LARGE SIZE BIOGAS PLANT FOR COMMERCIAL USES

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(to be Presented in the Webinar organized by Renewable Energy Confederation of Nepal (RECoN) June 8, 2020 Kathmandu, Nepal)

SUMMARY OF THE PRESENTATION

- Historical Development of Biogas in Nepal
- Large Size Biogas Technology
- International Context
- Inflatable Mould Design Biogas plant
- Success of the Project
- Way Forward

HISTORY OF BIOGAS IN NEPAL

- Gobar Gas Company (GGC) established in 1977
- SNV (Netherlands Development Organisation) started BSP (Biogas Support Program) in 1992:
- Construction companies formed NBPA in 1994
- Alternative Energy Promotion Centre (AEPC) set up by Nepal Government as Apex body for renewable energy promotion and coordination in 1996.
- BSP/N (NGO) established as NGO in 2003.

PUBLIC-PRIVATE PARTNERSHIP

Public-Private-Partnership (PPP) Model:

- Government Overview, through AEPC
- Quality control scheme, through BSP/N, an NGO
- Installation and manufacturing through private companies

WHY LARGE SIZE BIOGAS PLANTS ?

- **Large size biogas plants are basically for**
  - **Commercial (industries, hotels etc)**
  - **Local authority/municipal (sewage, waste from biomass),**
  - **Institutional (schools, colleges, barracks etc) and**
  - **Community (cattle farm, poultry farms, pig farm)**
- **Generates energy from waste**
- **Improvement of the waste water treatment system**
- **Environmental sanitation in schools, colleges, barracks and jails to reduce the dependency on the use of traditional fuels and to improve the kitchen environment**
- **Commercial applications of biogas and bio-slurry.**
- **Waste Management.**

LARGE SIZE BIOGAS TECHNOLOGY IN NEPAL (2)

Technology - GGC 2047 - underground concrete dome and floating drum plants

- **Developed through R&D work under GGC in early to mid '80s;**
- **Gas used for**
  - **Agro-processing;**
  - **Pumping water;**
  - **Generating electricity;**
  - **Laboratory purpose.**
- **In most cases the gas was used for domestic fuel for cooking and lighting.**
- **Slurry used as compost and in some cases it was used for feeding fish and mushroom cultivation;**
- **Use of gobar battery;**
- **Slurry also used for decomposing the Puplus leaves**

REASONS OF FAILIER OF LARGE SIZE BIOGAS PLANTS INSTALLED IN THE PAST (3)

- **No concrete government policy support for large size plants;**
- **Inadequate research for the development of running duel fuel engines ;**
- **No standards were developed;**
- **Social problems among the biogas users;**
- **Less aware about end use applications of biogas.**

BENEFITS OF LARGE SIZE PLANT (4)

Commercial use of large size biogas plant helps in:

- Income generation activities;
- Employment opportunities;
- Increase agricultural production;
- Livelihood enhancement;
- Environmental sanitation;
- Management of solid waste and other industrial wastes.

LARGE SIZE BIOGAS FOR MSW (5)

- Local authorities need to process organic fraction of MSW (Municipal Solid Waste)
- A few groups in India have worked with food waste as a feed material, such as ARTI (Appropriate Rural Technology Institute run by Dr. A. D. Karve) and Biotech Ltd (run by Dr A Sajidas). They both use floating drum digesters made from plastic materials
- Several local systems better than one large central one

- Example from India for food waste from a large hospital complex
- World Bank conference 2014 to discuss ideas in Kathmandu

INTERNATIONAL APPROACH (1)

- Nepal Biogas Program
  - Fixed dome and floating drum
  - Large size biogas plants for agro-processing, pumping water, power generation and recently for bottling the gas;
  - SNV encouraged by Nepal program to set up programmes in Vietnam, Bangladesh, Cambodia, Laos and many other Asian and African countries
- More than 5 millions of biogas have been installed in India. The New & Renewable Energy Development Corporation of Andhra Pradesh has built a 200-cubic meter plant in Krishna district, which generates 20KW of power per day.
- The Chinese government adopted a comprehensive regulatory framework and favorable policies in support of the bio-energy industry in general and the biogas sector in particular.

INTERNATIONAL LARGE SIZE BIOGAS PLANTS (2)

- Success of rural biogas for domestic energy inspired desire for other applications
  - commercial agriculture, sanitation, institutions
- Requires larger-scale biogas systems
- Gas can be used for cooking (in institutions) or to provide fuel for engines to generate electricity
- Biogas effluent as compost can be used directly or sold

Examples of such systems:

- Rwanda for sewage from jails
- Ghana for sewage from institutions: hospitals, schools, hotels, colleges
- Philippines and Thailand: sewage from detainees

EXPERIENCE FROM BURKINA FASO (3)

- 20 cum biogas plant feeding mango waste (August 2010)
- About 7 cum of biogas production per day which replaces about 2.8 kg LPG/day for drying mangoes
- Dry Mango slice business has good market in Europe.
- The plant is running well.

EXPERIENCES FROM THE PHILIPPINES (4)

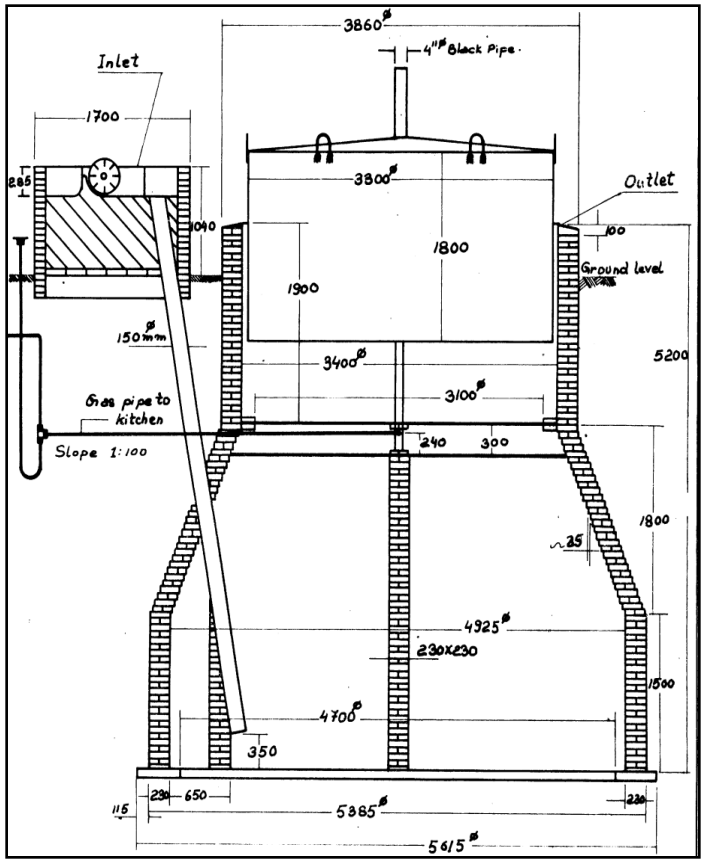
- A total of 5 night soil biogas plants were built by ICRC in the prison at the Philippines
- At Cagayan a 25 cum biogas plant was installed in 2009 and is totally run with night soil from about 1112 people.
- Gas is used for cooking. Baking is also done in this plant with excess gas.
- Before biogas about 30,000 peso per month was spent in firewood for cooking, and presently it has saved about 50% of the cost.
- The plant was visited in Oct. 2011 and was operating successfully.

SOME EXAMPLES OF LARGE SIZE BIOGAS PLANTS (5)

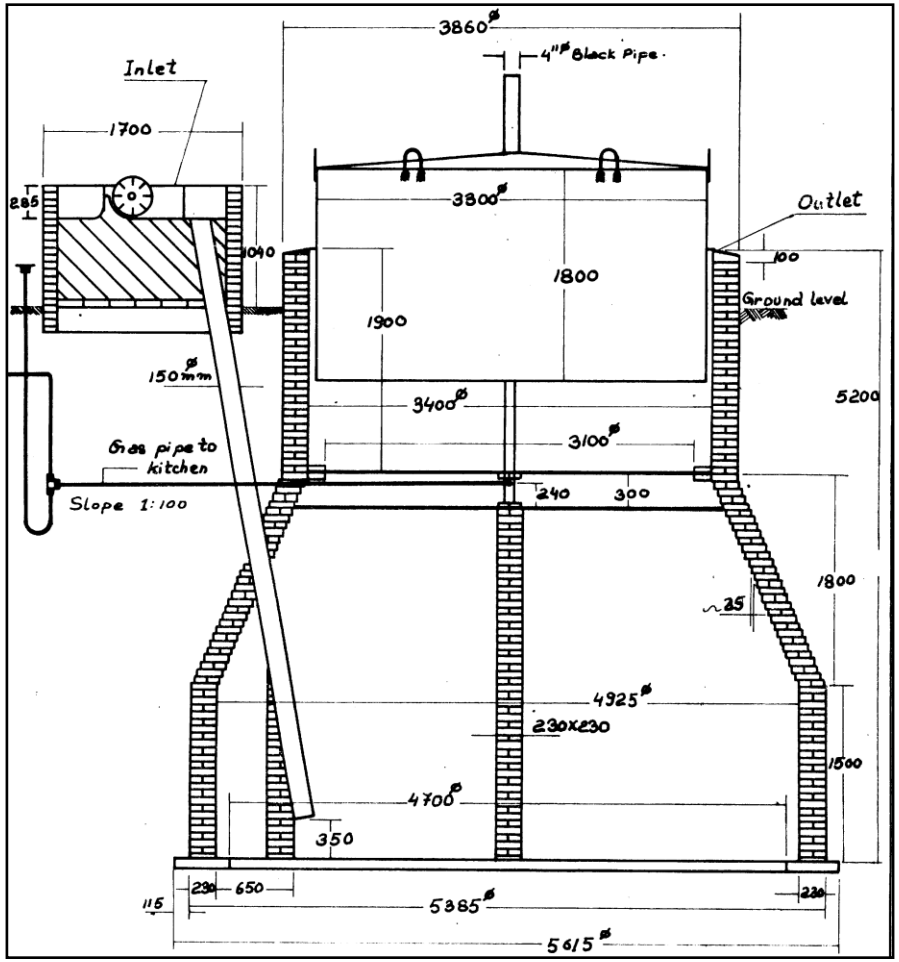
The Kigali Institute of Science, Technology and Management (KIST) has developed and installed large scale biogas plants in the prison to treat toilet wastes and generate biogas for cooking. The human waste is fed in the underground bio-digester, in which waste decomposes to produce biogas.

Prison garden Cyangudu in Rwanda

500 CFT FLOATING DRUM PLANT IN NEPAL (6)

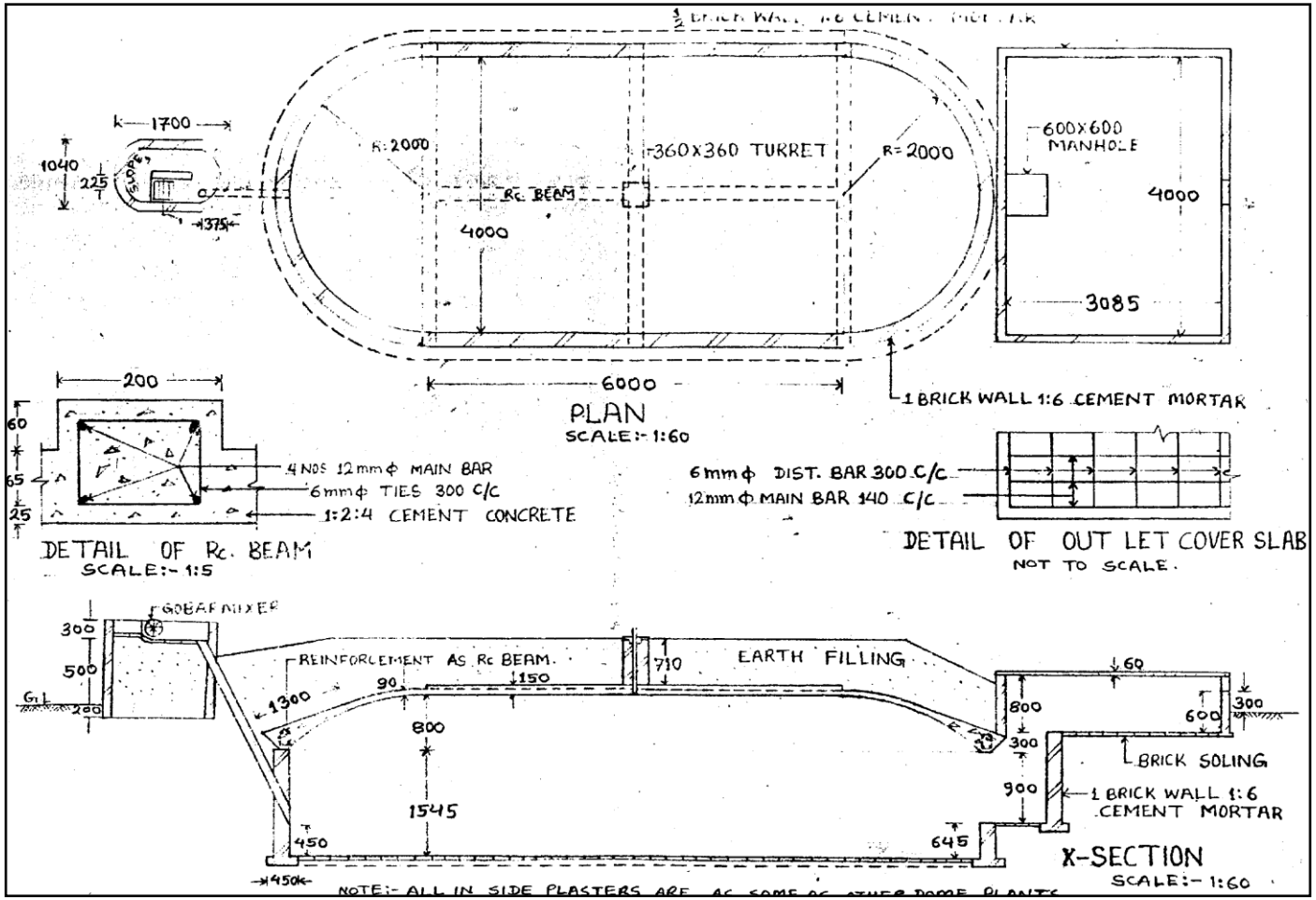


FLOATING DRUM PLANT – 750 CFT (7)

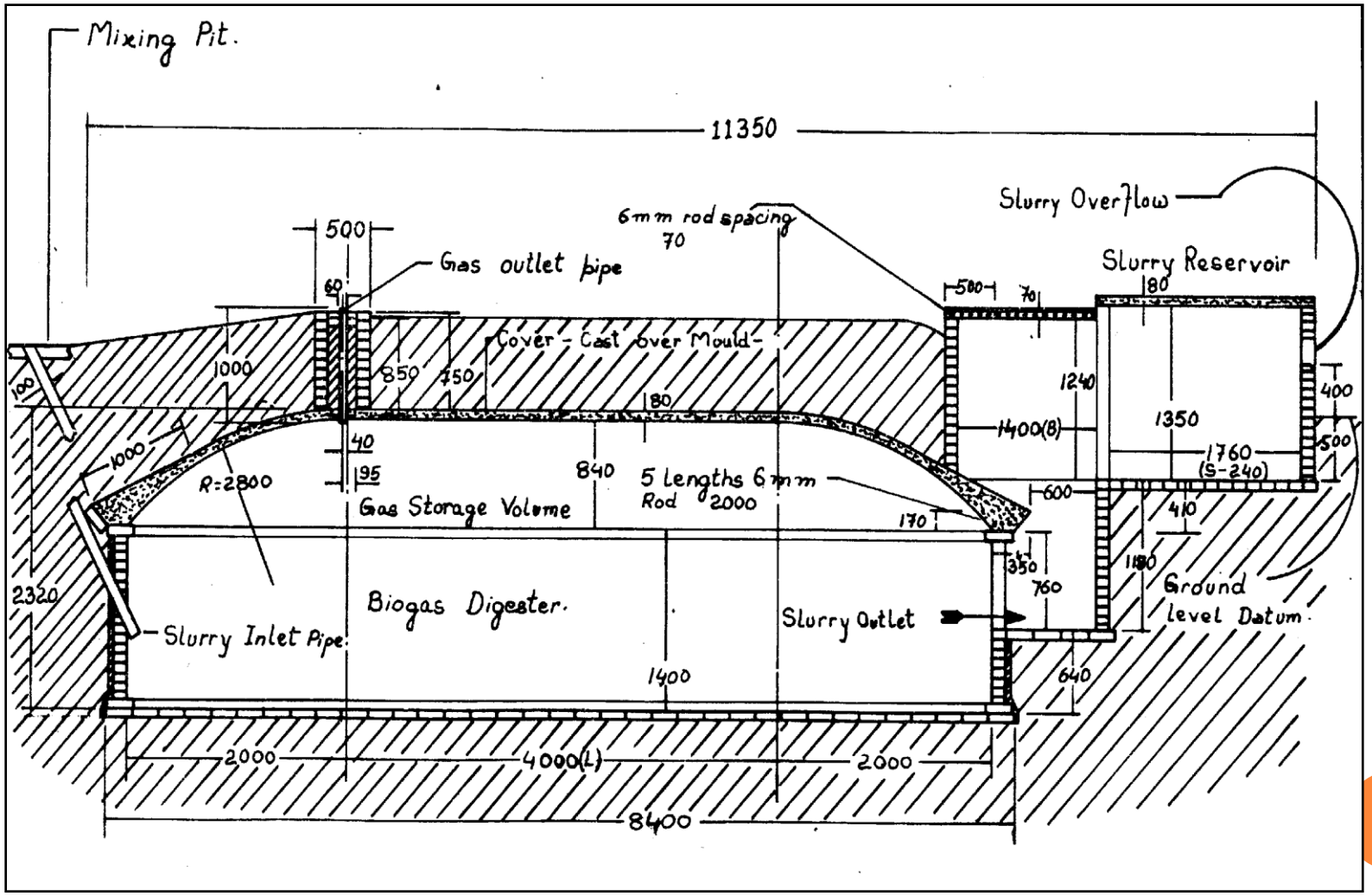


Gandaki Urja P. Ltd. (8)

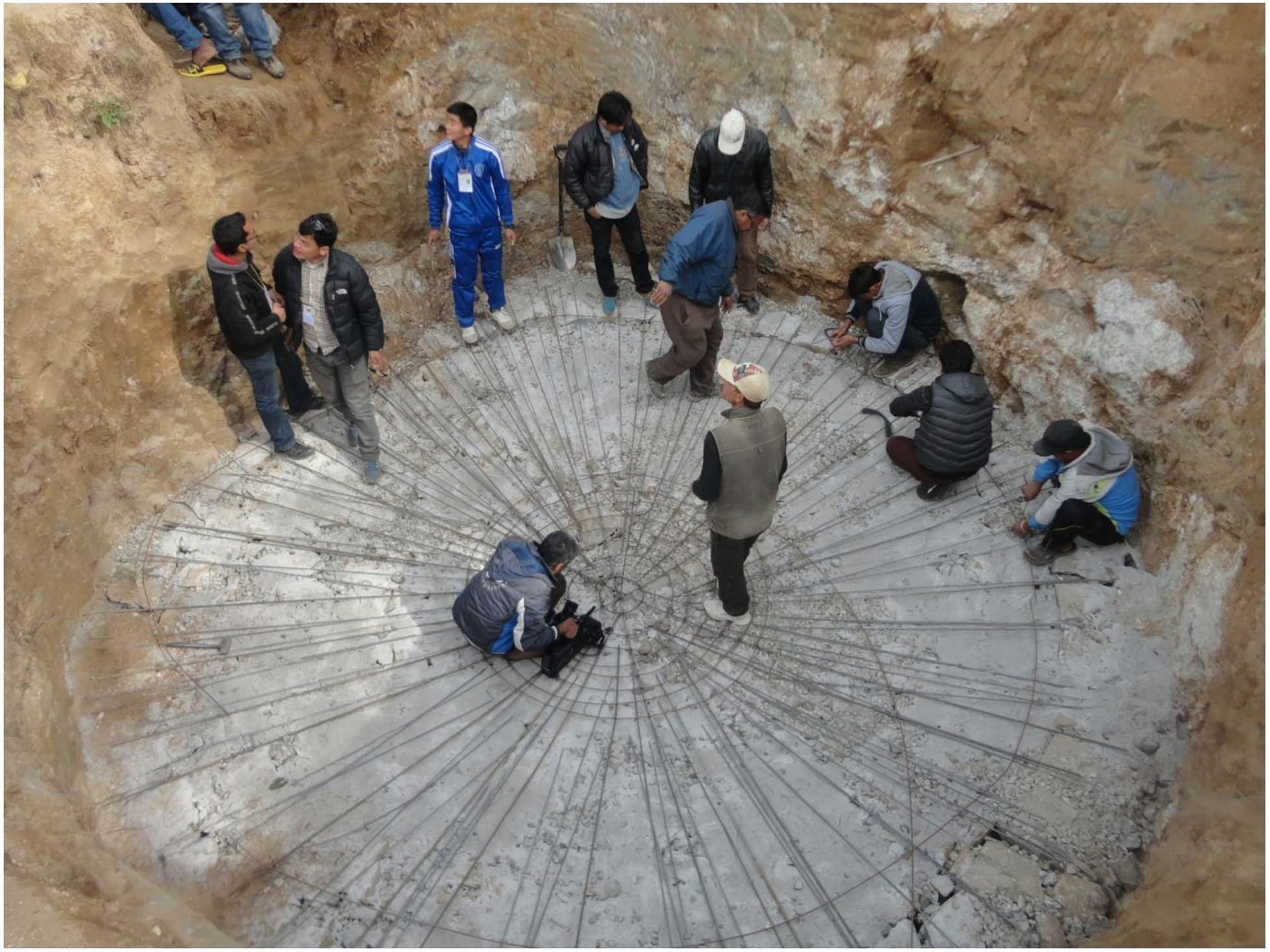
EXTENDED DOME PLANT -75 CUM IN NEPAL (9)



FIXED DOME PLANT – 50 CUM IN NEPAL (10)



DIGESTER FLOOR USING REINFORCEMENT – AEPC/BSP/N (11)



DOME USING REINFORCEMENT – AEPC/BSP/N (12)

INFLATABLE MOULD TECHNOLOGY FOR LARGE SIZE BIOGAS (1)

- Domestic plants use concrete cast over a mud mould
  - too labour intensive for larger plants
- Reusable steel moulds have been used:
  - Heavy to transport and difficult to remove
- German systems have been proposed
  - Too large, too expensive, too complex
- Need to transport waste to central system

- Suggested system: cast concrete dome over inflatable mould
- Pilot scale test at Bath University UK

PROPOSED PLANT AT GALCHI (2)

A 50 cum inflatable mould design, underground dome plants are not reinforced;

- Cattle farm with about 30 cattle;
- Biogas Users' committee is formed;
- Gas to be sold for cooking food initially at 7-8 households (possible hotels) and khuwa production;
- Fertilizer to be used in vegetable production for income generation;
- Opportunity of employment in the farm, khuwa factory, and the hotels;
- Establishment of workshop for inflatable mould manufacture
- This will help in both income and employment generation activities;

SUCCESS OF THE PROJECT

- Well proven, technically qualified and best available and low cost technology based on local resources
- R&D work included thorough field testing of the biogas systems, through careful follow - up surveys
- Financial provisions to be made to allow customers to obtain loans and subsidies that allow them to afford to purchase biogas systems.
- Financially feasible
- Institutional framework, enterprise development and capacity development for its sustainability.
- Workable regulations (standardization, quality management etc.)
- Enabling business environment
- Involvement of communities for economic activities
- Government support – 50,000 biogas; 4 00 million rupees budget for RET for FY 77/78.

WAY FORWARD

- Need for Research and Development of medium to large size biogas plants BUT
  - Aid groups not willing to fund R&D
- Once low-cost system for large scale domes is developed:
  - infrastructure for extension already in place
  - market already available, demand exists
  - installation companies,
  - training and licensing procedures ready to start
- Suggested designs can be made on a range of scales
  - wide range of applications
  - Community involvement in business activities for employment and income generation

Huge opportunities!

Thank You