



## Biorefinery on De Marke

Manure is valuable raw material. But processing it is necessary for an utmost utilisation of the components. De Marke has put a new Biorefinery installation into operation to investigate its practicability. All people concerned are working hard to start up this system. This Newsflash deals with the contribution of Biorefinery to the farm, the components of the refinery process and the phasing of the study.

### Contribution to the farm

Biorefinery must contribute to:

1. Further closing the mineral cycle on De Marke (figure 1);
2. Limiting methane and nitrous oxide emissions and
3. A more efficient production of bioenergy.

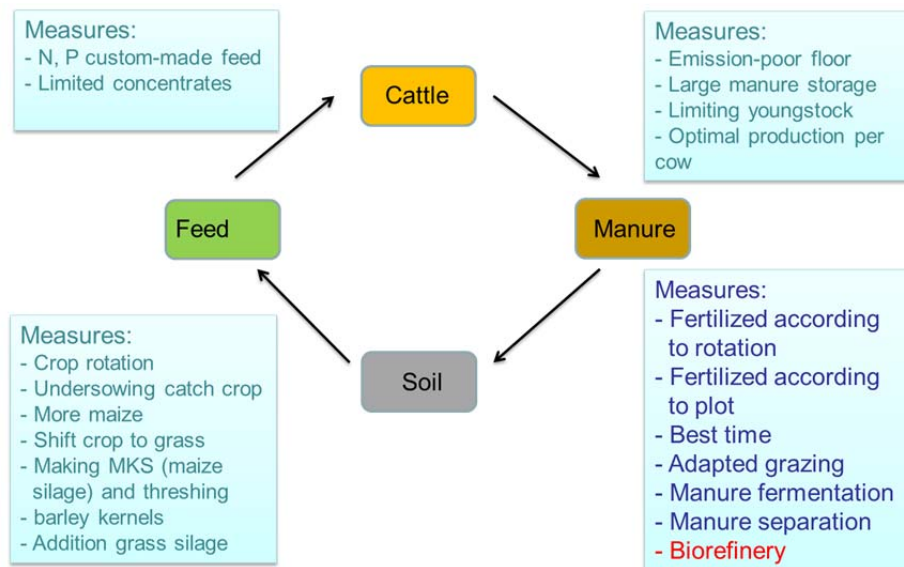


Figure 1: Biorefinery as component of mineral management.

### A birds'-eye-view of the process

Biorefinery is the cleavage of manure into useful components. The system that is being developed on De Marke consists of different parts (see also figure 2):

1. Hydrolysis: decomposition of large organic compounds by bacterial enzymes in a lightly acid environment. Fatty acids are formed.
2. Methane forming: converting the fatty acids into methane. This occurs by other bacteria than those that are involved in hydrolysis.
3. Separating digestate with the SMICON screw press.
4. Extracting struvite: by adding magnesium to the liquid fraction of the digestate (in a crystalliser) the struvite deposits.

During the methane forming biogas and digestate arise. The biogas contains mostly methane, but also other gases such as CO<sub>2</sub>. The higher the methane content, the higher the energy output. In the digestate, the amount of ammoniacal nitrogen in relation to organic-bound nitrogen is higher than in the starting material: the unprocessed liquid fraction. Separating the digestate results in a solid and a liquid fraction. From the liquid fraction, struvite is extracted. This is a deposition of phosphate, ammonia and magnesium in the shape of a dry particle. Struvite is, however, a rather

slowly working fertiliser. That is why we do not improve all manure to struvite, but we are also going to use the intermediate product, the digestate, for fertilising.

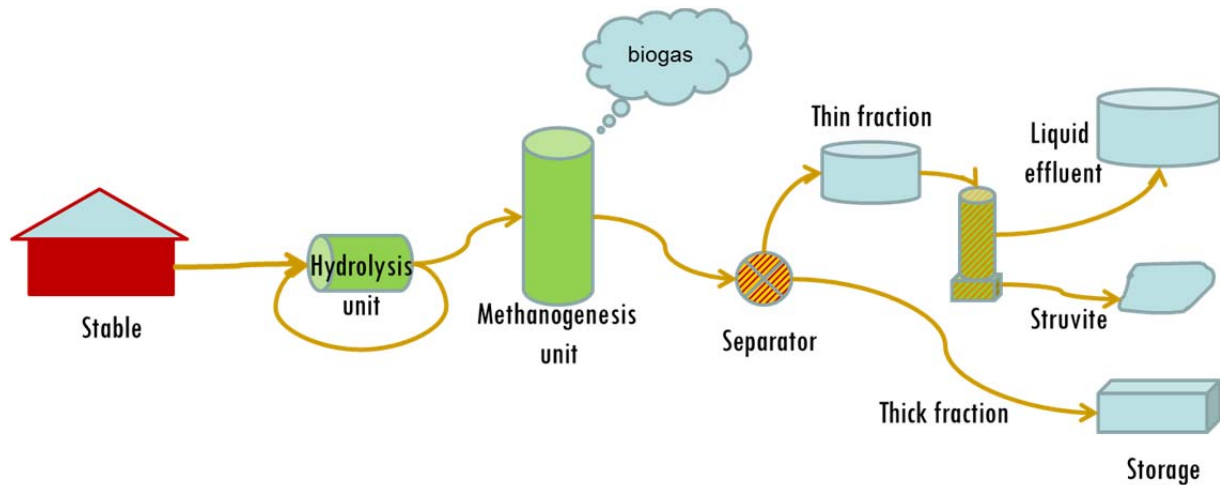


Figure 2: Overview of the manure flow at biorefinery on De Marke

### Testing practicability

The study is phased:

1. First all attention is for growing the bacteria that have to take care of the desired conversion. The study is aimed at the chemical quality of (intermediate) products and at biogas production (the amount of gas and methane content). Also the way in which the fertilisers flow through the entire chain is pictured. Where do nitrogen and phosphate end up, in which form and how much? What is this like with organic matter?
2. Subsequently we test the fertilisers as to their fertilising capacities in field tests. The tests make it possible to determine the uptake of nitrogen and phosphate in crops, such that we can compare and judge the different manure products. In this study we also want to monitor the losses of ammonia, nitrous oxide and nitrate.
3. Lastly we implement the biorefinery at farm level (in the setup that fits the De Marke's objectives best) to monitor and judge the practicability.

### Involvement of policy, practice and research

On 12 October 2012 the biorefinery installation was officially put into operation by Hans Huijbers, chairman of ZLTO and Harm Smit of the Ministry of Economic Affairs, Agriculture and Innovation (Figure 3). Prior to the opening act, a discussion was held among Ilse van den Broeck (dairy experimental farm KTC De Hooibeekhoeve), Martin Scholten (Wageningen UR), Hans Huijbers and Harm Smit and other guests about the importance of biorefinery for the Dutch (dairy) livestock sector. From the discussion it became clear that there is much interest in the possibilities of biorefinery because of the various advantages; however, many questions remain, for example, when and on what kind of farms is biorefinery cost-effective? How sensitive is the process? What is the fertilising value of the products? To go through the development process successfully, we will exchange experiences regularly with the many people involved who are working on manure processing.



Figure 3: Impression of opening act (left Huijbers, right Smit).

Please read more on the project 'Cows & Opportunities': [www.koeienenkansen.nl](http://www.koeienenkansen.nl)  
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