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Chapter 1 : Our Work : Habitat India

Improves hygienic conditions through reduction of pathogens, worm eggs and flies; Controls water and air pollution from Agri-waste, household waste & animal dung.

Standardization in biogas technology Benefits of biogas technology Well-functioning biogas systems can yield a wide range of benefits for their users, the society and the environment in general see illustrations: The net calorific value depends on the efficiency of the burners or appliances. Methane is the valuable component under the aspect of using biogas as a fuel. Biogas use, replacing conventional fuels like kerosene or firewood, allows for the conservation of environment. It therefore, increases its own value by the value of i. Biogas is able to substitute almost the complete consumption of firewood in rural households. The output from the digester digested manure is actually a high quality organic fertilizer. This fertilizer is very important, especially in a country where the farmers do not have the resources to buy chemical fertilizers frequently. It has been calculated through lab tests that the fertilizer which comes from a bio-gas plant contains three times more nitrogen than the best compost made through open air digestion. If you compost chicken manure, for example, the finished compost will have in it only 1. This nitrogen is already present in the manure. The nitrogen is preserved when waste is digested in an enclosed biogas plant, whereas the same nitrogen evaporates away as ammonia during open air composting. The composting process is achieved through microbe activity and contains all the nutrients and microbe organisms required for the benefits of the plants. Bio-fertilizers also secrete growth promoting substances like hormones, vitamins, amino acids and anti-fungal chemicals, as well as improve seed germination and root growth. Bio-fertilizers, thereby also aid in the better establishment of plants. If parasitic diseases had previously been common, the improvement in hygiene also has economic benefits reduced working time. The more fully the sludge is digested, the more pathogens are killed. High temperatures and long retention times are more hygienic. The following are the principal organisms killed in biogas plants: Typhoid Cholera and dysentery bacteria in one or two weeks , Hookworm and bilharzia in three weeks. Tapeworm and roundworm die completely when the fermented slurry is dried in the sun. The availability of biogas can have effects on nutritional patterns too. With easy access to energy, the number of warm meals may increase. Whole grain and beans may be cooked longer, increasing their digestibility, especially for children. Water may be boiled more regularly, thus reducing waterborne diseases. Once a biogas unit is installed, women will more time to engage in other useful activities such as education and interesting activities outside the home. Biogas plants also improve health conditions in the homes: Since biogas burns clean, homes do not fill with smoke and ash. Women and children experience less bronchial problems and can expect to live longer. Homes are also more hygienic. Dung cakes are no longer stored in the homes. Cooking with gas takes less time than with wood or charcoal or any other commonly used fuel. It is easier to cook with gas stove. The annual time saving for firewood collection and cooking averages to almost hours in each household provided with a biogas plant. A biogas plant therefore directly saves forest. A single biogas system with a volume of cubic feet 2. A recent study by Winrock, Nepal and others found that each biogas plant can mitigate about five tons of carbon dioxide equivalent per year. The credits thus earned could provide alternative financing for the sustainability of biogas program in that particular region. The widespread production and utilization of biogas is expected to make a substantial contribution to soil protection and amelioration. First, biogas could increasingly replace firewood as a source of energy. Second, biogas systems yield more and better fertilizer. As a result, more fodder becomes available for domestic animals. This, in turn, can lessen the danger of soil erosion attributable to overgrazing. International Standards in this important area will help to address a global problem of great interest to public policy holders. International Standardization in this area will standardize biogas related to technologies thereby creating increasing accessibility to companies who produce and use biogas technologies. Improved and streamlined technology will improve access to consumers. As indicated above, there potential societal benefits include improved health, reduced pollution,

increased employment and improved integration in the cultural and educational sectors. The costs of biogas technology An obvious obstacle to the large-scale introduction of biogas technology is the fact that the poorer strata of rural populations often cannot afford the investment cost for a biogas plant. This is despite the fact that biogas systems have proven economically viable investments in many cases. Efforts have to be made to reduce construction cost but also to develop credit and other financing systems. A larger number of biogas operators will ensure that, apart from the private user, the society as a whole can benefit from biogas. Financial support from the government can be seen as an investment to reduce future costs, incurred through the importation of petrol products and inorganic fertilizers, through increasing costs for health and hygiene and through natural resource degradation. Fuel and fertilizer In Kenya, there is a direct link between the problem of farm fertilization and progressive deforestation due to high demand for firewood. In many rural areas, most of the inhabitants are dependent on fuelwood, dung and organic residue as fuel for cooking and heating. The burning of dung and plant residue is a considerable waste of plant nutrients. Farmers in developing countries are in dire need of fertilizer for maintaining cropland productivity. Nonetheless, many small farmers continue to burn potentially valuable fertilizers, even though they cannot afford to buy chemical fertilizers. At the same time, the amount of technically available nitrogen, potassium and phosphorous in the form of organic materials is around eight times as high as the quantity of chemical fertilizers actually consumed in developing countries. Especially for small farmers, biogas technology is a suitable tool for making maximum use of scarce resources: After extraction of the energy content of dung and other organic waste material, the resulting sludge is still a good fertilizer, supporting general soil quality as well as higher crop yields. Public and political awareness Popularization of biogas technology has to go hand in hand with the actual construction of plants in the field. Without the public awareness of biogas technology, its benefits and pitfalls, there will be no sufficient basis to disseminate biogas technology at grassroots level. At the same time, awareness within the government is essential. Since impacts and aspects of biogas technology concern so many different governmental institutions e.

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Chapter 2 : Energy Bin - PEEPAL

Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. But one advantage which has proved boon is transformation of organic wastes into high quality fertilizer. The output from the digester (digested manure) is actually a high quality organic fertilizer which contains three times more nitrogen than normal.

Our Work As part of its endeavour, Habitat for Humanity focuses on the following aspects in relation to housing. Shelter Assistance We provide a decent place to live by the means of: Construction of a new house 2. Restoration of a dwelling that once met the required standards. A construction intervention that addresses a build in stages. Repair will include patching, restoration or minor replacement of materials and building components for keeping the house in good or sound conditions. To reduce the vulnerability of the family in the areas of health or safety. We, through our Disaster Response initiatives attempt to assist communities and families in building their capacities, to reduce their vulnerabilities, to minimise the impact of hazards and provide housing solutions to help families in the construction of disaster-resilient houses. Provision of Emergency Shelter Kits: This immediate shelter assistance will help families to instil confidence to negotiate for permanent shelters. Habitat will repair and renovate the partially damaged houses and make it safe and fit for dwelling till durable housing solutions are derived. The affected people can regain confidence and rebuild their life with dignity. Habitat will construct permanent houses Disaster Resistant for those families who have lost their houses. Habitat will work with the Corporates, Institutions and Foundations for raising the needed resources and volunteer support. General awareness will be created on disaster resilience construction practices â€" promoting safe houses. Housing Micro Finance technical Assistance Centre: Disposal of human excreta in a safe, hygienic and scientific manner is integral part of rural sanitation. Habitat India through its partner agencies has implemented rural hygiene and sanitation programmes in several districts of Maharashtra and Gujarat. Presently, the country is spending a fortune in importing fossil oil which can hardly be afforded for long on the face of developmental needs. Due to lack of access to LPG gas for domestic consumption communities are felling trees for firewood use. This is degrading environment as well as smoke is causing respiratory problems for women. Habitat India implemented a Bio gas project in Dharampur block, Valsad, Gujarat for 30 low income families. Observed project outcomes included: Income of families and their standard of living increased. Production of energy heat, light, electricity. Transformation of organic wastes into high quality fertilizer. Environmental advantages through protection of forests, soil, water and air. Global Environmental Benefits of Biogas Technology. Reduction of workload, mainly for women, in firewood collection and cooking. Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. Habitat India supports communities in its program locations to implement appropriate and suitable activities to increase access to safe drinking water. Tribal communities have been progressively alienated from their traditional rights over natural resources like land, forest, river and that has eroded the very basis of their existence. Habitat India therefore focuses its intervention on tribal communities across the country. There are disproportionately more poor women than there are poor men in the world. A low-income woman is more likely to live in an unsafe and substandard house, without access to services, on land that makes her vulnerable â€" whether to natural disasters, eviction or exploitation. Land tenure laws often deny women the ability to possess land. Living in a safe, decent home on land that provides security for the whole family is a major step in helping improve lives. This provides choice and opportunity for women â€" they are able to leave the home to earn an income and hold their ground when decisions are made. Habitat India therefore focuses its intervention on women. Disabled people are commonly the poorest of the poor in society, experiencing social exclusion and discrimination at all levels. Habitat India understands the needs of these people and works towards the attainment of a better and brighter for these individuals, such that they can lead the normal life they deserve. These constitute a highly vulnerable group of minors that are susceptible to exploitation and discrimination. As part of its intervention and outreach, Habitat India addresses housing needs of these

children. Recycled Tetra Pack Roofing Sheets: The sheets have proven to be fire retardant and anti-fungus under extreme weather conditions. Habitat homes are built with environment-friendly features and in-keeping with traditional local architecture and building methods. The houses build in Leh for instance; Habitat has incorporated a key environmental feature in each house â€" a south-facing trombe wall. A trombe wall is a wall separated from the outdoors by glazing and an air space. Connecting this air space with the inside of the house are two vents, one at the top and one at the bottom. During the day the sun heats the air and then the solid wall behind; warm air rises and enters into the room, hence providing additional heat. The rising air, in turn, pulls in cooler air which is then heated. The thick walls and multi-layered flat roofs provide excellent insulation. Each Habitat house has a private compost toilet located outside the main structure. These clean, low-tech system toilets utilize natural processes to deal with human waste; it does not have to be treated with chemicals or need an expensive sewerage network. The system does not need water, an important consideration in arid regions such as Leh where this housing innovation was implemented. The resultant matter is organic and can be used as natural fertilizer improving the structure and nutrient value of the soil. The smokeless chulha is an improved version of the traditional Chulha and has several added advantages. The closed design of the smokeless Chulha uses the heat from burning wood more efficiently and diverts carcinogenic fumes out of the home through an overhead cement pipe. This results in a smoke free kitchen which in turn safeguards the health of a family. The design of smokeless chulha prevents sparks from emerging, thus rendering it safer to use.

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Chapter 3 : Bioenergy: Refueling the Future

(3) Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. (4) Workload reduction; mainly for women, in firewood collection and cooking. (5) Environmental advantages through protection of forests, soil, water and air.

Biogas is composed primarily of methane and carbon dioxide, two major greenhouse gases. Biogas can be used as a low-cost fuel, typically for electrical purposes. However, it can also be compressed into biomethane and used as fuel. As new waste is piled on top of older waste, pressure builds up from the weight of the waste. This pressure compresses the waste and starves it of oxygen. Anaerobic bacteria thrive in conditions such as this. The Anaerobic bacteria breaks down the organic compounds. The three main by-products include methane, carbon dioxide and nitrogen. Before these gases can rise to the surface and escape into the atmosphere, they are captured to be refined into biogas. The pulp is heated to kill any bacteria that could be harmful. This also helps break down the organic waste to help get the anaerobic bacteria started later on. The organic waste then goes to a bioreactor where it is broken down by anaerobic bacteria. Here the organic waste is turned into biogas and nutrient-rich sludge. The biogas is dried and removed of any harmful gases. The gas goes to the generator and creates electricity. The nutrient-rich sludge is dried mechanically and then it is shipped as fertilizer. Transformation of organic wastes into high quality fertilizer. Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. Reduction of workload, mainly for women, in firewood collection and cooking. Environmental advantages through protection of forests, soil, water and air. No HTML skills required. Build your website in minutes.

and ensures the great care and hygiene. Cattle shed helps to safely dispose cow dung and â€¢ Improvement of hygienic conditions through reduction of pathogens.

To compensate for this, about three quarters of the billion tons of animals manure produced annually is burned for heating or cooking. This however causes tremendous medical problems. The acrid smoke leads to endemic eye disease, and the drying manure is a perfect breeding ground for flies of all types. The manure would also go a long way to improving the quality of the soil and hence increasing the harvest if these valuable minerals were returned to it instead of going up in smoke. Production of gas for cooking stoves in hours by our plants. This technology is feasible for small holders with livestock producing minimum 25 kg manure per day. This manure has to be collectable to mix it with water and feed it into the plant. Toilets can be connected. Another precondition is the temperature that affects the fermentation process. This makes the technology for small holders in developing countries often suitable. Our high quality biogas plant needs minimum maintenance costs and can produce gas for at least 20 years without major problems and re-investments. For the user, biogas provides clean cooking energy, reduces indoor air pollution and reduces the time needed for traditional biomass collection, especially for women and children. The slurry is a clean organic fertilizer that potentially increases agricultural productivity. It is simple as no moving parts exist. There are also no rusting steel parts and hence a long life of the plant 20 years or more can be expected. The plant is constructed underground, protecting it from physical damage and saving space. While the underground digester is protected from low temperatures at night and during cold seasons, sunshine and warm seasons take longer to heat up the digester. The construction of fixed dome plants is labor-intensive, thus creating local employment. Fixed-dome plants are not easy to build. They should only be built where construction can be supervised by experienced biogas technicians. Otherwise plants may not be gas-tight porosity and cracks. The facts about biogas: Its heating value is around B. Cow dung slurry is composed of 1. The manure produced by one cow in one year can be converted to methane which is the equivalent of over liters of gasoline. Gas engines require about 0. Some care must be taken with the lubrication of engines using solely biogas due to the "dry" nature of the fuel and some residual hydrogen sulphide; otherwise these are a simple conversion of a gasoline engine. All organic material, both animal and vegetable can be broken down by these two processes, but the products of decomposition will be quite different in the two cases. Aerobic decomposition fermentation will produce carbon dioxide, ammonia and some other gases in small quantities, heat in large quantities and a final product that can be used as a fertilizer. Anaerobic decomposition will produce methane, carbon dioxide, some hydrogen and other gases in traces, very little heat and a final product with a higher nitrogen content than is produced by aerobic fermentation. Anaerobic decomposition is a two-stage process as specific bacteria feed on certain organic materials. In the first stage, acidic bacteria dismantle the complex organic molecules into peptides, glycerol, alcohol and the simpler sugars. When these compounds have been produced in sufficient quantities, a second type of bacteria starts to convert these simpler compounds into methane. These methane producing bacteria are particularly influenced by the ambient conditions, which can slow or halt the process completely if they do not lie within a fairly narrow band. One third of the total biogas will be produced in the first week, another quarter in the second week and the remainder of the biogas production will be spread over the remaining 6 weeks. Gas production can be accelerated and made more consistent by continuously feeding the digester with small amounts of waste daily. This will also preserve the nitrogen level in the slurry for use as fertilizer. If such a continuous feeding system is used, then it is essential to ensure that the digester is large enough to contain all the material that will be fed through in a whole digestion cycle. The first action is, naturally, to insulate the digester with straw or wood shavings. A layer about 50 - cm thick, coated with a waterproof covering is a good start. If this still proves to be insufficient in winter, then heating coils may have to be added to the biogas digester. It is relatively simple to keep the digester at the ideal temperature if hot

water, regulated with a thermostat, is circulated through the system. Usually it is sufficient to circulate the heating for a couple of hours in the morning and again in the evening. Naturally, the biogas produced by the digester can be used for this purpose. The small quantity of gas "wasted" on heating the digester will be more than compensated for by the greatly increased biogas production. Benefits of Biogas 1. Production of energy heat, light, electricity. Transformation of organic wastes into high quality fertilizer. Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. Reduction of workload, mainly for women, in firewood collection and cooking. Environmental advantages through protection of forests, soil, water and air. Global Environmental Benefits of Biogas Technology. The net calorific value depends on the efficiency of the burners or appliances. Methane is the valuable component under the aspect of using biogas as a fuel. Biogas use, replacing conventional fuels like kerosene or firewood, allows for the conservation of environment. It therefore, increases its own value by the value of i. Biogas is able to substitute almost the complete consumption of firewood in rural households. The output from the digester digested manure is actually a high quality organic fertilizer. If you compost chicken manure, for example, the finished compost will have in it only 1. This nitrogen is already present in the manure. The nitrogen is preserved when waste is digested in an enclosed bio-gas plant, whereas the same nitrogen evaporates away as ammonia during open air composting. The bio-gas plant does not make extra nitrogen; it does not create nitrogen, it merely preserves the nitrogen that is already there. There is no better way to digest or compost manure and other organic material than in a bio-gas plant. One can compare the bacteria in a digester tank to fish worms. Fish worms help the soil by eating organic matter, passing it through their bodies and expelling it as very rich fertilizer. They live by breaking waste material down into food for plants. It is the same with the bacteria in a methane digester. One can also think of it another way. Seven cubic feet of methane gas can be generated from one pound of dry leaves but only one cubic foot of gas will come from one pound of cow dung. The cow dung, on the other hand; is just that much richer in fertilizer than the leaves. One can say, then, that the cow has digested the leaves and partly turned them into plant food. When the cow manure is then composted in a bio-gas plant, the bacteria there merely further processâ€”or refineâ€”the former dry leaves into a still richer plant food. It is all very natural. The composting process is achieved through microbe activity and contains all the nutrients and microbe organisms required for the benefits of the plants. Bio-fertilizers also secrete growth promoting substances like hormones, vitamins, amino acids and anti-fungal chemicals, as well as improve seed germination and root growth. Bio-fertilizers, thereby also aid in the better establishment of plants. Bio-fertilizers are cost effective and eco-friendly supplements to chemical fertilizers. They provide a sustainable source for nutrients and healthy soils. Once a Bio gas plant is installed, she will have that much extra time for herself and her children. They will now have more time for education and interesting activities outside the home. Biogas plants also improve health conditions in the homes: Since biogas burns clean, homes do not fill with smoke and ash. Women and children experience less bronchial problems and can expect to live longer. Homes are also more hygienic. Dung cakes are no longer stored in the homes. Cooking with gas takes less time than with wood or charcoal or any other commonly used fuel. It is easier to cook with gas stove. A biogas plant therefore directly saves forest. A single biogas system with a volume of cubic feet 2,8 m3 can save as much as 0. The widespread production and utilization of biogas is expected to make a substantial contribution to soil protection and amelioration. First, biogas could increasingly replace firewood as a source of energy. Second, biogas systems yield more and better fertilizer. As a result, more fodder becomes available for domestic animals. This, in turn, can lessen the danger of soil erosion attributable to overgrazing. The increase of the so called greenhouse gases which also include methane, ozone, nitrous oxide, etc. The World Bank Group expects a rise in sea levels until the year of up to 50 cm. Flooding, erosion of the coasts, salinization of ground water and loss of land are but a few of the consequences mentioned. Until now, instruments to reduce the greenhouse effect considered primarily the reduction of CO2-emissions, due to their high proportion in the atmosphere. Though other greenhouse gases appear to be only a small portion of the atmosphere, they cause much more harm to the climate.

Chapter 5 : ECONOMIC IMPACT OF BIOGAS

Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. 4. Reduction of workload, mainly for women, in firewood collection and cooking.

Specifications a Air Pollution Control "Every community produces both liquid and solid wastes and air emissions. Solving odour problems requires a thorough understanding of the situation. Air contaminants are emitted into the atmosphere as particulates, aerosols, vapors, or gases. The most common methods of eliminating or reducing pollutants to an acceptable level are destroying the pollutant by thermal or catalytic combustion, changing the pollutant to a less toxic form, or collecting the pollution by use of equipment to prevent its escape into the atmosphere Wet Scrubber at a Curry Powder Factory b Waste Water Treatment Plant When untreated wastewater accumulates and is allowed to go septic, it will lead to nuisance conditions including the production of malodorous gases harmful to human life. Management of Bio-Medical Wastes- is a critical area of great concern as hospital biomedical wastes could be highly infectious and be a source of spreading contagious diseases, AMACON takes up turnkey project on Bio-Medical Waste Management in Hospitals. AMACON has solutions for Effluent and sewage management problems that are enviro-friendly, cost effective and trouble-free in Hospitals, Industries, Hotels and Municipalities etc, through improved Bioprocess. Biogas originates from bacteria in the process of bio-degradation of organic material under anaerobic without air conditions. Biogas is produced by anaerobic digestion or fermentation of organic matter including like Cow dung, Food waste, sewage sludge, municipal solid waste, biodegradable waste or any other biodegradable feedstock, under anaerobic conditions. Biogas and the global carbon cycle: Each year some million tons of methane are released worldwide into the atmosphere through microbial activity. The remainder is of fossil origin e. In the northern hemisphere, the present tropospheric methane concentration amounts to about 1. Unlike fossil fuel combustion, biogas production from biomass is considered CO 2 neutral and therefore does not emit additional Greenhouse Gases GHG into the atmosphere. Finally, biogas production from anaerobic digester presents the additional advantage of treating organic waste and reducing the environmental impact of these wastes. It contributes to a better image of the farming community while reducing odor, pathogens and weeds from the manure and producing an enhance fertilizer easily assimilated by plants. The output from the digester digested manure is actually a high quality organic fertilizer. Benefits of Biogas Biogas plants can yield a whole range of benefits for their users, the society and the environment in general, the chief benefits being; 1. Production of energy heat, light, electricity. Transformation of organic wastes into high quality fertilizer. Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. Reduction of workload, mainly for women, in firewood collection and cooking. Environmental advantages through protection of forests, soil, water and air. Global Environmental Benefits of Biogas Technology. Biogas use, replace conventional fuels like kerosene or firewood thus allows for the conservation of environment. Biogas is able to substitute almost the complete consumption of firewood in rural households. The bio gas plant is the perfect fertilizer-making machine and it has been tested all over the world. There is no better way to digest or compost manure and other organic material than in a bio-gas plant. Seven cubic feet of methane gas can be generated from one pound of dry leaves but only one cubic foot of gas will come from one pound of cow dung. Bio-fertilizers also secrete growth-promoting substances like hormones, vitamins, amino acids and anti-fungal chemicals, as well as improve seed germination and root growth. Bio-fertilizers, thereby also aid in the better establishment of plants. Bio-fertilizers are cost effective and eco-friendly supplements to chemical fertilizers. They provide a sustainable source for nutrients and healthy soils. The following are the principal organisms killed in biogas plants: Typhoid Paratyphoid, Cholera and dysentery bacteria in one or two weeks , Hookworm and bilharzia in three weeks. Tapeworm and roundworm die completely when the fermented slurry is dried in the sun. Biogas plants also improve health conditions in the homes: Since biogas burns clean, homes do not fill with smoke and ash. Women and children experience less bronchial problems

and can expect to live longer. Homes are also more hygienic. Dung cakes are no longer stored in the homes. Cooking with gas takes less time than with wood or charcoal or any other commonly used fuel. Anaerobic digestion systems for digesting MSW are now widely used throughout the world. The majority of plants operates on a large scale, and involves complex plant design. To increase the rate of digestion and biogas production multi-stage processes are often used. These split the stages of anaerobic digestion, causing them to occur in separate reactors. The environment in each reactor can then be optimised for the particular digestion stage and so increase the reaction rate and amount of gas produced. Other systems use the thermophilic temperature range to increase the gas production rate. Most of the larger scale, industrial systems process MSW alone, however the simpler, smaller scale systems are more successful when co-digestion with animal manure is used. Advantages of MSW anaerobic digestion: Makes landfills easier to manage by removing problematic organic waste material, which is responsible for gaseous and liquid emissions. Methane is a greenhouse gas with twenty times the impact of carbon dioxide. An end product that can be used as a soil conditioner is produced You May Like Not exactly what you want?

Chapter 6 : Benefits of Winnergy Service

Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies. Reduction of workload, mainly for women, in.

Traces Typical composition of biogas. To achieve this sequence of four steps, various bacteria e. The biogas can be collected and the CH4 be used as a combustible. Thereby, a hydrogen atom H is added to one part of the split chain, while the remaining hydroxyl group of the water OH is added to the other. Hydrolysis is the first step of anaerobic digestion in which insoluble complex molecules such as carbohydrates and fats are broken down to short sugars, fatty acids and amino acids. Fermentation is the second step of anaerobic digestion. Fermentative bacteria transform sugars and other monomeric organic products from hydrolysis into organic acids, alcohols, carbon dioxide CO2 , hydrogen H and ammonia NH3. Acetogenesis is the third step of anaerobic digestion. To produce acetic acid, acetogenic bacteria need oxygen and carbon. For this, they use the oxygen solved in the solution or bounded-oxygen. Hereby, the acid-producing bacteria create an anaerobic condition, which are essential for the methane-producing microorganisms responsible for the further step. Methanogenesis is the fourth and final step of anaerobic digestion. Factsheet Block Title Important process parameters Factsheet Block Body For the digestion to be effective, it should operate as a finely balanced, living system â€" carefully controlled and closely monitored â€" in order to create optimal conditions for the growth of the bacteria responsible for anaerobic digestion. Therefore, several factors should be considered for design and processing of biogas treatment units. The most important of these parameters are described below. As in all other microbial processes, the rate of metabolism increases along with the temperature: Depending on the temperature, the digestion process will be more or less long and therefore, temperature is directly linked to the retention time. The following types of digestion are distinguished according to the temperature in the digester SASSE The conventional operational temperature levels for anaerobic digesters are mesophilic and thermophilic. Thermophilic processes produce more biogas in shorter time but require higher input energy to obtain operation temperatures. Therefore, mesophilic systems are generally more interesting. The optimal pH-level There are two groups of bacteria in terms of pH optima, namely acidogens and methanogens. The best pH range for acidogens is 5. The operating pH for combined cultures is 6. Since methanogenesis is considered as a rate-limiting step, pH close to neutral is optimum. Generally, pH is self-regulating and there is now need for adjustment. However, in the case of dysfunction of a system, an inappropriate pH may be the reason for the disturbed microbial process MES et al. Content of total solids TS: The most often, low-rate processes for the treatment of excess sludge, faecal sludge and agricultural or industrial slurries are wet processes. Wet also low-solids digesters can transport material through the system using standard pumps that require significantly lower energy input. Dry processes have the advantage to require less space, but they are somehow more complex and relatively new, however they have a large potential for the treatment of municipal organic solid waste. The TS content of high-rate systems after separation of the sludge from the liquid is generally similar to the one of slurries for wet digestion, but the concept of dry and wet mode is not applicable to high-rate anaerobic systems. Mixing For a well operating system, mixing has to be provided by mechanical stirring, gas circulation bubbling or displacement under gravity MUELLER Intensive mixing is important for the process to allow the bacteria the contact with every degradable material. COD and anaerobic biodegradability In all kinds of biogas technologies, it is the chemical oxygen demand COD , which is generally used to quantify the amount of organic matter in waste streams and predict the potential for biogas production. Another very useful parameter to evaluate substrates for anaerobic digestion is the anaerobic biodegradability and hydrolysis constant. The total anaerobic biodegradability is measured by the total amount of methane produced during a retention time of at least 50 days MES et al. High-rate reactors a mixed concept: Wet systems often also apply fed batch reactors accumulation systems, MES et al. Batch systems are the only systems that allow controlling accurately the hydraulic or solid residence time HRT and SRT. But as the batch

needs to be opened and emptied regularly, odour emissions can occur. One-stage and multi-stage processing One-stage digestion, where all the process takes place in a single reactor, saves costs and is easier to operate. Small-scale plants in general are designed as one-stage processes. Large-scale plants however, often apply two- or multi-stage processes. The idea of multi-stage processes is that the digestion is mediated by a sequence of bio-chemical reactions, which do not necessarily share the same optimal environmental conditions. The systems involve separation of hydrolysis and acidogenesis from acetogenesis and methanogenesis phases MES et al. This allows to more accurately control the main process factors oxygen, temperature and pH influencing the performance of the digestion bacteria. This is particularly interesting where heating is applied to improve the methanogenesis process as the volume to be heated is considerably lowered, resulting in an energy savings. Applicability Anaerobic digestion can be used for almost any kind of organic waste. It is particularly interesting where there is a demand for biogas as a renewable energy source and where the remaining fertilising sludge can be reused for food or crop production. Small-scale biogas reactors for the household level treatment of animal manure, kitchen waste and toilet products have been widely disseminated in southern countries, mainly in Asia. Large-scale plants are used mainly in industrialised countries for the treatment of waste slurries from agriculture and industry or the treatment of excess sludge from municipal wastewater treatment. There are also technologies for the treatment of organic solid wastes at small-, community- and large-scale level. Options for Recovering Beneficial Products from Dairy Manure This manual provides an introduction to the anaerobic digestion of dairy manure. The operation and waste management practices of Idaho dairies, the anaerobic digestion and the anaerobic digestion processes suitable for dairy waste, the typical design applications for different types of dairies and finally the cost and benefits of the facilities are discussed. Dairy Waste Anaerobic Digestion Handbook.

Chapter 7 : Bio-Gas plant Energy generation from Cow-Dung | People for Animals International

â€¢ improvement of hygienic conditions through reduction of pathogens, worm eggs and flies; â€¢ reduction of workload, mainly for women, in firewood collection and cooking.

Biogas is comprised primarily of methane and carbon dioxide. It also contains smaller amounts of hydrogen sulphide, nitrogen, hydrogen, methylmercaptans and oxygen [1]. Biogas originates from bacteria in the process of bio-degradation of organic material under anaerobic without air conditions. The natural generation of biogas is an important part of the biogeochemical carbon cycle. Methanogens methane producing bacteria are the last link in a chain of micro-organisms which degrade organic material and return the decomposition products to the environment. In this process biogas is generated, a source of renewable energy. The gases methane, hydrogen and carbon monoxide can be combusted or oxidized with oxygen. This energy release allows biogas to be used as a fuel. Biogas can be used as a low-cost fuel in any country for any heating purpose, such as cooking. It can also be utilized in modern waste management facilities where it can be used to run any type of heat engine, to generate either mechanical or electrical power. Biogas is a renewable fuel and electricity produced from it can be used to attract renewable energy subsidies in some parts of the world. Below is the biogas equivalent to different fuels [2]: Anaerobic fermentation involves the activities of three different bacterial communities. The process of biogas-production depends on various parameters. For example, changes in ambient temperature can have a negative effect on bacterial activity. Biogas microbes consist of a large group of complex and differently acting microbe species, notably the methane-producing bacteria. The whole biogas-process can be divided into three steps: Three types of bacteria are involved. The three-stage anaerobic fermentation of biomass [3] Hydrolysis In the first step hydrolysis , the organic matter is enzymolyzed externally by extracellular enzymes cellulase, amylase, protease and lipase of microorganisms. Bacteria decompose the long chains of the complex carbohydrates, proteins and lipids into shorter parts. For example, polysaccharides are converted into monosaccharides. Proteins are split into peptides and amino acids. These bacteria are facultatively anaerobic and can grow under acid conditions. To produce acetic acid, they need oxygen and carbon. For this, they use the oxygen solved in the solution or bounded-oxygen. Hereby, the acid-producing bacteria create an anaerobic condition which is essential for the methane producing microorganisms. Moreover, they reduce the compounds with a low molecular weight into alcohols, organic acids, amino acids, carbon dioxide, hydrogen sulphide and traces of methane. From a chemical standpoint, this process is partially endergonic i. Methanogenesis Various types of methanogenic bacteria. The spherically shaped bacteria are of the methanosarcina genus; the long, tubular ones are methanothrix bacteria, and the short, curved rods are bacteria that catabolize furfural and sulfates. The total length of the broken bar at top left, which serves as a size reference, corresponds to 1 micron. For example, they utilize hydrogen, carbon dioxide and acetic acid to form methane and carbon dioxide. Under natural conditions, methane producing microorganisms occur to the extent that anaerobic conditions are provided, e. They are obligatory anaerobic and very sensitive to environmental changes. In contrast to the acidogenic and acetogenic bacteria, the methanogenic bacteria belong to the archaebacter genus, i. Symbiosis of Bacteria Methane- and acid-producing bacteria act in a symbiotic way. On the one hand, acid-producing bacteria create an atmosphere with ideal parameters for methane-producing bacteria anaerobic conditions, compounds with a low molecular weight. On the other hand, methane-producing microorganisms use the intermediates of the acid-producing bacteria. Without consuming them, toxic conditions for the acid-producing microorganisms would develop. In practical fermentation processes the metabolic actions of various bacteria all act in concert. No single bacteria is able to produce fermentation products alone. Composition and Properties of Biogas The composition of biogas varies depending upon the origin of the anaerobic digestion process.

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(c) Improvement of hygienic conditions through reduction of pathogens, worm eggs and flies Qualitative information from various household surveys has revealed that problems like respiratory illness, eye infection, asthma and lung problems have decreased after installing a biogas plant.

Out of 42 respondents who had respiratory problems in the past, it was reported that the problem has improved for 34 of them. Similarly, those who had problems like asthma, eye infections and lung problems found that their problems had decreased after displacing dirtier fuels with biogas. If parasitic diseases had previously been common, the improvement in hygiene also has economic benefits reduced working time. The more fully the sludge is digested, the more pathogens are killed. High temperatures and long retention times are more hygienic. The following are the principal organisms killed in biogas plants: The availability of biogas can have effects on nutritional patterns too. With easy access to energy, the number of warm meals may increase. Whole grain and beans may be cooked longer, increasing their digestibility, especially for children. Water may be boiled more regularly, thus reducing waterborne diseases. Workload reduction; mainly for women, in firewood collection and cooking. Biogas Plants units have many benefits and address many problems. To gather wood, women can spend up to hours per day searching and carrying the firewood. Once a BGU is installed, she will have that much extra time for herself and her children. They will now have more time for education and interesting activities outside the home. Biogas plants also improve health conditions in the homes: A biogas plant therefore directly saves forest. A single biogas system with a volume of cubic feet 2,8 m3 can save as much as 0. The credits thus earned could provide alternative financing for the sustainability of biogas program in that particular region. The widespread production and utilization of biogas is expected to make a substantial contribution to soil protection and amelioration. First, biogas could increasingly replace firewood as a source of energy. Second, biogas systems yield more and better fertilizer. As a result, more fodder becomes available for domestic animals. This, in turn, can lessen the danger of soil erosion attributable to overgrazing. At a time of increased prices, rising inflation, diminishing resources and intense global demand for energy, we need to have options to meet these challenges. Renewable energy technology is definitely one option that the country must look into closely. Gone are the days of cheap labour and resources to maintain a healthy standard of living, at optimum energy costs, which is why we must look into the depth of the energy crisis and identify solutions. Biogas is a natural resource, abundantly found in forests, organic industrial waste along with human and animal waste. It can be recycled to produce efficient and usable energy. One cow alone can produce enough waste in one day to generate 3 kilowatt hours of electricity whereas only 2. Major benefits have been attained by many developing nations. In China, over 30 million households have applied biogas alternative energy, leading to reduced air and water pollution, saving money, improving hygiene conditions, producing high quality fertilizer, saving cooking time, saving time collecting firewood, using crop residue for animal fodder instead of fuel and improving rural standards of living. Cow manure can be used to power ethanol power plants, where plants are saving almost 1, barrels of imported oil by switching to methane bio-gas. Government must now and today use biogas in running diesel engines, and gas generators. This process is feasible for small holders, with livestock producing 50kg waste per day, produced by three cows. The government needs to proactively assist by providing subsidies to build efficient biogas plants and by reworking the energy conservation bill, which is aimed at replacing old equipment and machinery to the rural farming communities with new technological gadgets.

Chapter 9 : Home Biogas Plant Design and the Advantages of Biogas

improvement of hygienic conditions through reduction of pathogens, worm eggs and flies; encouragement of better sanitation; reduction of workload, mainly for women, in firewood collection and cooking.