Enhanced Biogas System for Sustainable Agriculture

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The Egyptian Industry faces many challenges in areas such as energy production and sustainable agriculture. Many of these challenges could be tackled when our industries start operating on a reliable source of clean energy. Moreover, the agricultural system could be productive and profitable when yields get higher and the produce gets fresher. This could be achieved when effective fertilizers are secured for green lands and farming areas. This project aims to design a system that could generate a cheap clean energy and also produce cheap effective fertilizers. The system designed focuses on enhancing Biogas production through accelerating Anaerobic digestion, reducing the required retention time. This is done by adding inoculums and additives to break long chain fatty acids and also an adequate pretreatment of the substrate.Furthermore, sludge has been utilized as a natural fertilizer, whereas reject water (water remaining inside the digester after biogas has been produced) has been used to wash “vermiculite”, a mineral known for its unique molecular structure full of cages to saturate itself with ammonia and become a novel cheap effective land fertilizer. In addition, “Methane” produced ,after Biogas purification with pressure swing adsorption and silica gel, can be either used for energy production or methane reformation where the byproducts (H2 and CO2) can be used to manufacture Urea (a well known soil fertilizer). What is also unique is the addition of “Zeolite” (a clay mineral) to the urea granule, forming “ZEOUREA”, another excellent enriching fertilizer for soil. Zeourea has shown a 40% increase in efficiency more than pure urea and 20% plant growth. Thus, the system produces energy and three types of enriching fertilizers (Sludge, Vermiculite, Zeourea).

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