

## Device for Mechanical Fragmentation of Organic Substrates Before Methane Fermentation

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**Abstract :** This publication presents a device designed for mechanical fragmentation of plant substrate before methane fermentation. The device is equipped with a perforated rotary cylindrical drum coated with a thermal layer, connected to a substrate feeder and driven by a motoreducer. The drum contains ball- or cylinder-shaped weights of different diameters, while its interior is mounted with lateral permanent magnets with an attractive force ranging from 100 kg to 2 tonnes per m<sup>2</sup> of the surface. Over the perforated rotary drum, an infrared radiation generator is mounted, producing 0.2 kW to 1 kW of infrared radiation per 1 m<sup>2</sup> of the perforated drum surface. This design reduces the energy consumption required for the biomass destruction process by 10-30% in comparison to the conventional ball mill. The magnetic field generated by the permanent magnets situated within the perforated rotary drum promotes this process through generation of free radicals that act as powerful oxidants, accelerating the decomposition rate. Plant substrate shows increased susceptibility to biodegradation when subjected to magnetic conditioning, reducing the time required for biomethanation by 25%. Additionally, the electromagnetic radiation generated by the radiator improves substrate destruction by 10% and the efficiency of the process. The magnetic field and the infrared radiation contribute synergically to the increased efficiency of destruction and conversion of the substrate.

**Keywords :** biomass pretreatment, mechanical fragmentation, biomass, methane fermentation

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