

Sposób wytwarzania biogazu w szczególności z osadu nadmiernego w komunalnych oczyszczalniach ścieków lub z mieszaniny substratów go zawierających

A method of biogas production, in particular from excess sludge in municipal sewage treatment plants or from a mixture of substrates containing sludge

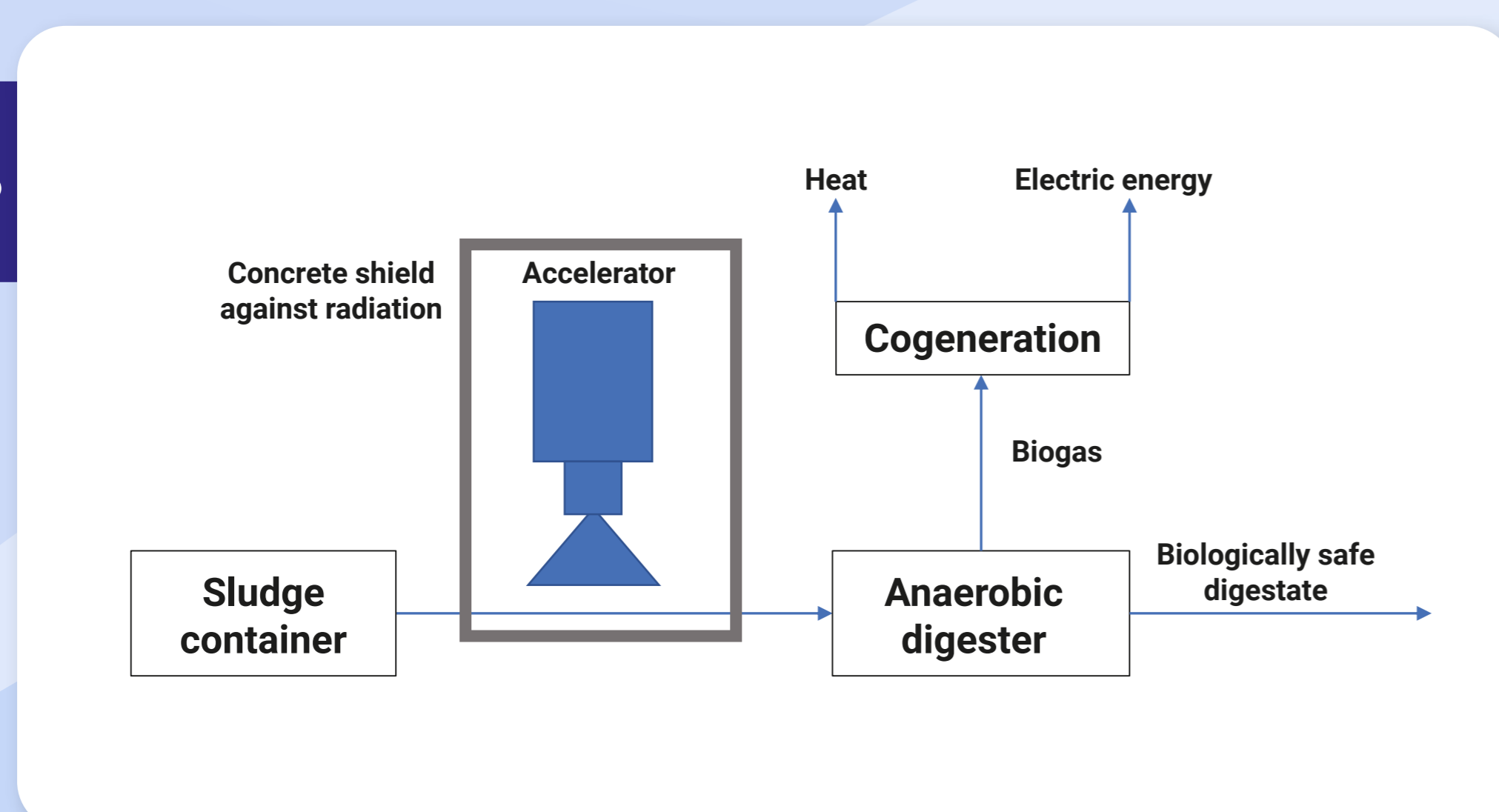
Patent Application PL: No.433229

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A subject of the invention is method of hygienization connected with disintegration of secondary sludge from wastewater treatment plant by using ionizing radiation in the form of high Energy electron beam from electron accelerator. Ionizing radiation causes phenomenon of water radiolysis, products of which are highly reactive chemical species, like: hydroxyl radicals – OH[·] with highly oxidative properties and solvated electrons – e⁻_{aq} with hydrogen radicals - H[·] - highly reductive. These chemical species interacts with cell membranes, intercellular substance and DNA of living cells. Sewage sludges due to their origin are rich in various biological threats like: pathogenic bacteria, viruses, pathogenic fungi and intestinal parasites eggs. Some of these pathogens can survive anaerobic digestion process, so in case use of digestate as a fertilizer soil could get contaminated. For this reason hygienization process is necessary. Ionizing radiation can remove all pathogens making sludge or digestate biologically safe and suitable for use in agriculture. Ionizing radiation cause also disintegration which cause release of nutrients from solid phase to liquid phase by destroying sludge flocs structure.

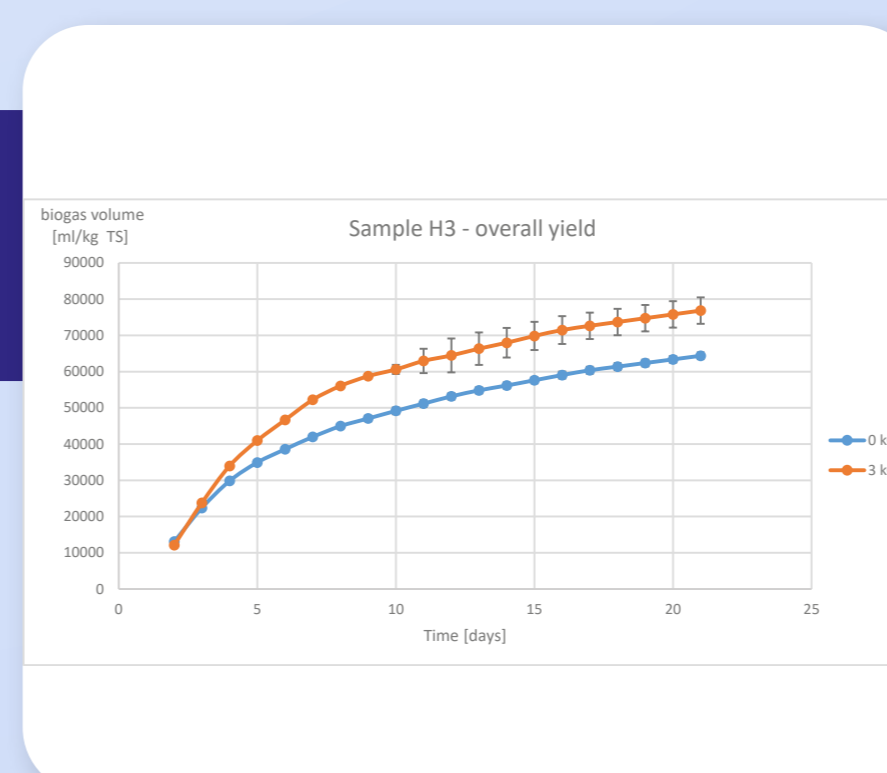
It results with higher biogas yield for the first period of anaerobic digestion process. Laboratory experiments shown that irradiation with dose of 3 kGy increases COD in liquid phase in secondary sludge sample from 318 to 1425 mgO₂/L. Laboratory measurements of biogas volume produced during anaerobic digestion process shown that for the sample irradiated with dose of 3 kGy specified amount of biogas was obtained faster in comparison to untreated sample.

Fig. 1



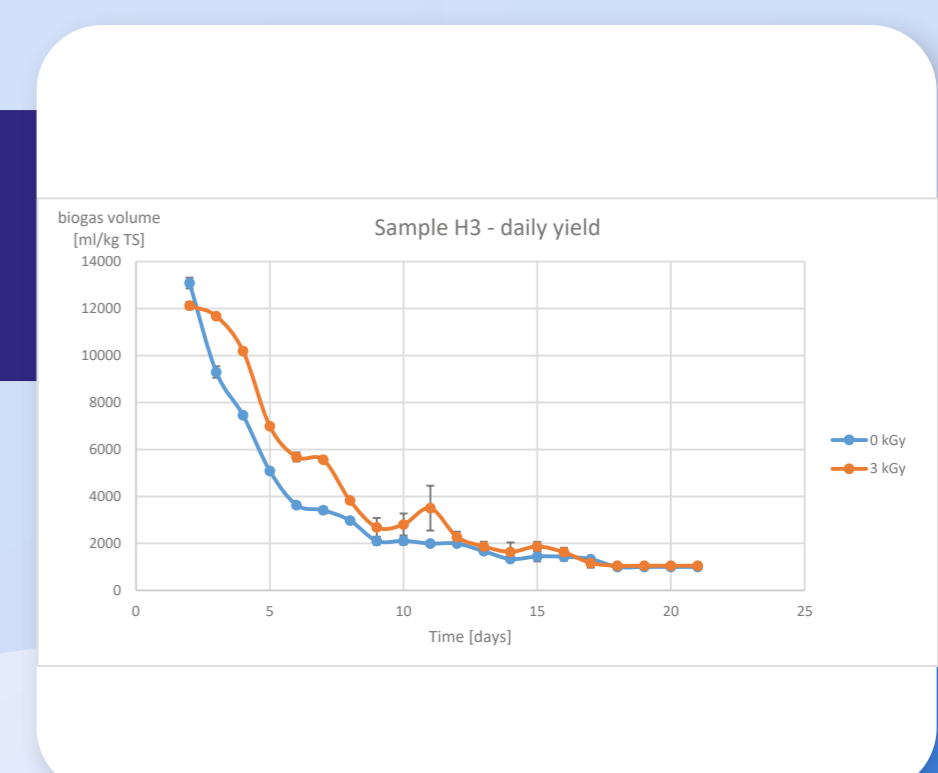
Simplified scheme of a installation equipped with electron accelerator for sewage sludge irradiation

Fig. 2a



Graph showing progress in overall biogas yield from anaerobic digestion of sewage sludge irradiated to 3 kGy and untreated sewage sludge

Fig. 2b



Graph showing changes in daily biogas yield from anaerobic digestion of sewage sludge irradiated to 3 kGy and untreated sewage sludge

That phenomenon could be used to achieve same biogas volume from the same reactor in the shorter period of time or to decrease reactor volume without loses on obtained biogas volume during same period of anaerobic digestion proces.

Fig. 3



DIN 38414/8 eudiometric sets used for the experiments with anaerobic digestion of sewage sludges