

2010

*REPORT ON*  
*INSTALLATION OF NIGHT SOIL*  
*BASED BIOGAS PLANT*  
*&*  
*TOILET COMPLEXES IN*  
*JURISDICTION OF*  
*MMRDA.*

*Prepared by*

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*Submitted to :-*

*MMR-ENVIRONMENT IMPROVEMENT*  
*SOCIETY,*

*Bhandra-Kurla Complex, Bhandra (E),*  
*MUMBAI- 400 051*

**MIS - 2711**

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## **1. INTRODUCTION**

Depleting conventional sources of energy such as coal and oil have necessitated a fresh search for other available alternatives for energy. This search has also been accentuated by the ever rising price levels of fossil fuels. Rising level of population and its effect on the environmental cycle has also been of prime concern. While it is necessary to identify and develop an energy source available in abundance, it is also essential to establish that it is locally available, economical to tap and does not pollute the environment. One such important source is biogas. With a developed biogas technology, availability of night soil and degradable biowaste in abundance makes this source highly feasible, places such as S.T. Stands, Municipal Council, G.P. and Market area, etc. Keeping in view the objectives of "growth with social justice" the Ministry of Non-Conventional Energy Sources (MNES) Govt. of India, New Delhi, has introduced the Programme of Community toilets linked Biogas Plants or Night Soil based Biogas Plants. The Programme envisages utilisation of human waste as a source of energy by way of production of biogas besides sanitation. This potential energy source can be a boon for slum dwellers and bastes by way of setting up community facilities such as lighting, cooking etc. The benefits of this programme can be summarized as under :-

1. Sanitation and hygiene
2. Environmental improvement
3. Generation of energy
4. Provision of community facilities
5. Social justice

## **2. IMPLEMENTATION OF NIGHT SOIL BASED BIOGAS PLANT PROGRAMME IN THE STATE OF MAHARASHTRA :**

Maharashtra Energy Development Agency (MEDA) is implementing the programme of night soil based biogas plants on a large scale. The night soil biogas plants are being installed in the city slum areas, bus stands, railway stations, tourist places, Pilgrim places, with the provision of Public toilets, such plants are helpful in improving the environment of the locality and at the same time the generated biogas is used for lighting and cooking purposes. Small size night soil based biogas (15 Cum to 25 Cum capacity) alongwith 10 to 20 seats toilets are installed in slum areas, bus stands /stations, hospitals and public places where 500-900 toilet users are available. These complexes, include Care-

taker-room, water tank of 1000-2000 Ltrs. capacity and gas distribution system. The gas is used for cooking by providing 6 to 10 cooking connections and also for lighting through biogas lamps in the complex. There is a programme of Night Shelter Scheme under which assistance is provided for "pay & use" type public conveniences their complexes can be connected to Night Soil based biogas plants which can generate biogas for various applications like lighting, cooking etc. On the basis of this background MEDA has carried out detailed feasibility work & the feasible sites are identified for the project in various 9 Municipal Councils / Corporations under jurisdiction of MMRDA. Out of feasible 9 sites, 3 Projects are commissioned and one project is under commissioning. The Sitewise details are given in Annexure - I -IV. The objective of this project is to provide the sanitation facility along with the energy recovery unit for the benefit of the rural poor. The efforts are being made by co-ordinatory the programme with other departments like MNES, MEDA, MMRDA, MJP, Municipal Councils & Corporations, where the financial assistance are available for such programme.

MEDA is a nodal agency incorporated by Govt. of Maharashtra for promotion, propagation & development of various non-conventional & renewable source of energy such as solar, wind, biogas, biomass etc. in the state of Maharashtra, MEDA is register under Societies Act. 1980. (ACT XXI of 1860)

### **3. REQUIREMENT OF SANITATION :**

Sanitation is, however, far more important and is a serious problem for Towns and it has also been revealed by surveys that a very high percentage of households in small and medium towns of Maharashtra do not have individual household latrines. Govt. had already undertaken an ambitious programme of converting dry latrines to PAY & USE Basis Community Toilet complexes which has been well received in the urban Maharashtra and it is expected that individual household not having a latrine will provide hereafter Community Toilet complexes In the absence of any such facility, large scale population resorts to indiscriminate open air defecation creating a serious health hazard to the people.

### **3.1 COMMUNITY TOILETS :**

Provision of individual toilets is the ideal solution. However, for such urban habitations there is not adequate space and hence, provision of individual toilet becomes difficult. Community toilets have, therefore, to be thought of under such conditions. While considering Community toilets, the earlier studies and experience of Community toilets in urban area has been taken into consideration.

### **3.2 INSTALLED COMMUNITY TOILET COMPLEX ON PAY & USE BASIS AND OPERATION & MAINTENANCE :**

- a) The Community Toilets Complexes are having the facility for excretion, urination and bathing. The Complexes provide complete privacy to the users and compartments for male and females are provided separately.
- b) The complexes are provided with adequate lighting arrangements.
- c) It is ensured that adequate water is made available for the complex through the local authority.
- d) The toilet complex are kept neat and clean and well maintained. Cleaner will remain attendance for all the time.
- e) The sites for the construction of toilet complex are selected in consultation with the local authority and keeping in view the convenience of the users.
- f) The number of latrine seats, bathrooms and urinals are determined on the basis of anticipated number of users in consultation with the local authority.
- g) The toilets are linked to the biogas and energy is generated.
- h) All these complexes are on "Pay and Use" basis which means that the users nearby will use the toilet daily and will pay Rs.15-20 per person per month to the NGO/Contractor who runs the shauchalaya complex on commercial basis.
- i) The maintenance of the Installed toilet complex and biogas plant is looked after by selected NGO/Contractor for the period of 20 years. The structural repairs, including painting, replacement of toilets, glass panes, lights etc., are done by Selected N.G.O. & Contractors Service Organisation or any other NGO for this agreed period. Caretakers are posted at the complex for maintenance and monitoring the cleanliness of the complex. The complex is open for the agreed period of a token charge. The local Municipal Corporation / Councils are providing water electricity free of charge.

### **3.3 DESIGN CRITERIA FOR NIGHT SOIL BASED BIOGAS PLANTS**

The design criteria considered for installation of Night Soil Based Biogas Plants (NBP) are as follows :

- A. Average night soil yield/person -
  - i] Adult :: 400 gms
  - ii] Children :: 200 gms
- B. Attendance required :: 40 to 50 persons per Toilet per day
- C. Biogas yield per person per day :: 0.03 cu.m/adult
- D. Biogas yield per Kg. of Night soil :: 0.075 cu.m.
- E. Dry Solids in the Night soil :: 25 %
- F. Moisture percentage in the Night soil :: 75 to 80 %
- G. Solid content in Feed to digester :: 5-6 % solids
- H. Slurry disposal :: As manure after drying in soak pits.
- I. Biogas requirement :: 1.8 Cu.m. to 2.00 Cu.m. for cooking purpose per family.
- J. Biogas requirement :: 0.18 Cu.m. per Hour for lighting purpose per Lamp
- K. Household burner :: 16 Cft per hour Capacity
- L. Calorific value of Gas :: 4710 kcal/cu.m.

#### **4 DESIGN SELECTION :**

The installed NBP envisages the following sub-systems :

##### **4.1 GAS GENERATION SUB-SYSTEM :**

The gas generation sub-system is of fix dome plant, consisting of digester fix dome gas holder. The digester volume has been calculated on the basis of retention period and daily feed. 40 days of retention period has been considered. The design has been approved by MoNES.

##### **4.2 FEED HANDLING SYSTEM :**

All the toilets are being linked with the gas generation system with the help of chambers in between them for the purpose of initial feeding. The initial feeding will be thus made directly, however, the chambers provided will enable to rectify any defects arising while functioning. The night soil to be mixed with water in the ratio 1:4.

##### **4.3 SLURRY HANDLING SYSTEM :**

The spent slurry consists of about 90% to 95% water and poses handling and transportation problems. Soak pits have been provided for drying the slurry. The dried slurry can be used as manure.

##### **4.4 GAS DISTRIBUTION SYSTEM :**

The gas generated from the Night Soil based Biogas plant is to be supplied to the nearby houses and chaukidar room for cooking. Gas burners of 16 Cft / hour capacity are provided. Necessary control valves, water taps, etc. are also be provided.

## **Annexure - I**

### **Sitewise Detail on Night Soil Based Biogas Plants installed Under Jurisdiction of MMRDA.**

1. Name of Site : Municipal Corporation Navi Mumbai.
2. Capacity of Plant : 15 cum per day
3. No. of toilets : 10 Nos.
4. No.of Bathrooms : 3 Nos.
5. No. of Urinals : 5 Nos.
6. No.of toilet Users : Approximately 400 to 500
7. Utilisation of gas : Work in progress.
  - a) No.of gas connections provided : Nil.
8. Name of Contractor/ NGO Responsible for operation & maintenance : M/s. Aryan Foundation Trust, Vadodara.
9. Date & Month of Commissioning: Work in progress.

### **Financial Details -**

1. Cost of the Project : Rs.8,69,800/-
2. MEDA and MNES Share : Rs.1,45,000/-
3. MMREIS Share : Rs.2,08,000/-
4. M.C./ User Agency Share : Rs.5,16,800/-

## **Annexure - II**

### **Sitewise Detail on Night Soil Based Biogas Plants installed Under Jurisdiction of MMRDA.**

1. Name of Site : Municipal Council, Alibag, Dist. Raigad
2. Capacity of Plant : 15 cum per day
3. No.of toilets : 10 Nos.
4. No.of Bathrooms : 3 Nos.
5. No. of Urinals : 5 Nos.
6. No.of toilet Users : Approximately 400 to 500
7. Utilisation of gas : cooking
  - a) No.of gas connections provided : 6 nos.
8. Name of Contractor/ NGO : M/s. Britto Industries, Thane.  
Responsible for operation & maintenance
9. Date & Month of Commissioning: 11 /10/2000

### **Financial Details -**

1. Cost of the Project : Rs.8,49,500/-
2. MEDA and MNES Share : Rs. 1,45,000/-
3. MMREIS Share : Rs.2,08,000/-
4. M.C./ User Agency Share : Rs. 4,96,500/-



### **Annexure - III**

#### **Sitewise Detail on Night Soil Based Biogas Plants installed Under Jurisdiction of MMRDA.**

1. Name of Site : Municipal Council, Bhiwandi, Nizampur, Dist. Thane.
2. Capacity of Plant : 15 cum per day
3. No.of toilets : 10 Nos.
4. No.of Bathrooms : 3 Nos.
5. No. of Urinals : 5 Nos.
6. No.of toilet Users : Approximately 400 to 500
7. Utilisation of gas : cooking
  - a) No.of gas connections provided : 5 nos.
8. Name of Contractor/ NGO Responsible for operation & maintenance : M/s. Nirmal Foundation, Thane.
9. Date & Month of Commissioning : 10/09/2000

#### **Financial Details -**

1. Cost of the Project : Rs.8,49,500/-
2. MEDA and MNES Share : Rs.1,45,000/-
3. MMREIS Share : Rs.2,08,000/-
4. M.C./ User Agency Share : Rs.4,96,500/-

## Annexure - IV

### Sitewise Detail on Night Soil Based Biogas Plants installed Under Jurisdiction of MMRDA.

1. Name of Site : Municipal Council, Vasai, Dist. Thane.
2. Capacity of Plant : 15 cum per day
3. No.of toilets : 10 Nos.
4. No.of Bathrooms : 3 Nos.
5. No. of Urinals : 5 Nos.
6. No.of toilet Users : Approximately 400 to 500
7. Utilisation of gas : cooking & water heating
- a) No.of gas connections provided : 2 nos.
8. Name of Contractor/ NGO : M/s. Britto Energy Engineers, Thane.  
Responsible for operation & maintenance
9. Date & Month of Commissioning : 31/07/2000.

### Financial Details -

1. Cost of the Project : Rs. 9,07,600/-
2. MEDA and MNES Share : Rs. 1,45,000/-
3. MMREIS Share : Rs. 2,08,000/-
4. M.C./ User Agency Share : Rs. 5,54,600/-

April 23, 2001

**Work Progress Report on - Installation of Night Soil based Biogas Plants & Community toilet Complexes in MMR.**

1. Maharashtra Energy Development Agency (MEDA) established by Government of Maharashtra as a Nodal Agency for Promotion, Propagation and Development of Non-conventional & Renewable Sources of Energy in the State of Maharashtra.
2. Among various Renewable Energy Programmes with support of MNES & various Institute Community/ Institutional / Night Soil Based Biogas (CBP/IBP/NBP) Plant Programme is one of the important Programme Implemented by MEDA in State of Maharashtra with the following objectives -
  - a) To provide fuel for cooking purpose and organic manure to rural households through Community / Institutional Biogas plants.
  - b) To mitigate drudgery of rural women, reduce pressure on forest and accelerate social benefits.
  - c) To improve sanitation in slum areas, village by linking Community toilet complexes with biogas plants.
3. The programme of community toilet linked biogas plants with night-soil based biogas envisaged utilisation of human waste as a source of energy by way of production of biogas besides sanitation is important concern for urban and rural areas. The shortage of community toilets, unhygienic disposal of human excreta create pollution. To over come these problems the installation of Night Soil based Biogas Plants attached to Public toilet complex is one of the best & easiest methods, Besides sanitary benefits and to control Pollution, it general valuable non-polluting & clean energy in the form of biogas.
4. Taking in to consideration the above benefits, with financial support of Mumbai Metropolitan Region Environment Improvement Society (MMREIS), MEDA has taken 9 sites in various Municipal Corporation / Council under jurisdiction of MMR, for installation of NBP & toilet complexes on "Pay & Use Basis". The status of these Projects is given below -

**Status of NBP's linked with toilet complexes in MMR.**

Sr. No	Name of M.C.	Site	Status
1	Bhivandi-Nizampur	Shivajinagar	Biogas Plant & toilet complex has been commissioned & working satisfactorily. Daily maintenance & operation is being done by NGO slum dwellers using gas for cooking and toilets on "Pay & Use basis".
2	Alibag	Siddarthnagar	Biogas plant & toilet complex commissioned. Daily operation & maintenance is being done by contractor who has constructed the complex on "Pay and Use basis."
3	Vasai	Holimarket	Biogas Plant & toilet complex commissioned & working satisfactorily. Toilet complex is operated & maintained by contractor on Pay & Use basis. The generated gas is used for heating the water for bathing purpose.
4	Navi Mumbai	Koparkhaine	Entire work of toilet complex & biogas plant completed, commissioning is in progress.
5	Uran	Indiranagar	R.C.C.structure for toilet complex and excavation for biogas digester was completed. However, project has been canceled on demand of Municipal council on the ground that Hon.High Court issued stay order for dispute of proposed land.
6	Badlapur	Station Road	Problem on proposed land arised, MEDA has taken all possible effort to get alternate site & resolve the problem but no response from Municipal Council.
7	Ambarnath	Gadgenagar	M.C. not ready to deposit contribution amount & not interested in implementation of project.
8	Kalyan-Dombavali		M.C.not ready to deposit contribution amount & not interested in implementation of project.
9	Panvel		M.C.not ready to deposit contribution amount & not interested in implementation of project.

**Effort taken by MEDA -**

- i) MEDA has taken all possible efforts to co-ordinate with various institutes and Municipal Council / Corporation for successful implementation of the projects.
- ii) Efforts are taken to motivate Municipal Councils to deposit the contribution amount for setting up the project.

**Financial Status -**

- i) Amt sanctioned by MMREIS -  $\text{Rs.}2.08 \times 9 \text{ sites} = \text{Rs.}18.72 \text{ lakhs.}$
- ii) Amt. released to MEDA as first installment 20%  $\times 18.72 = \text{Rs.}3.744 \text{ lakhs.}$
- iii) Out of sanctioned 9 projects MEDA has completed 4 projects for which MMREIS subsidy will be  $\text{Rs.}2.08 \times 4 = \text{Rs.}8.32 \text{ lakhs.}$
- iv) Amt. due from MMREIS -  $\text{Rs.} 8.32 \text{ lakhs} - 3.744 = 4.576 \text{ lakhs.}$

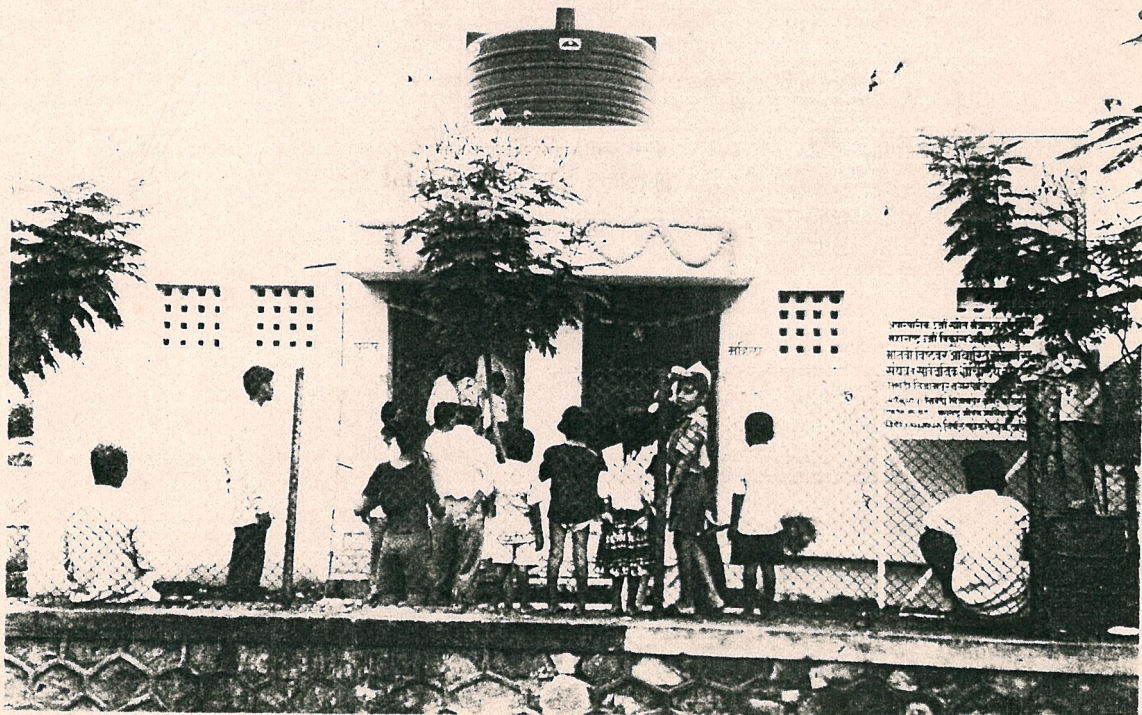
**Suggestions -**

It is suggested that MMREIS may please release balance subsidy amount  $\text{Rs.} 8.32 - 3.744 = 4.576 \text{ lakhs}$  to MEDA and settle the financial account.

(U.M.Pande)  
Manager (Biogas)  
MEDA , Pune.



NBP's toilet Complex installed at Pshurani.



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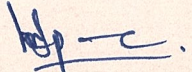
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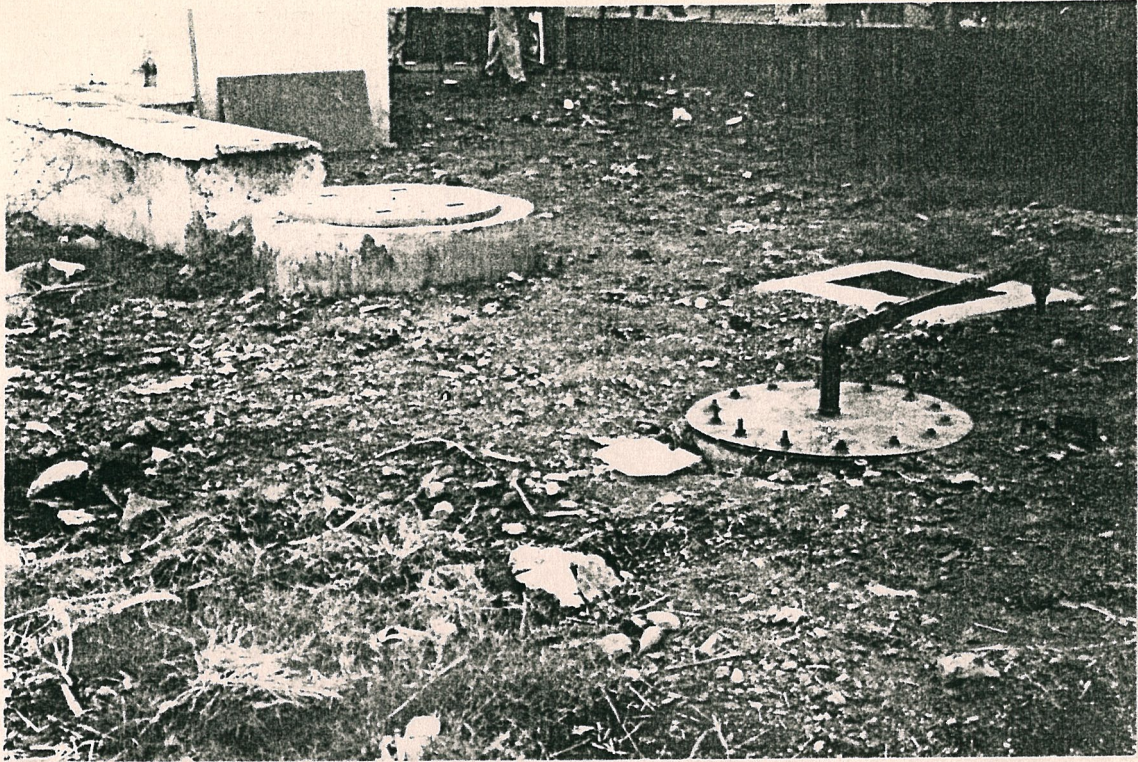
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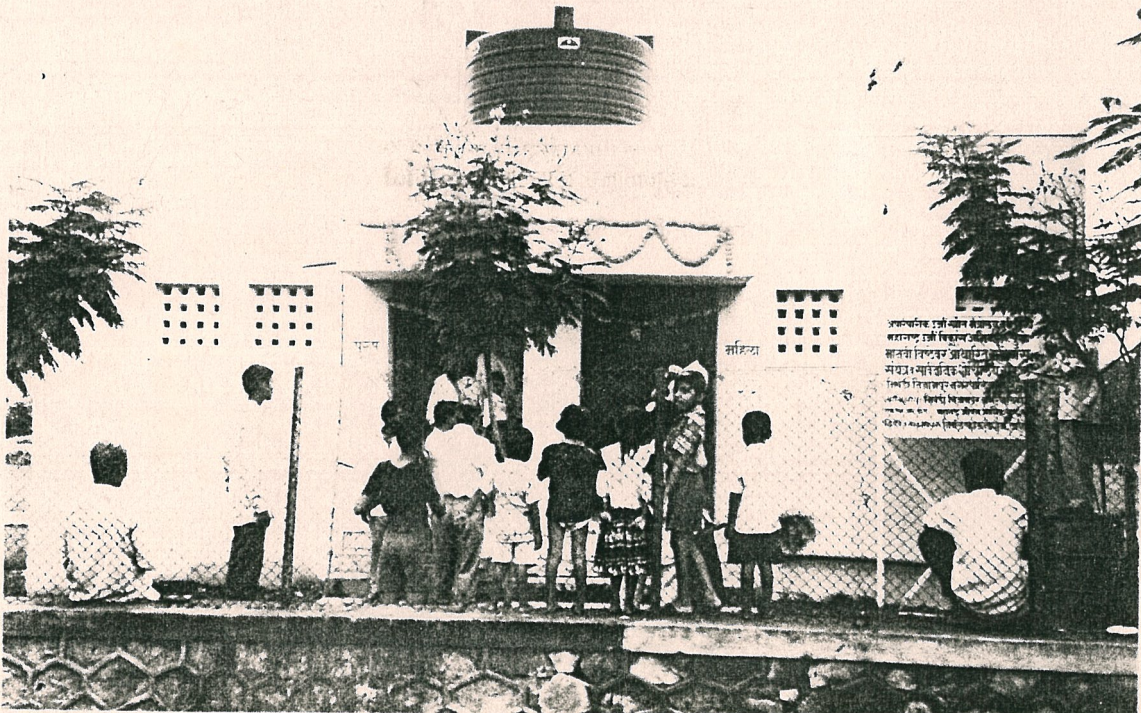
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NBP & toilet Complex installed at Phulwadi



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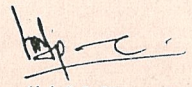
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  - a) To provide fuel for cooking purpose and organic manure to rural households through Community / Institutional Biogas plants.
  - b) To mitigate drudgery of rural women, reduce pressure on forest and accelerate social benefits.
  - c) To improve sanitation in slum areas, village by linking Community toilet complexes with biogas plants.
3. The programme of community toilet linked biogas plants with night-soil based biogas envisaged utilisation of human waste as a source of energy by way of production of biogas besides sanitation is important concern for urban and rural areas. The shortage of community toilets, unhygienic disposal of human excreta create pollution. To overcome these problems the installation of Night Soil based Biogas Plants attached to Public toilet complex is one of the best & easiest methods, Besides sanitary benefits and to control Pollution, it general valuable non-polluting & clean energy in the form of biogas.
4. Taking in to consideration the above benefits, with financial support of Mumbai Metropolitan Region Environment Improvement Society (MMREIS), MEDA has taken 9 sites in various Municipal Corporation / Council under jurisdiction of MMR, for installation of NBP & toilet complexes on "Pay & Use Basis". The status of these Projects is given below -



**Effort taken by MEDA -**

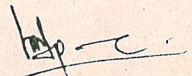
- i) MEDA has taken all possible efforts to co-ordinate with various institutes and Municipal Council / Corporation for successful implementation of the projects.
- ii) Efforts are taken to motivate Municipal Councils to deposit the contribution amount for setting up the project.

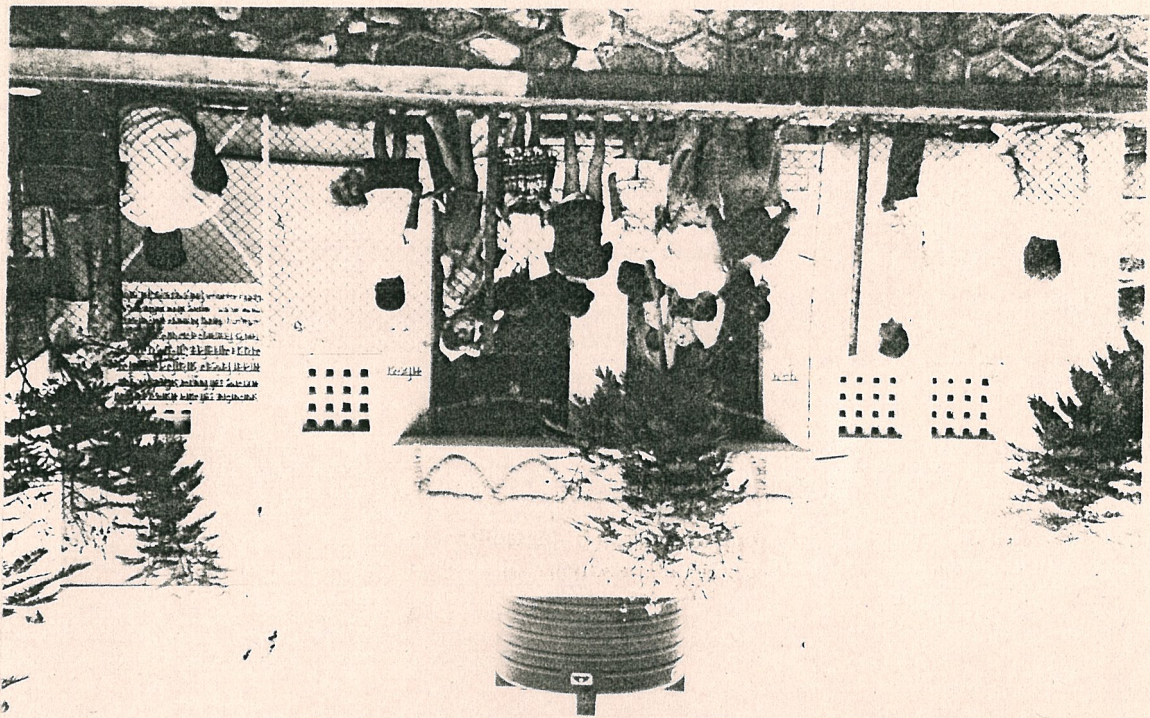
**Financial Status -**

- i) Amt sanctioned by MMREIS -  $\text{Rs.}2.08 \times 9 \text{ sites} = \text{Rs.}18.72 \text{ lakhs.}$
- ii) Amt. released to MEDA as first installment 20%  $\times 18.72 = \text{Rs.}3.744 \text{ lakhs.}$
- iii) Out of sanctioned 9 projects MEDA has completed 4 projects for which MMREIS subsidy will be  $\text{Rs.}2.08 \times 4 = \text{Rs.}8.32 \text{ lakhs.}$
- iv) Amt. due from MMREIS -  $\text{Rs.} 8.32 \text{ lakhs} - 3.744 = 4.576 \text{ lakhs.}$

**Suggestions -**

It is suggested that MMREIS may please release balance subsidy amount  $\text{Rs.} 8.32 - 3.744 = 4.576 \text{ lakhs}$  to MEDA and settle the financial account.

  
(U.M.Pande)  
Manager (Biogas)  
MEDA , Pune.



NBP 1 toilet complex installed at Bhumra.

