

DRY ANAEROBIC DIGESTION OF ROADSIDE CLIPPINGS IN COMBINATION WITH VGF-WASTE

In Flanders, roadside clippings (e.g. from right-of-way maintenance, median strips...) are still considered as a waste material, despite its potential as a renewable energy source. Roadsides and natural landscapes generate roughly 350,000 tonnes of grass cuttings annually. The verge decree of 1984 (*bermbesluit 27/06/84*) imposes that these clippings must be removed from the roadsides in order to improve the biodiversity. Despite this decree, only 10 - 40% of this grass is currently removed and processed, mostly in green composting facilities.

At the same time the demand for alternative and renewable energy sources is increasing. In view of the limited means to produce renewable energy in the densely populated Flanders, it is of paramount importance to use the available sources as efficiently as possible. Roadside clippings present a significant amount of usable biomass, which unfortunately is 'lost' by not using it or by only recovering its nutrients as compost.

Anaerobic digestion seems an obvious valorisation route for this product, generating both renewable energy and a quality compost, but until now only negligible amounts of roadside clippings have been digested. Several reasons can explain this:

- Roadside clippings are produced in two periods: after June 15th and after September 15th, so long-term storage of this material is needed when using it in a continuous process
- Roadside clippings are typically contaminated with sand and litter. This makes this grass unsuitable for treatment in wet anaerobic digestion plants (the majority of AD-plants in Flanders) because of possible damage to pumps and mixers, and the formation of sinking and floating layers

Dry anaerobic fermentation on the other hand could be the key to a successful valorisation of this material, because sand and litter pose no problems in this system (no sinking or floating layers, equipment is resistant to litter in the grass). **OWS nv** and **IGEAN milieu & veiligheid** have investigated the effect of adding up to 25% of roadside clippings to a VGF-digester on a full-scale level. 1,000 tonnes of roadside clippings were collected and stored on site between June and December 2013, and treated in the AD-plant in January and February 2014.

A first conclusion that can be drawn from this study, is that a good storage is very important to retain as much of the biogas potential in the grass as possible. Techniques that are used in agriculture to preserve maize or grass silage, can easily be used for roadside clippings storage as well. The more biogas is retained, the more profitable a project will be.

During the full-scale demonstration test, no problems were encountered throughout the process. The roadside clippings passes nearly integrally through the pre-treatment step (to remove plastics and other undesired material from the source separated VGF-waste) so no organic material is lost. Total solids concentration increased slightly in the digestate, but this did not affect the pumpability of the whole. The addition of the roadside clippings even had a positive effect on the anaerobic digestion process by decreasing the ammonium content, thus creating a more stable environment for the bacteria. After 20 days of digestion, the digestate is dewatered and post-composted during 2 weeks. No effects of the addition of roadside clippings were noticed during these processes or on the final compost quality.

Parallel to the full-scale demonstration test, lab-scale reactors were set up to evaluate the addition of higher amounts of roadside clippings (50/50 VGF-waste/roadside clippings and 100% roadside clippings). The conclusion of these tests is that up to 50% roadside clippings addition to VGF-waste poses no problems to the AD-process, although some extra water addition might be necessary depending on the VGF-characteristics. Also 100% roadside clippings mono-digestion is biologically possible, but extra water addition will be necessary to maintain a pumpable digestate and an extra nitrogen source is advised to maintain bacterial growth at a good rate.

Based on the results of both the full-scale and lab-scale tests, an economic and ecological analysis was performed by **VITO** and **UGent** resp. Co-digestion of roadside clippings with VGF-waste has a positive effect on the profitability compared to VGF-digestion alone. Regarding the sustainability, treating roadside grass is always better than not removing it from the roadsides. Anaerobic digestion of well-preserved roadside clippings had the best score in an LCA-analysis. By digesting all available roadside clippings in Flanders, the emissions of 20,000 cars could be avoided, and electricity for 13,000 families can be generated.

In view of the fact that many composting plants in Flanders are currently investigating the possibility to expand their activities with an anaerobic digester, this offers a unique opportunity to start using the large amounts of roadside clippings yearly available. By building a larger digester to treat the material, a more profitable project will be obtained, a more stable process is possible due to the positive effect of roadside clippings on ammonium content and more renewable energy can be created which is not competing for land with food or feed crops. Furthermore, by feeding more roadside clippings in the winter periods (when the share of garden waste is at its lowest), the input composition of the waste entering the digester will remain more constant, which is again better for process stability.

More information about this study can be found in the final report on www.ows.be (in Dutch), or by contacting OWS (mail@ows.be).



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