Summary

Overall View of Bio Digester Development in China
The article provides a comprehensive view of biogas development in China over 60 years. The more recent developments in the field of farmer domestic plants have not yet provided any true alternative to the well-known fixed-dome plant. In larger plants, UASB, filter or combined digesters have been used.
The author also concerns himself in detail with newly developed materials and methods of construction. The author sees a broader application for "red mud plastic" foils in particular for all kinds of biogas plants in the future.

Sommaire

Vue d'Ensemble sur le Développement des Biodigesteurs en Chine
Cet article donne une vue d'ensemble détaillée du développement du biogaz en Chine depuis 60 ans. Les derniers développements dans le domaine des installations ménagères paysannes n'ont apporté jusqu'à présent aucune réelle alternative par rapport aux installations à dôme fixe connues. Dans le cas des installations plus importantes, des digesteurs UASB, à filtres ou des digesteurs combinés sont utilisés.
L'auteur traite en outre en détail de matériaux et de méthodes de construction nouvellement mis au point. L'auteur prévoit en particulier une ample utilisation des bâches »Red Mud Plastic« pour tous les types d'installation de biogaz à l'avenir.

Resumen

Reseña sobre el desarrollo de Bio-Digester en China
El articulo da una reseña extensa sobre 60 años de desarrollo mas modernos en el terreno de las instalaciones campesinas particulares, aún no ha significado una alternativa real en comparación con las instalaciones de cúpula fija conocidas.
Para instalaciones colectivas se empléan Digester UASB, Digester de filtro o Digester combinados.
El autor describe además detalladamente materiales y prosesos de construcción desarrollados ultimamente. El autor ve para el futuro una amplia utilización, particularmente de los folios »Red Mud Plastic« para todo típo de Biogas.

Biogas from Toilet Waste

Some Figures for Calculation

The following article is an extract from an advisory letter by GTZ/TBW to an Indonesian Institution planning to construct a bio-digester for toilet waste of 100 people.

Basic Calculation

In order to prevent unnecessary quantities of water to get into the digester, the water from showers and laundry should not reach into the biogas unit (assuming there is sufficient water).

It is useful to check if other organic wastes (e.g. organic kitchen garbage, animal waste, etc.) are available. The additional feeding can enrich the substrate in the case of biogas units with attached flush-toilets and increase the solid matter concentration. In both cases, an increase of the biogas yield is the result. There might be heavy scum formation when adding kitchen waste.

For the scaling of the unit, the following data must be available:

a) Daily amount of waste water.

In the case of flash-toilets, 7-10 litres must be calculated per use. To avoid unnecessary flushing, it is recommended to install urinals for men. According to how often the institution is frequented a low average of one use (of the flush toilet) per person and day is assumed.

b) Retention time

Experience shows that depending on the location, the retention time in conventional fully mixed continuous digesters should be at least between 80 and 100 days to allow a safe re-use of the effluent.

For your specific purpose the following data could be calculated as an example:

8 litres	flush water/person/day (to be adjusted to each specific type of toilet)
0,5 kg	feaces/person/day (assumed)
1,0 litre	urine/person/day (assumed)
9,5 litres	waste water/person/day

9,5 l/day x 100 persons = 950 litres waste water/day

With an average temperature of 27°C (81°F) like in Indonesia, a necessary retention time of 80 days can be assumed.

950 l/day x 80 days = 76.000 litres = 76 m^3

76 m^3 + 15% (security) = approx. 88 m^3 (digester volume).

To consider possible peak seasons or a small extension of the capacity the scaling of the unit should be designed correspondingly.

(More sophisticated digesters, like UASB systems would need considerably smaller volumes but additional sedimentation tanks.)

Gas Yield

The expected gas yield can be estimated as follows:

0,5 kg feaces (14% organic dry substance ODS) = 70 kg ODS/person

1,0 l urine (2% ODS) = 20 gr ODS/person

Total = 90 gr ODS/person

1 kg ODS produces approx. 450 litres biogas

90 gr ODS/person x 100 persons = 9 kg ODS

9 kg ODS x 450 l/kg = 4 m^3 biogas/day

(approx. 4000 litres biogas per day) = 40 ltr per person

The theoretical gas yield can be doubled under practical conditions, as reports from Burundi/Africa state (by adding some additional residues from the kitchen).

4 m^3 biogas are equivalent to 1,6 kg Butane or about 2,2 l Diesel.

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Summary

Biogas from Toilet Waste

This article is an excerpt from a consulting letter to an institute in Indonesia which is planning to build a biogas plant for a toilet for 100 persons. A conventional digester of this size would have to have a volume of 88 cbm and would produce about 4 cbm of biogas daily. UASB digesters with settling tanks could be possible with considerably smaller volumes.

Sommaire

Biogaz à partir des Eaux usées de Toilettes

L'article est un extrait d'une lettre donnant des conseils à une institution située en Indonésie désirant construire une toilette pour 100 personnes. Un digesteur conventionnel de cet ordre de grandeur devrait avoir un volume de 88 m^3 et produirait 4 m^3 de biogaz par jour. Dans le cas de digesteurs UASB munis d'un réservoir de sédimentation, un volume moindre pourrait être suffisant.

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