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# Technology of Electrokinetic Disintegration of Virginia Fanpetals (Sida hermaphrodita) Biomass in a Biogas Production System

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**Abstract :** Electrokinetic disintegration is one of the high-voltage electric methods. The design of systems is exceptionally simple. Biomass flows through a system of pipes with alongside mounted electrodes that generate an electric field. Discharges in the electric field deform cell walls and lead to their successive perforation, thereby making their contents easily available to bacteria. The spark-over occurs between electrode surface and pipe jacket which is the second pole and closes the circuit. The value of voltage ranges from 10 to 100kV. Electrodes are supplied by normal “power grid” monophase electric current (230V, 50Hz). Next, the electric current changes into direct current of 24V in modules serving for particular electrodes, and this current directly feeds the electrodes. The installation is completely safe because the value of generated current does not exceed 250mA and because conductors are grounded. Therefore, there is no risk of electric shock posed to the personnel, even in the case of failure or incorrect connection. Low values of the electric current mean small energy consumption by the electrode which is extremely low – only 35W per electrode – compared to other methods of disintegration. Pipes with electrodes with diameter of DN150 are made of acid-proof steel and connected from both sides with 90º elbows ended with flanges. The available S and U types of pipes enable very convenient fitting with system construction in the existing installations and rooms or facilitate space management in new applications. The system of pipes for electrokinetic disintegration may be installed horizontally, vertically, askew, on special stands or also directly on the wall of a room. The number of pipes and electrodes is determined by operating conditions as well as the quantity of substrate, type of biomass, content of dry matter, method of disintegration (single or circulatory), mounting site etc. The most effective method involves pre-treatment of substrate that may be pumped through the disintegration system on the way to the fermentation tank or recirculated in a buffered intermediate tank (substrate mixing tank). Biomass structure destruction in the process of electrokinetic disintegration causes shortening of substrate retention time in the tank and acceleration of biogas production. A significant intensification of the fermentation process was observed in the systems operating in the technical scale, with the greatest increase in biogas production reaching 18%. The secondary, but highly significant for the energetic balance, effect is a tangible decrease of energy input by agitators in tanks. It is due to reduced viscosity of the biomass after disintegration, and may result in energy savings reaching even 20-30% of the earlier noted consumption. Other observed phenomena include reduction in the layer of surface scum, reduced sewage capability for foaming and successive decrease in the quantity of bottom sludge banks. Considering the above, the system for electrokinetic disintegration seems a very interesting and valuable solutions meeting the offer of specialist equipment for the processing of plant biomass, including Virginia fanpetals, before the process of methane fermentation.

**Keywords :** electrokinetic disintegration, biomass, biogas production, fermentation, Virginia fanpetals
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