

***'Sanitation is more important than  
political independence'***

*... Mahatma Gandhi*

*Gandhi, who wanted to make sanitation a priority for India more than a century ago.*



**TECHNOLOGY SUPPORT FROM...**

**DEFENCE RESEARCH AND DEVELOPMENT  
ORGANISATION, MINISTRY OF DEFENCE...**

**BIO-DIGESTER TECHNOLOGY**

**... FOR TREATMENT OF HUMAN FAECAL MATTER**

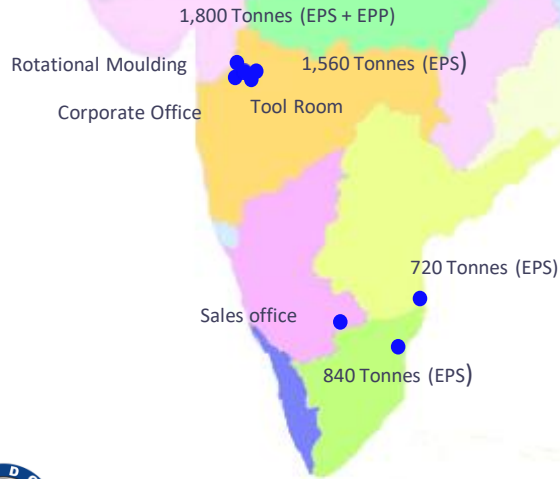


## *BRIEF PROFILE OF K. K. NAG PVT LTD...*

- ✧✧ Founded in 1965 by the late Mr K. K. Nag and the late Mrs Surabhi Nag
- ✧✧ Rich history of innovation and of pioneering new plastic processes in India
- ✧✧ Pioneered Fibreglass Reinforced Plastic (FRP)
- ✧✧ Pioneered Expanded Polystyrene (EPS)
- ✧✧ First to introduce Expanded Polypropylene (EPP) in India
- ✧✧ Manufacture proprietary and custom-moulded products in Rotomoulding
- ✧✧ Strongly believe in maintaining long-term relationships with all stake holders.  
(many relationships are now more than 40 years old)
- ✧✧ In 2015-16, we have ventured into Bio-Digester Toilets - Govt of India Licensee for technology developed by DRDO.



## OUR PRESENCE



Maharashtra – Pune - Urse and Ranjangaon  
Tamil Nadu - Thiruvallur  
Puducherry - Kariamanickam  
Karnataka - Bengaluru



## AVAILABLE WASTE MANAGEMENT SYSTEMS

- ✧✧ **Burying- Pit Latrine/ Septic Tanks:** Major cause of ground pollution
- ✧✧ **Incineration:** Cause of Air pollution
- ✧✧ **Chemical- STPs:** Costly and manpower intensive
- ✧✧ **Bio Degradation:** Aerobic and Anaerobic

Aerobic Systems: Need regular maintenance, emits unpleasant smell

Anaerobic: Maintenance free



# DRDO BIO-DIGESTER HOW AND WHERE IT ALL BEGAN



The Siachen glacier is known as the world's highest and coldest battlefield

At 70 km, it is the longest glacier in the Karakoram and second-longest in the world's non-polar areas

*Pakistani Army soldiers carry supplies up the 2,400-metre mountain near the Siachen area.*  
- PHOTO: AP



SIACHEN

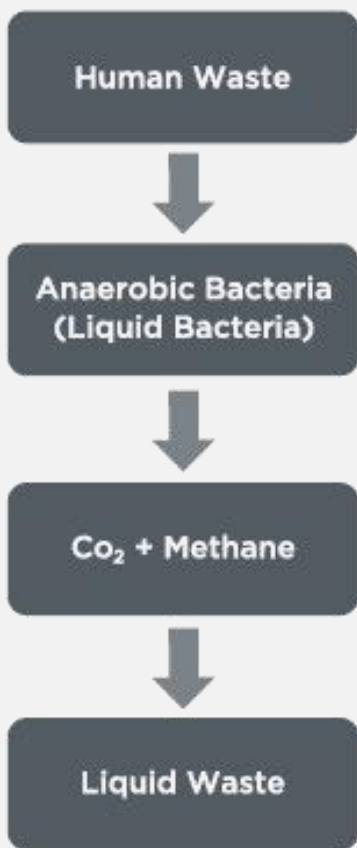


## AEROBIC Vs. ANAEROBIC

AEROBIC bio-degradation	ANAEROBIC bio-degradation
Forced aeration/ agitation is essential and is energy intensive	No aeration is required
Incomplete aeration (partial aerobic condition) leads to foul smell	Complete anaerobic conditions
Not effective in pathogen inactivation	More than 99% Pathogens inactivation
Can not tolerate detergents/ phenyl	Anaerobes can even sustain e detergents/ phenyl
Generates large amount of sludge	Sludge generation is very less
Repeated addition of bacteria/ enzyme is required for the process	One time bacterial inoculation is enough
Maintenance & recurring cost is high	Minimal maintenance & no recurring cost



## How a Bio-Digester System Works



Recycled water outlet

Treated water inlet  
into Reed Bed

Reed Bed

Biogas outlet

Bio-Digester tank

Treated water outlet

Waste water Inlet  
from toilet



# BIO-DIGESTER TANK PERFORMANCE COMPARED TO SEPTIC TANK

Working Features	Septic Tank	Bio-Digester
Waste Degradation	Aerobic dominant	Anaerobic
Waste Decomposition	Only 30%	Up to 99%
Maintenance	Periodic removal of sludge, to be emptied every 2 years as per IS 2470 norms	Maintenance-free
Mechanical Sludge Removal	Pumping device required	No sludge removal required
Discharge from Tank	Odorous, sludge formation and hazardous waste	Odourless, colourless and hazard-free waste (water only)
Space for 300 Users	Three times more than the Bio-Digester, hence costly to construct and occupies more space	One third space required compared to Septic Tank, hence economical and has a smaller footprint
Sensitivity towards Cleaning Agents	Cannot tolerate toilet cleaning agents	Bacteria conditioned to remain unaffected by cleaning agents up to permitted limits
pH	6.7-7.5	7.0-7.2
Turbidity (NTU)	500-800	70-90
Total Suspended Solids (mg/L)	150-300	90-120
TDS (mg/L)	500-850	350-450
VS (mg/100ml)	50-60	20-30
COD (mg/L)	1200-2000	250-300
BOD 5 (mg/L)	350-500	70-120
Coliforms (MPN/ml)	> 3,000	300-350

Source: DRDO



## OUR PRODUCT RANGE

- \* Anaerobic Microbial **Inoculum** – AMI – commonly known as DRDO Bacteria (liquid inside the Bio-Tank).
  
- \* **Toilet Superstructures ...**
  - \* ECO version – For Bottom of the Pyramid
  - \* MID version
  - \* PREMIUM Version
  
- \* **Range of Rotationally Moulded Bio-Digester Tanks** (Bio-Tanks): made from virgin polymer in various capacities. Tanks can be installed in series to augment the capacity ...700, 1000, 1500, 2000, 3000, 3500, 5000 & 7000 Liter Capacities
  
- \* **REED BED (WET LAND) Systems** for Secondary Treatment



More Details on [www.biodigester.in](http://www.biodigester.in)

# *RANGE OF BIO-DIGESTER TANKS 700 TO 7,000 LITRES CAPACITY*



## *BIO-DIGESTER TANK CAPACITY CHART*

Sr. No.	Bio-Digester Tank Size - Litres	No of users in domestic setting	No of users in industrial setting	Tank Dimensions		First charge of AMI - Litres
				Dia (mm)	Height (mm)	
1	700	4 to 6	8 to 12	1,100	1,015	200
2	1,000	6 to 10	12 to 20	1,100	1,385	300
3	1,500	10 to 20	20 to 40	1,210	1,670	450
4	2,000	20 to 30	40 to 60	1,425	1,600	600
5	2,400	30 to 35	60 to 70	Two 700 litre tanks combined with one 1,000 litre tank		700
6	3,000	35 to 45	70 to 90	1,680	1,665	900
7	3,500	45 to 55	90 to 110	Two 1,000 litre tanks combined with one 1,500 litre tank		1,000
8	5,000	55 to 80	110 to 160	Two 1,500 litre tanks combined with one 2,000 litre tank		1,500
9	7,000	80 to 120	160 to 240	Two 2,000 litre tanks combined with one 3,000 litre tank		2,100



## *DRDO BIO-DIGESTER - KEY BENEFITS*

- \* ZERO MAINTENANCE, ONE TIME ADDITION OF BACTERIAL INOCULUM
- \* NO NEED TO EVACUATE THE DIGESTER TANK AT ALL AS NO SLUDGE IS FORMED
- \* ALL FAECAL MATTER COMPLETELY DIGESTED AND CONVERTED INTO WATER, METHANE (BIO GAS) AND CO<sub>2</sub>. EFFLUENT IS SAFE FOR IRRIGATION, GARDENING OR TO BE LET OFF
- \* BIO DIGESTER TANK SEALED TANK CONSTRUCTION - NO MIXING WITH GROUND WATER
- \* WHEN IMPLEMENTED IN SATURATION MODE AND AT EVERY HOUSEHOLD, SAVES HUGE COST TO GOVTS IN DESIGN OF CITY/MUNICIPAL DRAINAGE SYSTEMS (SMALL DRAIN PIPES, LESS LABOUR)
- \* RIVERS, LAKES AND WATER BODIES WILL BECOME CLEAN ON ITS OWN IN A SHORT PERIOD - AS RAW SEWAGE DO NOT ENTER
- \* HUGE COST SAVING FOR GOVT ON HEALTH CARE ESPECIALLY TOWARDS BPL FAMILIES THAT DEPEND ON OPEN SOURCE WATER
- \* NO NEED FOR STP AS EFFLUENT FROM BIO DIGESTER IS "SAFE"



# DR. LOKENDRA SINGH FORMALLY INAUGURATES OUR BACTERIA GENERATION PLANT (USABLE CAPACITY 100 CBM)...PUNE



# TESTING FACILITIES – FULL FLEDGED BIO-CHEMICAL LAB

## LAB Equipment

- LAMINAR HOOD
- GASSING MANIFOLD
- GAS CHROMATOGRAPHY
- INCUBATOR
- MUFFLE FURNACE
- pH METER
- DATA LOGGER ON BGP PLANT

**LIVE Bio-Toilet Setups at all our manufacturing locations for conducting experiments**







Date	pH Target 6.5 to 8.0	Temperature (°C) Before running Chiller Target 18 to 22 Degrees Celsius	Total Solids (%) TARGET 4%	Volatile solids (%) TARGET 3.20%	Cumulative Gas Yield (Cu M)	Cattle Dung (Litres)	Methane Content (%) of BGP, TAR: 40% - 70%	Methanogen MPN (CFU/ml)
10-12-2017	6.81	20.10	4.20%	3.18%	874	2380	52%	<b>4,00,000</b>
21-12-2017	6.82	20.00	4.22%	3.16%	900	3860	52%	
22-12-2017	6.82	20.00	4.24%	3.12%	924	3898	52%	
23-12-2017	6.81	20.20	4.22%	3.18%	942	3936	52.0%	
24-12-2017	6.81	20.10	4.22%	3.18%	1023	3974	52%	
25-12-2017	6.82	20.00	4.22%	3.16%	1045	4012	49%	
26-12-2017	6.82	20.00	4.20%	3.18%	1072	4050	52%	
27-12-2017	6.81	20.00	4.22%	3.16%	1116	4088	51%	
28-12-2017	6.81	20.20	4.24%	3.12%	1816	4126	52%	
29-12-2017	6.82	20.10	4.20%	3.18%	1839	4164	49%	
30-12-2017	6.82	20.00	4.22%	3.18%	1872	4202	52%	
31-12-2017	6.81	20.10	4.24%	3.16%	1902	4240	51%	
01-01-2018	6.81	20.00	4.22%	3.12%	1931	4278	52.0%	
02-01-2018	6.82	20.00	4.22%	3.18%	1962	4316	50.0%	
03-01-2018	6.82	20.10	4.22%	3.18%	1987	4354	50.0%	





## Effluent testing results of BDT installed at various location

Date of Sampling (Location)	Colour	Photo	Odour	pH Desired Value 6.0 – 9.0	Total Solids (mg/100ml) Desired Value < 750 (mg/100 ml)	Total Dissolved Solids (mg/100ml) Desired Value < 350 (mg/100 ml)	Total Volatile Solids (mg/100ml) Desired Value < 750 (mg/100 ml)	Fecal Coliform Count (CFU/100 ml) Desired Value < 108 CFU/100 ml	COD (mg/L) DRDE Desired Value <2000 mg/L	BOD (mg/L) DRDE Desired Value <120 mg/L
01-01-2018 (MUR)	Yellow		NO	6.92	184	138	146	45 x 10 <sup>3</sup>	217	136
01-01-2018 (RMD)	Yellow		NO	7.07	168	112	140	37 x 10 <sup>3</sup>	204	108
15-12-2017 (Mr Patil residence, Talegaon)	Faint Yellow		NO	6.98	154	98	136	38 x 10 <sup>3</sup>	194	106
23-11-2017 (MKM)	Faint Yellow		NO	7.14	112	78.4	84	48 x 10 <sup>3</sup>	198	102

# OUR FACILITIES





## WHY DRDO BIO-DIGESTER TECHNOLOGY...

- \* TECHNOLOGY DEVELOPED BY MINISTRY OF DEFENCE, GOVT OF INDIA...INDIAN RAILWAYS IS THE SINGLE LARGEST ADAPTOR ... CONVERTING ALL OPEN TOILETS IN TRAIN'S TO BIO-TOILETS.
- \* DE-CENTRALISED, LOW COST, MAINTENANCE FREE AND HIGHLY EFFECTIVE SYSTEM FOR TREATMENT OF HUMAN FAECAL MATTER.
- \* HIGHLY ADAPTABLE, SHORT TERM OVERLOAD / OVER USAGE IS EASILY ACCOMODATED BY THE SYSTEM.
- \* HGHLY COST EFFECTIVE COMPARED TO OTHER OPTIONS AVAILABLE IN THE MARKET SUCH AS SOAK PITS, SEPTIC TANKS, STP's.
- \* UNIVERSAL ACCEPTANCE BY THE AUTHORITHIES, THUS LEADING TO FASTER PROJECT COMPLETION.
- \* RECOMMENDED IN ALMOST ALL GOVT TENDERS.
- \* GREEN TECHNOLOGY TO WIPE OUT MANUAL SCAVENGING.



## *WHY NAGMAGIC BIO-DIGESTERS...*

- ✳ IN HOUSE FACILITY FOR MANUFACTURING OF ANAEROBIC MICROBIAL INOCULUM (DRDO BACTERIA) AND BIO-DIGESTER TANKS.
- ✳ FULL FLEDGED ENVIRONMENTAL MICROBIOLOGY LABORATORY SET-UP IN HOUSE FOR PRODUCT QUALITY ASSURANCE, R & D AND AFTER SALES SUPPORT.
- ✳ NAGMAGIC BIO-DIGESTER TANKS... AS COMPARED TO FRP / STEEL / RCC TANKS...ONE PIECE CONSTRUCTION WITH HOMOGENOUS WALLS, NO SEAMS, NO SPLITTING AND NO WELDING.
- ✳ ROTATIONAL MOULDING - AUTOMATED PROCESS...CAN BE SCALED UP VERY FAST, FRP - MANUAL PROCESS, HIGH INCONSISTENCIES IN THE OUTPUT.
- ✳ THE DELAMINATION OF A FRP TANK CAN RESULT IN A LEAKING OF THE INOCULUM THROUGH THE LAMINATE LAYERS. RESINS AND BINDERS USED IN FRP ARE SUSCEPTIBLE TO LEACHING OF MINOR RESIN COMPONENTS INTO THE INOCULUM THUS DAMAGING THE BIO ECO-SYSTEM INSIDE THE BIO-DIGESTER TANK.
- ✳ HIGHER CHEMICAL & IMPACT RESISTANCE AS COMPARED TO FRP TANKS.
- ✳ EXCELLENT UV STABILITY & COMPLETELY WATERPROOF.
- ✳ EASY TO INSTALL USING SEMI SKILLED LABOUR ... INSTALLATION IS A MATTER OF FEW HOURS.
- ✳ HIGHLY COST EFFECTIVE AS COMPARED TO OTHER OPTIONS SUCH AS FRP, STEEL OR CONSTRUCTED.

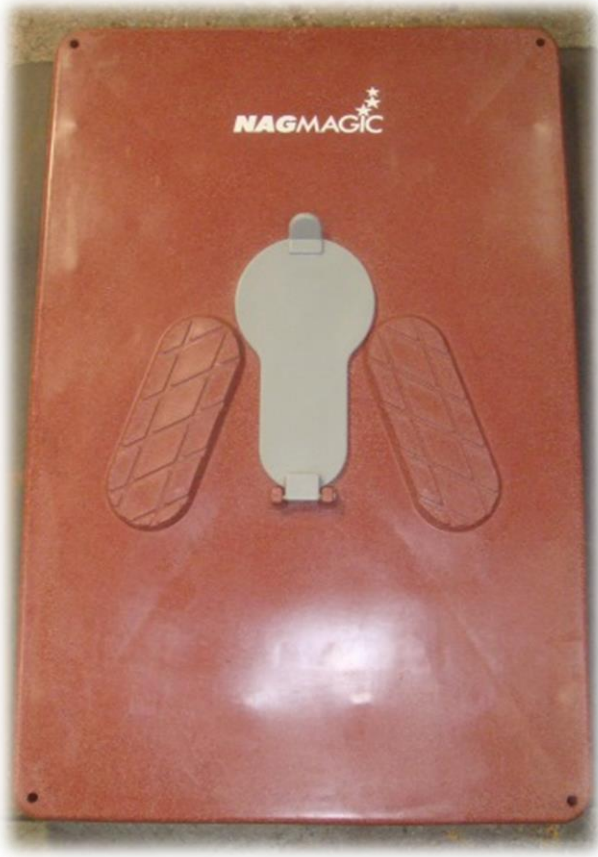


## OUR OTHER PRODUCTS

- Our Pans – Slope of 35 degrees versus slope of 17 to 25 degrees in Ceramic Pan
- Water Seal of 20 mm as compared to 75 mm Water Seal that are normally available.
- Due to the above...only 1 to 2 Liters required in pour flush as compared to 10 liters required in a normal toilet.
- High Freight efficiency – 3,300 sets as compared to 800 sets in Ceramic.
- Plastics Pans and Traps – highly scalable and high quantities can be manufactured in short time.



# SQUATTING SLABS



## ADD ON'S TO SQUATTING SLABS



MALE URINAL



FEMALE URINAL



WESTERN STYLE TOILET





## OUR VALUED CUSTOMERS – SANITATION PRODUCTS

- \* INDIAN RAILWAYS
- \* JINDAL STEEL – JSL
- \* RAILTECH
- \* PERMALI WALLACE
- \* WEST COAST
- \* THANE BELAPUR INDUSTRIES ASSOCIATION
- \* RANE PLASTICS
- \* PARAMOUNT POLYMERS
- \* SEINE TECH, SPAIN
- \* BRITISH RED CROSS, UK
- \* INTERNATIONAL COMMITTEE OF RED CROSS, INDIA
- \* UNICEF, COPENHAGEN,
- \* OXFAM, UK
- \* MEDECINS SANS FRONTIERES (MSF), BELGIUM
- \* MEDECINS SANS FRONTIERES (MSF), HOLLAND
- \* ACTION CONTRE LA FAIM (ACF), FRANCE
- \* INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES, SWITZERLAND
- \* INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES, MALAYSIA
- \* INTERNATIONAL RESCUE COMMITTEE, USA
- \* RELIEFLINE, SUDAN
- \* RELIEF SUPPLIER, INDIA
- \* DEEKAY RELIEF, KENYA



# OUR VALUED CUSTOMERS - FOAM MOULDING & BBG DIVISIONS



Hindustan Unilever Limited



VIDEOCON



Panasonic



LG



Haier



## Waste Treatment Division

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