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Integrated Water Resources Management Mongolia

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– Model Region Mongolia –

MoMo Fact Sheet
Biogas Pilot Plant at the Central WWTP Darkhan

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Background

In the city of Darkhan wastewater from apartment houses is purified in a central wastewater treatment plant (WWTP). The produced **sewage sludge** is deposited in huge ponds, which however might cause a contamination of soil and groundwater. Furthermore nutrients and energy as resources of sewage sludge are wasted.
Ger-settlements, surrounding the strictly planned city of Darkhan, are not connected to a sewer system. People just use simple pit latrines. This leads to unsafe hygienic conditions as well as a contamination of soil and groundwater. That is why a new toilet system, called iPiT, is tested in Ger-settlements within the MoMo-project. The iPiT is a dry toilet. Urine and **feces** are collected separately in two different containers.

As a part of an **integrated sanitation system** an **anaerobic co-digestion** of sewage sludge from WWTP, feces from Ger-settlements and biodegradable waste from Darkhan region is supposed to be tested by running a **biogas pilot plant**.

Objective

The biogas pilot plant is constructed in a 40 ft shipping container. It consists of a control room, a storage & mixing section and a digestion section.

Fig. 1: Biogas pilot plant installed in a 40 ft shipping container (location: WWTP Darkhan)

There are seven different tanks (0,1 m^3 – 2 m^3) for storing and mixing substrates (*fig. 2, left*).

Two continuously stirred tank reactors (CSTR) made of stainless steel are built up in the digestion section (*fig. 2, right*). Each digester has got a volume of 750 L. Every day each digester is fed with 37,5 L of substrate which leads to a solids retention time (SRT) of 20 days. One digester is just fed with sewage sludge, in the other digester a co-digestion of sewage sludge, feces and organic waste is carried out. An electrical heating, surrounding the digesters, keeps the temperature at 37°C (mesophilic conditions). The produced biogas is counted with a gas meter and its composition is analysed by a gas analyser.

Feeding and mixing of the digester is automated and controlled by a programmable logic control located in the control room.

Fig. 2: Local operator of the plant explains storage & mixing section to inhabitants of Darkhan (left); digester (right)

Preliminary Results

The biogas pilot plant has been already run in and optimised in Weimar. A co-digestion of sewage sludge from municipal WWTP Weimar and feces from public urine diverting dry toilets has been carried out. A stable process could be attained.

In spring 2012 the container was transported from Weimar to Darkhan. During summer time the co-digestion of sewage sludge and feces from Ger-settlements collected in the iPiTs has been started and resulted in a stable process.

There are two main challenges which are in the centre of research running the biogas pilot plant in Darkhan:

1. **Connecting new toilet (iPiT) and transport system to the biogas pilot plant.**

   When feces from ger settlements arrive at the wastewater treatment plant, they have to be pre-treated in a receiving area before feeding the biogas plant. Due to its consistency and its pathogenicity handling of feces is very difficult. That's why a feasible receiving area has to be designed and tested. The connection of transport system and biogas plant has to be well organised.

2. **Operating the biogas pilot plant under extreme climate conditions in Mongolia.**

   Feces collected in the iPiT will freeze during wintertime. As a consequence they are not available as a substrate for a co-digestion. So a discontinuous co-digestion has to be investigated.

Key Data

Location:	Darkhan, Mongolia 49.507575 N, 105.926827 E
Manufacturer:	Passavant-Roediger GmbH
Operator:	Bauhaus-Universität Weimar, University of Agriculture Darkhan
Type of pilot measure:	Co-digestion of sewage sludge, feces from Ger-settlements and organic waste from Darkhan region
Size of the pilot project:	Two CSTR-digester (each 750 L); feed: 37,5 L/d

Project Partners & Contact Information

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