

Poul-AR®

biological valorisation of poultry manure

In contrast with other manure types poultry manure is very rich in nutrients as nitrogen (N) & phosphorus (P) and also in organic material. Both the form and the N/P ratio in which the nutrients are present, make the manure less suitable for direct application as natural fertilizer. It leads to the release of large and undesired amounts of volatile ammonia into the environment. At the same time the effective N/P nutrient ratio of poultry manure dictates that legislatively restricted applicable amount of phosphorus is rapidly reached, which requires additional amounts of nitrogen to reach the proper fertilizer characteristics and performance. Secondly, traditional manure treatment processes are unable to successfully deal with poultry manure, which is therefore mostly regarded as a waste stream, which is discharged or incinerated.



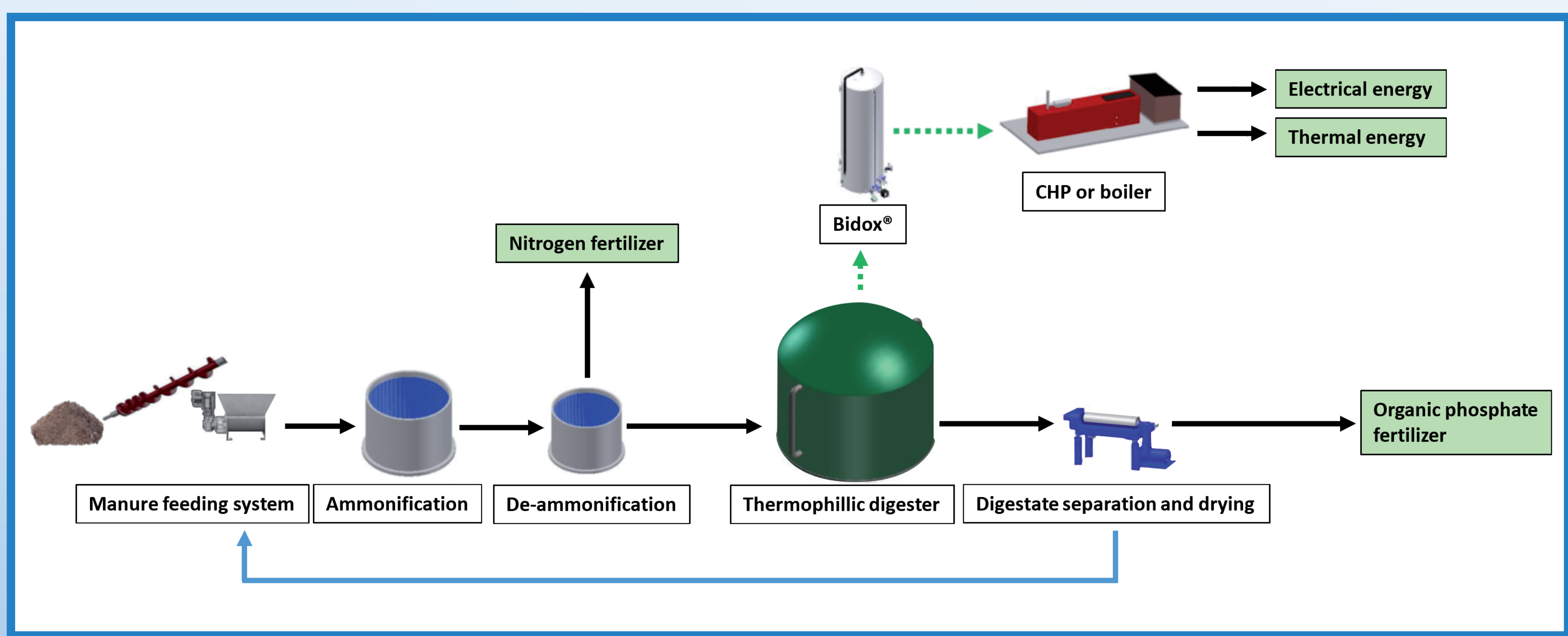
Incineration



Land usage

Poul-AR® proces

The Poul-AR® system applies eco-innovative principles and technologies and thus opens a sustainable route to nutrient recovery and energy efficiency for poultry manure. The approach makes use of subsequent biological and physical treatment steps. The 1st step in the process consists of a biological ammonification step in which the manure is liquefied and the organic nitrogen is biologically converted into ammonia. We supply the enzymes to run this process. A 2nd step is the de-ammonification step which removes the ammonia present in the manure via stripping with air. The ammonia is subsequently fixated with sulphuric or nitric acid as an ammonium salt (sulphate, nitrate) to produce the desired fertilizer. The residual organic fraction of the manure can now be readily digested afterwards, to produce biogas which in turn can be used as a source of heat or electricity.



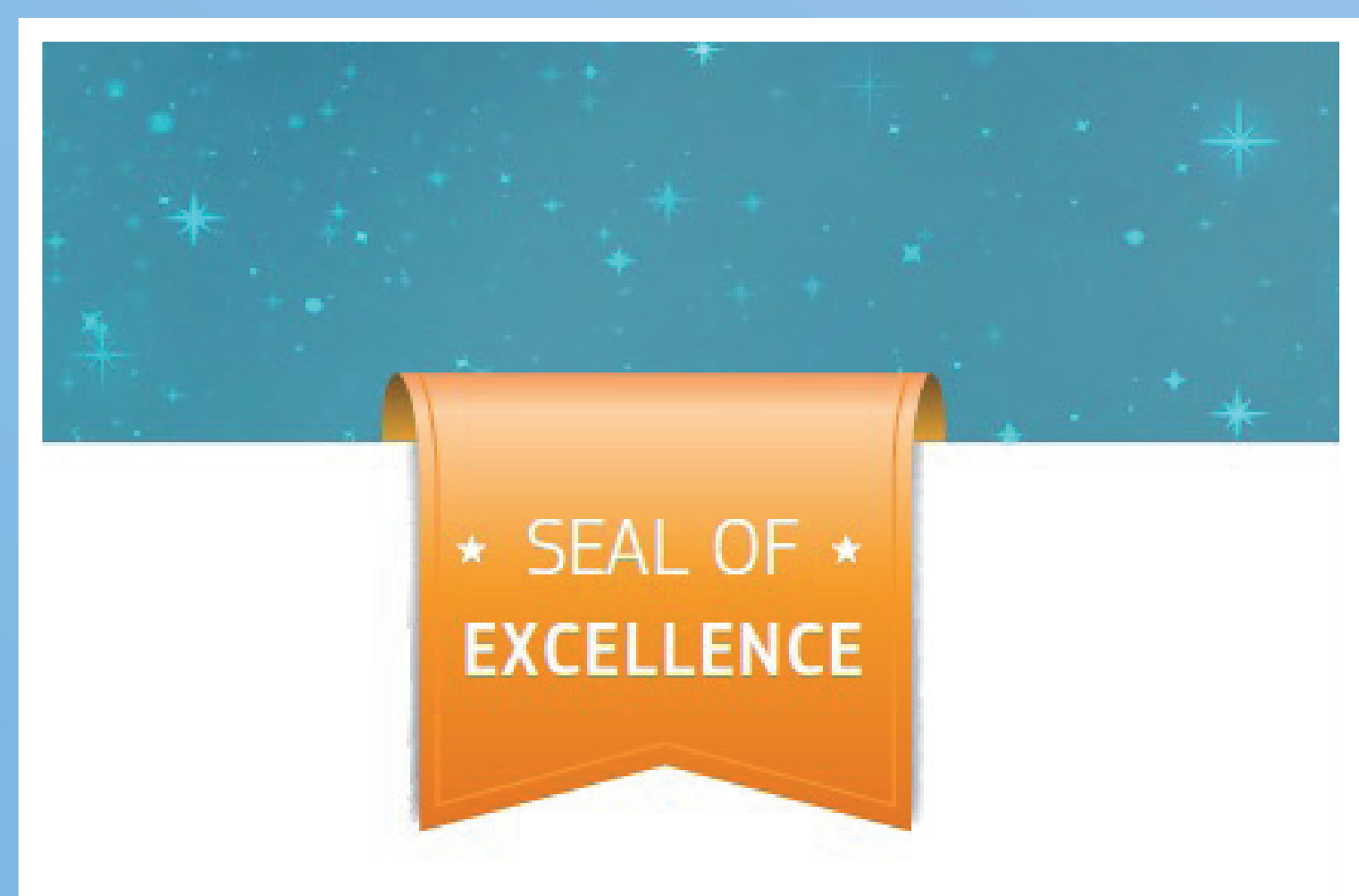
Schematic presentation of the Poul-AR® process en de post-treatment

The Poul-AR® products

As can be seen in the scheme the Poul-AR® system itself produces one valuable stream, highgrade N-fertilizer. The removed ammonia is fixated with nitrate or sulphate, forming an ammonium salt. In the case of the nitrate salt the highest N concentration can be obtained, 252 kg N/m³ NH₄NO₃ product. Another output of the Poul-AR® system is the effluent itself. The treated manure is now low in nitrogen which makes it suitable for digesting processes. The effluent is already at the desired temperature for conducting (thermophilic) digestion. The manure has a very high organic load, so it has a very high biogas potential. This biogas can be used in a CHP to produce heat and electricity. The produced heat can be integrally used by the system itself as explained before, while only 10% of the produced electricity will be used by the system. The remaining electricity can be used at the location and reduces energy costs significantly. The solid fraction from the digesting process can be dried up to 80% of dry matter by using the heat of the CHP. This solid fraction contains a high concentration of phosphorus and can be readily used as a dry P-fertilizer.

Poul-AR® reward route

Poul-AR® was rewarded a phase 1 innovation project in the European Horizon 2020 program. Project number SEP-210183539. Poul-AR® was rewarded with a Seal of Excellence for a phase 2 innovation project in the European Horizon 2020 program. Poul-AR® was rewarded the second price for the “Pluimvee innovatieprijs Vlees 2015”, an innovation reward at the Dutch Poultry Symposium. Poul-AR® was rewarded financial support from the Dutch government for the realization of a fullscale demonstration plant in the Dutch program for innovation on renewable energy.



Poul-AR® facts summary

- Step 1: Ammonification with enzymes
- Step 2: De-ammonification with addition lime
- Up to 90% NH₄-N removal over the complete system
- Minimal COD loss
- Formation of N-fertilizer: e.g. 52% NH₄NO₃
- 0.24 m³ NH₄NO₃ (52%) produced per ton manure
- 252 kg N/m³ fertilizer
- 60 kg N per ton manure
- NPK for 52% NH₄NO₃ is 18-0-0

Poul-AR®: Effluent potential

- High temperature effluent accessible for high temperature digestion processes
- No-toxic N concentration for mesophilic and thermophilic digestion processes
- High biogas/energy potential
- 110 Nm³ CH₄ per ton manure
- 170 Nm³ biogas per ton manure

