

Biogas de aguas residuales de letrinas

El artículo fué extraído de una carta de información para una instalación en Indonesia, que desea construir una instalación de Biogas en una letrina para 100 personas. Un digester convencional de este tamaño debería tener un volumen de 88 cbm y podría generar aproximadamente 4 cbm de Biogas por un día. Un UASB digester con tanque de deposito adicional funciona con un volumen bastante menor.

Cylinder capped Biogas Plants

Special Energy Programme - CAMARTEC

Introduction

CAMARTEC in collaboration with GTZ has been developing and testing Fixed Dome Biogas Plants since 1983 when Biogas Extension Services started in Arusha/Tanzania.

In the fall of 1986 development of sound designs; reliable and crack proof plants was attained.

Main and outstanding features of this design are:

- The bottom is flat for convenient workmanship

- Weak/strong rings are embedded between the digester proper and the gas storage part. The weak-ring distributes vertical cracks horizontally while the strong ring reinforces the gas storage part to remain intact against cracks which might have originated from the foundation.

Between 1986 - 1988 CAMARTEC/GTZ developed and tested also Biogas Plant named Cylinder Capped Biogas Plant (Fig. 1) which has given successful results in terms of both structure stability as well as gas supply.

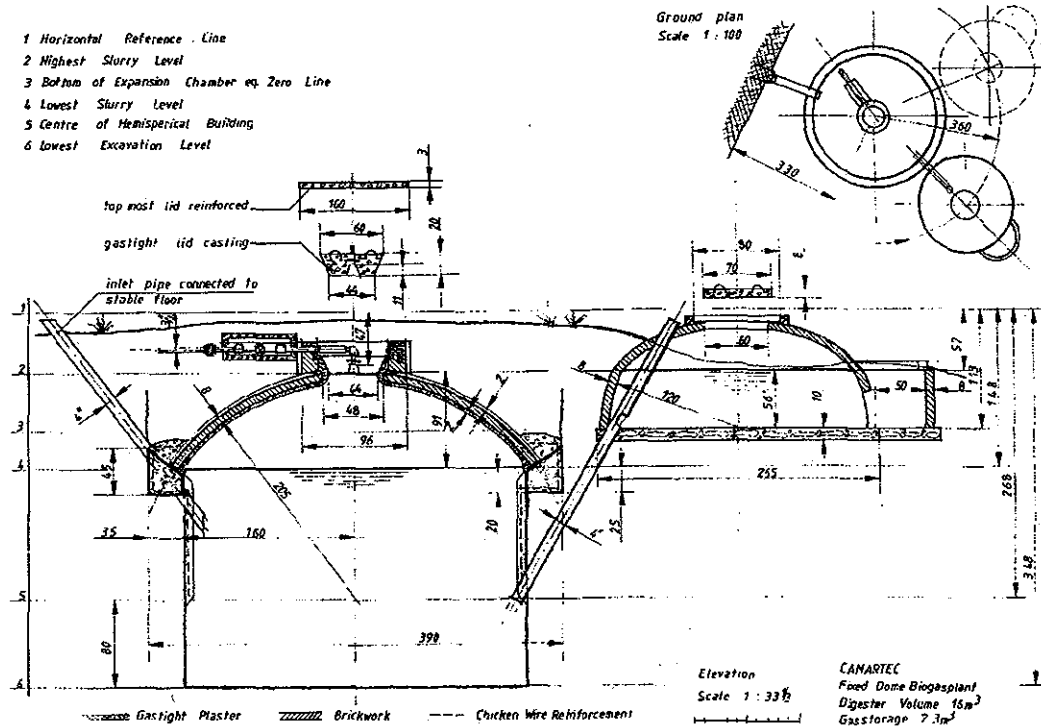


Fig. 1: Cylinder Capped Biogas Plant

Cylinder Capped Biogas Plant

After 4 years of operation, continuous monitoring on performance has given the following results:

- Daily gas production 2 m³ out of 2 zero grazed cows
- Minimum and maximum pressures reached: 0 - 90 cm of water column
- Total solid contents 8 %
- Structure of the total building 100 % intact

More data:

- digester capacity 16 m³
- retention time about 200 days
- digester temperature 22-24°C

Under the above given conditions, one cow has been producing about 1 m³ a day with specific digester production of 0.156 m³ gas/m³ digester, which is the same as that produced from the hemispherical domes of same capacity and under same conditions. Three similar designs built in the same period have also given same performances.

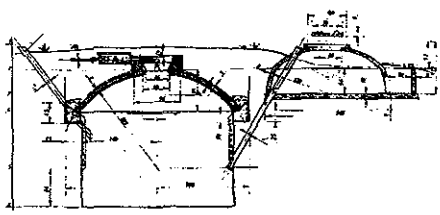
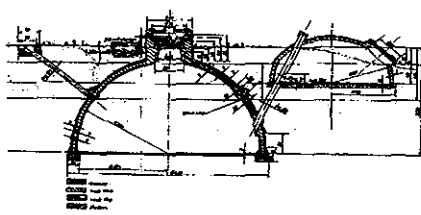
Conclusion and Recommendations

Use of good quality bricks coupled with skilled workmanship and engineering supervision have been recommended for orderly Hemispherical BGP. This safeguards the installations to work in all soil conditions keeping the digester water-tight, and the gas storage part to remain gas-tight.

However, the design does not rule out cracks in all cases, and in case of more potential cracks, then they should distribute and disappear horizontally along the weak ring. Field report II of Ringkamp has mentioned that the weak/strong ring features and their positional configuration seem to influence and change the whole pattern of stresses otherwise inflicted on any other fixed domes.

The Cylinder Capped Biogas Plant has given acceptable performance in terms of gas supply and user-friendly operation. On the other hand the design costs less money in terms of labour input and demand in building materials. These are therefore good reasons for intensive and extensive promotion though may not replace the famous HEMISPHERICAL dome owing to the following environmental specifics.

Tab. 1: Comparison between the cylinder capped and the hemispherical Biogas Plants 16 m³ each

	Cylinder capped 16 m ³ digester	Hemispherical 16 m ³ digester
Configuration		
Material demand	70 %	100 %
Labour demand	70 %	100 %
Engineering supervision demand	100 %	70 %
Operation	same	same
Life time	At least 20 years	At least 20 years

- It is suitable for firm soils whereby hole dimensions can be maintained.
- The so called »Black cotton soils« are not suitable in cases where they go deeper to as much as 2 m which constitute part of the digester wall.
- High water table conditions will not only dilute the digester contents but will also influence digester temperatures to go even lower to levels where gas production is seriously impaired to become uneconomic at the end.
- Rocky areas may not permit correct depths to be reached according to design/drawing or else intended retention time will not be achieved.

In addition to reduced costs for this design, the cylinder capped biogas plant has an outstand-

ing advantage that crack risks are reduced to only one part of the plant which is the gas storage part, and due to the embedded reinforcement, and highest workmanship attained in BES - CAMARTEC, then such risks, are reduced to zero.

Despite all the above bottle-necks however, the cylinder capped biogas plant of CAMARTEC has a wider area for introduction and acceptability. And a careful dissemination approach will likewise be followed in order to achieve at least the same level of success as the contemporary famous hemispherical fixed dome.

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»Cylinder Capped« Biogas Plants

In order to save construction costs the digester extent of the fixed-dome plant is dug as a cylindrical pit and only plastered if necessary. In order to make such a construction the earth must be firm and non-swelling.

Installations de Biogaz de Type »Cylinder Capped«

Pour épargner des frais de construction, le digesteur de l'installation à dôme fixe est réalisé en creusant une fosse cylindrique, le cas échéant crépie. La condition pour une telle construction est un sol dense, ne trempant pas.

»Cylinder Capped« Instalación de Biogas

Para ahorrar los costos de construcción se cava para el Digester de instalación de cúpula fija una fosa cilíndrica, la cual solo será estucada en caso de necesidad. Como condición previa para una construcción semejante se precisa un terreno firme sin supuración de agua.

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Contents

Radiant Light - Caution With Incandescent Mantles	4
Overview on Bio Digester Development in China	7
Biogas from Toilet Waste Some Figures for Calculation	20
Cylinder capped Biogas Plants Special Energy Programme - CAMARTEC	22
Events	25
Course	25
Books	27



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