christoph Spurk, co-founder and managing director of ÖKOBIT GmbH, wanted to convince his engineering colleagues that it was possible to develop a simple and cheap biogas plant with a few basic components. The internal discussion was triggered by modification of Germany's Renewable Energy Sources Act (EEG) in the same year, which promoted 75 kW plants. It quickly became clear to everyone at ÖKOBIT that to be economic, the much smaller slurry and manure plants would have to be technologically adapted.

But what quality of components is actually indispensable for an efficient, low-tech biogas plant? Spurk, who is himself a qualified utility engineer, waste expert and has been in the high-tech industry with ÖKOBIT for 16 years, decided to go back to technological basics. Whilst his colleagues concentrated on plant development compliant with the German Renewable Energy Sources Act, the company boss started to conduct research in his spare time. He wasn't bothered about developing alternatives to the 75kW plant.

As an experienced biogas professional, Spurk knew that the basic principle behind generating methane from organic waste is several thousand years old. He also knew that functioning mini plants operate in India and Nepal, to a greater or lesser extent. Spurk discovered why none of the three current plant types has been successful: there are problems with corrosion and there-

fore loss of gases and fluctuations in gas pressure. The existing solutions are sub-optimal due to high material costs, and the high cost of transport and maintenance. Also the need to dilute the feedstock generates a need for water that is hardly environmentally friendly and, in some places, infeasible. Above all, sink layers in the fermenter represent a functional problem and considerably reduce gas yield.

The outcome of his research was that future mini ÖKOBIT plants must be easy to transport, erect and operate. They must experience as little wear as possible and a mixer aggregate is an essential part of a efficient plant that runs well. In a nutshell, Spurk wanted to equip his mini plants with simple components which, if possible, should be available anywhere in the world. He found the model for his mixer aggregate in a museum in Trier.

### Test in his own garden

Most of the components in a patented HoMethan (from "home" and "methane") mini biogas plant, as it is known, are available from any do-it-yourself store, including the safety equipment. Only the fermenter bag is a special solution from ÖKOBIT GmbH. In spring 2013 it was time for a test and Christoph Spurk set up a prototype plant in his own garden. A pit was dug and lined with the special film. The earth fermenter created in this way was fed with grass cuttings. As May, when it was installed, was relatively cool, "harvesting" of the gas did not start until June. Spurk recalls that

Picture on the top of the page: Graduates of the biogas course "Biogas Tutorium" with their certificates of attendance near the Pacific coast Nariños.

“One evening my daughter came into the kitchen from the garden and said ‘We’ve got gas!’.” ÖKOBIT made contact with Colácteos, an agricultural cooperative in Pasto, Nariño region, Colombia, through the mediation of RLP AgroScience GmbH, a German non-profit company in Rhineland-Palatinate. Colácteos was very interested in HoMethan, because it hoped that with it, it would be possible to solve several of the region’s problems at the same time. Up to that point the farmers had been reliant on energy imports. Local capital went towards buying expensive fossil fuels, such as liquid gas or diesel, and fertilisers. At the same time the forests of Páramo la Paja Blanca were coming under attack from the need for firewood for heating. On the other hand, considerable biomass potential was being wasted, which also caused environmental problems, as the farm workers simply dumped the animal slurry in the surrounding area. There was no such thing as waste management.

**Transfer of technology and knowledge**

There was an urgent need for change in Nariño. A two-year project, supported by DeveloPPP (funded by the German Federal Ministry of Economic Cooperation and Development and executed by sequa gGmbH), was developed in conjunction with the Colombian vocational education institution SENA in the region of Nariño. Know-how transfer was key to the project implemented between 2014 and 2016 in addition to installation and commissioning of several HoMethan plants. Together with SENA, for three days ÖKOBIT provided ten teachers with theoretical and practical instruction on site as



part of a train-the-trainer biogas tutorial. These later passed on their knowledge to their trainees, because the idea is that local experts should be able to independently set up, operate and maintain the mini plants as quickly as possible.

**Biogas production at 3,000 metres above sea level**

HoMethan’s operation is exclusively mechanical and requires sunlight for the substrate inside the earth fermenter to heat up. The stable biological process of methane production commences when the fermenter temperature reaches 22 degrees Celsius. Of the ten plants installed between 2014 and 2016, one was set up at Centro Agroindustrial y Pesquero, SENA’s training centre in Pasto, which is located at sea level. The remaining nine plants have been set up by trained colleagues at agricultural businesses at 2,600 to 3,300 metres above sea level.

HoMethan had to be adapted to conditions in the Andes, because the temperatures at these altitudes are not sufficient for continuous gas production. But Christoph Spurk had also prepared for this, with a winter ver-

Small operating biogas plant in the vocational training centre SENA Centro Lope in Pasto in the District of Nariño on 2,658 metres above sea level.

PRONOVA

BIOGAS ANALYSIS

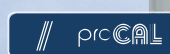


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Picture on the top of the page: View over the Farm Chambacú on 3.266 metres above sea level close to Pasto, District of Nariño.



Course participants are trained in biogas production.

in the Nariño region. ÖKOBIT installed the first HoMethan biogas plant in Pasto and is supporting three more projects. The cooperative took over installation from the second plant. Two of the three plants have been installed and commissioned by trainees. The desired know-how transfer was successful. And freedom from construction materials and components from Germany was also achieved, as planned; only the special sheet to cover the pit was imported from Föhren.

The ten HoMethan plants have been adapted to their respective sites. Like all ÖKOBIT biogas plants, the new mini plant is designed to be flexible in the use of different feedstock. This means it can use manure, organic waste and even agricultural waste which, to European eyes, is exotic, such as coffee bean husks.

sion in his garden. In winter he simply insulated his fermentation pit and placed a little greenhouse made from polythene sheeting and wooden slats on top. Exactly the same was added to the high-altitude HoMethan plants

**Great benefit to small businesses**

The advantages for Colombian agricultural businesses are obvious, as it is clear from the example of a dairy business: HoMethan produces five cubic metres of biogas per day when fed with 200 kilograms of slurry. This

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corresponds to around 75 kilograms of liquid gas per month, or 90 litres of diesel. The gas is mainly used for cooking (up to 10 hours per day), or to heat water for washing and cleaning. In addition the dairy farmer can produce around 200 kilograms of organic fertiliser every day.

An average farm in the cooperative comprises four to five hectares of land for grazing and cereal cultivation, plus a vegetable and ornamental garden. The fermentation residue does not require further treatment before being used as fertiliser on these areas. This has been highly successful. "Our grazing land is much greener and the grass roots are longer and stronger. And the palomilla de la papa (South American tomato leaf miner) has disappeared," says Jorge Meneses, member of the Colácteos cooperative, of the improvements at his farm La Pradera, at an altitude of 3,266 metres.

The problems which ensued from unregulated disposal of slurry, such as the smell, have also been resolved. Albeyro Quintero is also a member of the Colacteos cooperative and runs the El Imacal farm at 3,013 metres. He reports two other benefits: "Since we use biogas instead of wood the smell in the kitchen has disappeared and we are now no longer dependent on the gas supply. I have also used the organic fertiliser for grass, cereal crops, vegetables and flowers. The yields are similar to those for mineral fertilisers. This has simply completed the cycle."

**Initial resistance overcome**

As a result of savings on LPG and fertiliser, the project's amortisation period for a HoMethan plant averaged 18 months. Project manager Montserrat Lluch Cuevas says that it was a comparatively short route to all these remarkable results in technological terms, but somewhat lengthier culturally: "The first challenge was



Biogas plant on the Farm San Rafael on 3,136 metres above sea level in Guachucal, District of Nariño.

integrating our technology into the agricultural process and winning over the local people." The farm workers initially balked at controlled collection of manure and slurry. The ice was not broken until the first HoMethan plant supplied gas. From then all those involved were enthusiastic. "For ÖKOBIT it's also about the mission," explains Christoph Spurk, "Mini plants are a good way to increase awareness of the enormous benefits of biogas plants in developing and emerging countries. We hope that in this way we will be able to access new markets in future for our high-tech solutions too." A follow-up project in Colombia has already been agreed. A sustainable home, including biogas plant, will be erected in conjunction with SENA. ◀

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