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Short Communication

Health and Environmental Risk of using Renewable Natural Gas in India

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Abstract

Renewable Natural gas (RNG) or Biogas is one of the important sustainable sources of energy today. As more and more people start making and using the RNG at homes through biomass digesters they are also oblivious to the fact that this gas has a lot of contaminants that come with it. If not removed, these contaminants when burnt can release dangerous chemicals into confined spaces like homes and kitchen which can cause health issues to the people residing there. One of these chemicals is called Siloxanes which are present in soaps and shampoos we use daily. When siloxanes are burnt it produces silica micro particles which can cause silicosis and lung cancer. This calls for a community awareness mission and also more research on the impact of other renewable natural gas on health.

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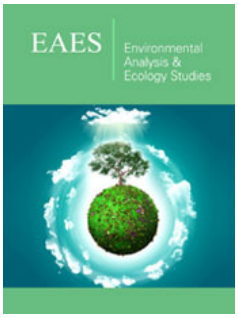

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Introduction

Renewable energy is the future. As climate change and other concerns take over our planet our energy needs will shift to renewable sources. One of these sources is biogas.

Biogas is primarily Methane and Carbon dioxide. It may have small amounts of hydrogen sulfide and moisture. It's the energy source of the future. In India, the estimate for the production of biogas is about 20,757 lakh cubic meters in 2014-15. This is equivalent to 6.6 crore domestic LPG cylinders. This is equivalent to 5% of the total LPG consumption in the country today [1]. But this energy source is not pure. It's dependent on what contaminants go into these bio digesters. In this case we will be talking about Siloxanes which needs to be removed.

Biogas is generated from sewage from homes. If untreated they will contain chemicals such as siloxanes which are commonly used in shampoos and body creams. Siloxanes are most widely used in the cosmetics industry, adding beneficial qualities such as spread ability, enhanced skin feel, reduction in greasiness, increased absorption, that silky shiny look, and more. These siloxanes can mix with methane and when burnt produces silica nano particles.

Discussion

The research conducted by Nair et al. [2], on a residential furnace with siloxane spiked natural gas shows that even at the lowest 2ppmv concentration level for which the SMPS detected the presence of silica microparticulate in the flue gas, with an average particle diameter of ~75nm. Particles of this size class are classified as Carcinogenic, Mutagenic, Asthmogenic, or Reproductive (CMAR) toxic nanoparticles and can be biologically active due to their large surface area to volume ratio. The toxicity of nanoparticles in general has been shown to be size-dependent: smaller particles are more cytotoxic as the larger specific area can make these particles more apt to interact at the cellular level [3,4]. A comprehensive review of the properties of nano-sized silica materials, with specific emphasis on inhalation exposure, found a limited number of in vivo studies displayed largely reversible lung inflammation, granuloma formation, and focal emphysema, with progressive lung fibrosis [5]. Most in vitro studies reported cellular uptake and size- and dose-dependent cytotoxicity [5]. The highest rates of infection occur in patients with acute and accelerated silicosis [6]. Rughooputh et al. [7], found based on meta data analysis the positive association of crystalline silica and lung cancer and the existence of an exposure-response relationship between these two.

All the above research points to the fact that there should be limits on siloxanes in biogas. But this message hasn't reached everywhere. Even some of the developed countries don't have this specification. As per a report from California council on science and technology only Austria, Czech Republic and Netherlands have this siloxane specification limit [8]. The state of California, USA on citing this author Nair et al. [9] has implemented siloxane limits in the state for industrial and transportation use [8]. But it still needs across other developed countries and more importantly developing countries which are more likely to use this renewable fuel as climate change forces them to.

Conclusion

People are increasingly setting up biogas digesters in their homes without knowing the risk to health it poses. There is no doubt that biogas is the future of energy, but awareness should be spread regarding its potential health impacts. Governments should start to implement the siloxane limits in their countries and also allow cheap access to biogas contaminant monitoring tools for homes. Universities and community colleges in the meantime can bridge this gap. Also, more research should be carried out on the potential health impacts of other contaminants in biogas.

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