Sustainable Construction by Provisions of Bio-Sanitation

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Abstract - Stepping into the 21st century, coupled with enormous scientific development we also face a grave threat of resource depletion and pollution leading to poor health conditions. The most significant contribution of this pollution comes from various construction activities. From pre-construction to post-construction activities, huge amount of resources are spent on erecting as well as maintaining a building. Even with all leading innovations concerning sustainable construction, we have left out the extensive role of sanitation that could prove to be a pivotal path towards obtaining sustainable buildings. Thus, this paper aims at the innovative use of Bio-toilets in collaboration with Bio-Gas to unveil their use and adaption to not only traditional buildings, but even high rise structures.

Keywords - Bio-Toilets, Linked Bio-Gas, Permeable Reactive Barrier ,Bio-Digester, Anaerobic co-digestion, Bacteria ,Urine Diverting Dry Toilets.

I. INTRODUCTION

Urine Diverting Dry Toilets (UDDT):

In areas of water scarcity, this design of toilets proves to be exactly the best solution. The urine discharge after suitable treatment is circulated back for gardening around the vicinity or used for flushing back again. The method needs a single pit to collect faeces and thus consumes less space. It is ideal for public places as the amount of discharge to be treated and recycled is optimum and thus the model becomes efficient.

Anaerobic co-digestion:

The anaerobic co-digestion is the simultaneous treatment of more than one substrate in the same digester. According to MATA-ALVAREZ (2003), the mixing of several wastes types has positive effects on the anaerobic digestion process because it improves the methane yield, improves the process stability and achieves a better handling of the waste. In addition, such a system is economically more favourable as it combines different waste streams in one common treatment facility.

Permeable Reactive Barrier (PRB):

The Permeable Reactive Barrier (PRB) is passive technique application, meaning it requires no external energy to force the contaminated liquid through the barrier. To allow the liquid to flow through the reactive material, the reactive barrier material
must have a higher hydraulic conductivity than the surrounding contaminated medium. The PRB is then placed perpendicular to the direction of the water flow allowing the contaminated water to travel through the reactive material for the best removal results. Within the barrier the contaminants are either absorbed, chemically or biologically degraded. Once the chemical process is complete, the remediated water continues downstream via natural flow.

![Diagram of PRB and reactive cell](image)

**Linked Bio-Gas:**

This technology is an emerging yet primitive technology that has an evolving scope. The generation of bio-gas from biological breakdown of waste feed is used for cooking as well as heating systems. This technique at present is used only for rural vicinities however the research paper is aimed at emphasising the adaptability of this fashion to urban structures which will introduce zero waste concept & induce sustainability in the life cycle of structures.

![Diagram of Bio-Digester](image)

**Bio-Digester:**

A bio-digester is similar to a mechanical stomach. It can digest anything of organic nature & origin. It converts the feed into methane(CH4) and carbon dioxide (CO2). The methane in gaseous form is then supplied to households through a network of pipe fixtures and the remaining decomposed feed is then used as manure and fertilizers for agriculture or backyard gardening. The biological breakdown of feed is done by bacteria of aerobic & anaerobic nature.
II. OBJECTIVES

1. To study the feasibility of project. The important objective of providing Bio-toilets is to be reduced the maintenance cost and to increase the sustainability of the building.
2. To design an adaptive model of bio-toilets to suit all class of buildings.
3. To check the feasibility of the proposed model with respect to reduction in fresh-water requirement & discharge treatments.
4. To verify the various alternative uses & applications of bio-toilet discharges to corresponding building it is installed in.

III. FUTURE SCOPE

The Bio-Toilet linked with Bio-gas has a tremendous reach in all class of buildings. An innovative approach of inclusion of such sanitation schemes in high rise buildings, malls, educational institutes, administrative complexes will relieve a huge dependence on drainage and sewage treatment structures. Also, the organic outflow from such toilets being decomposed can be recycled and be used for gardening, flushing, solid matter can be exported as manure to nearby farm lands, and the methane produced can be linked to the building’s gas pipeline.

IV. CONCLUSION

With the adaptive construction of bio-toilets to buildings, concrete results are achieved depicting the reduction on dependence of water supply and use of public sewer system provided by government. Thus, reducing the running & maintenance cost of buildings. Also this new technique, is a breakthrough innovation yet got camouflaged in the conventional use of sanitation. This Bio-Toilet linked Bio-Gas can thus serve to generate Bio-Energy which through pioneering research could be used to generate electricity.

V. REFERENCES

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