POUL-AR®

A profitable solution for treatment and digestion of poultry manure

water, energy & environment

Colsen International b.v.
Kreekzoom 3, 4561 GX Hulst, The Netherlands
Tel.: +31 (0) 114 311 548
Fax.: +31 (0) 114 316 011
info@colsen.nl
www.colsen.nl
C.C.: Terneuzen 22063422
V.A.T.: NL817632700B01

1. INTRODUCTION

1.1. Project introduction

Poultry farming is worldwide one of the largest sectors of animal husbandry for food production and is associated with a significant manure production. To handle this large amounts of manure, environmental and economic challenges need to be overcome. Colsen International b.v. offers a profitable solution for farmers and the natural environment to process poultry manure: the Poul-AR® technology. With this technology the manure is first pretreated to remove >80% of the nitrogen. This nitrogen is converted to a N-fertilizer. Due to the nitrogen removal, digestion of the manure is possible and biogas and other valuable fertilizers can be gained. To demonstrate this technology a pilot installation was operated during three months at Burdan Egg in Karacabey, Bursa. The project was founded with a DHI subsidy of the Government of the Netherlands.

Figure 1: Poul-AR pilot installation in Karacabey (Bursa, Turkey) at Burdan Egg

1.2. Poul-AR® technology

Due to the relatively high ammonium content in the manure, poultry manure is not easily applicable as a digestion substrate without any pre-treatment steps due to the toxicity of NH_3 toward methanogenic bacteria. The Poul-AR® technology consists out of a biological and physical pre-treatment step of chicken manure, prior to digestion.

The first step consists out of a biological ammonification step in which organic nitrogen is biologically converted into ammonium. Approximately 80% of the nitrogen can be liberated as ammonium. In the second step the liberated ammonium is converted to ammonia and removed via stripping with air. The ammonia is subsequently fixated with sulphuric acid (H_2SO_4) or nitric acid (HNO_3) as an ammonium salt to produce the desired nitrogen fertilizer 35% ammoniumsulphate or 52% ammoniumnitrate.

The de-ammonified manure is a perfect feed for high yield thermophilic digestion, whereby the organic fraction is transformed into biogas and subsequently converted into electricity and heat for all processes involved. The surplus of electricity is available for other purposes. The digested manure can be dried with the excess heat and can be sold as a solid organic phosphate fertilizer. A schematic representation of the technology is given in the figure below.

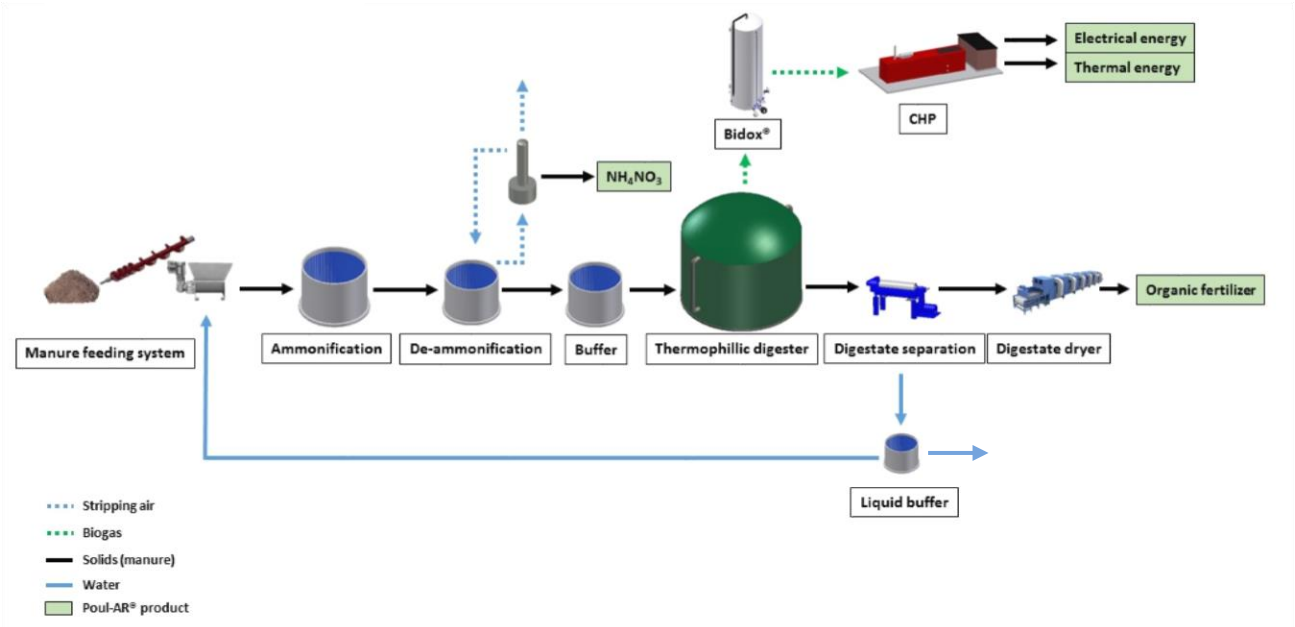
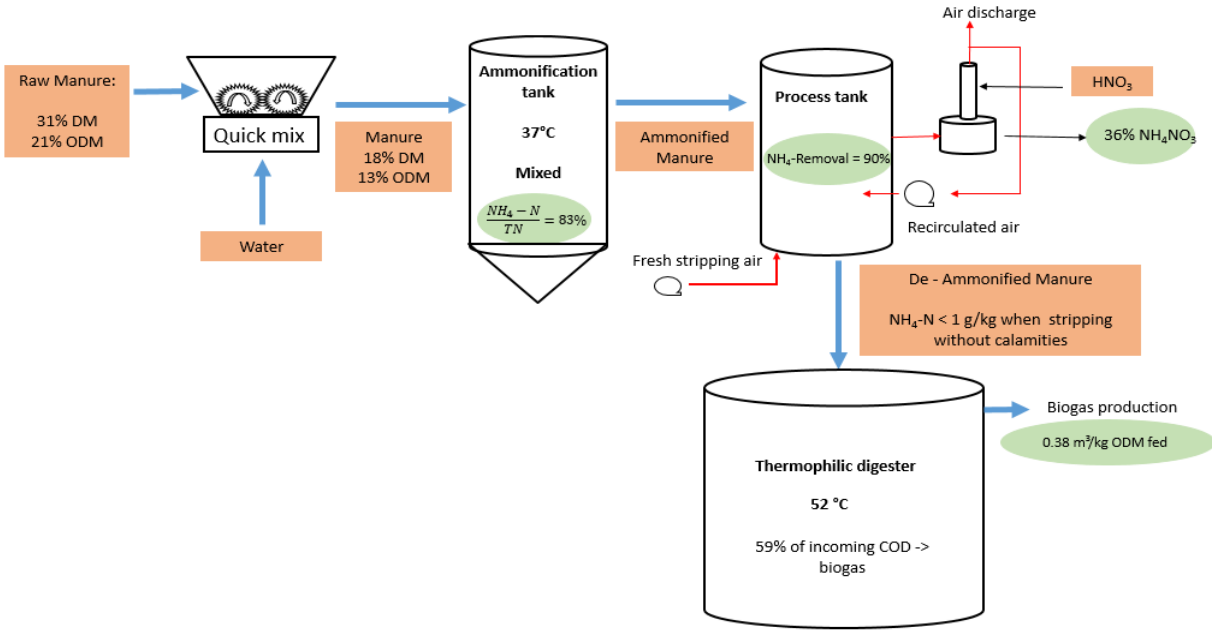


Figure 1: Simplified process flow chart of the Poul-AR® system

2. RESULTS PILOT BURDAN EGG

The result of the Pilot installation are summarized in the scheme below.



Balance of 1 batch chicken manure during pilot operation

Approximately **140 kg of manure** was fed each batch. The manure had a DM content of 31% and a ODM content of 21%. It was diluted to assure transport and avoid clogging of the installation. During the **ammonification process 83%** of the bound nitrogen was liberated as ammonium, followed by a **90% ammonium-removal** during the stripping process. These results are in line with the full scale expectations (~ 80% N-liberation and >90% ammonium removal).

The de-ammonified manure was fed to a thermophilic digester. The biogas production efficiency was **0.38 m³ biogas per kg ODM** fed to the digester. This is approximately **10.49 m³ biogas** production per batch or **6.8 m³ methane** production. From this amount of methane, **27 kWh electrical** and **29 kWh thermal** energy can be produced if used in a CHP (*not executed at pilot*).

During full scale operation the digestate is separated by a decanter into a liquid and solid fraction. The approximate composition of these fractions is given in the table below:

Table: N-P-K composition of liquid and solid digestate fraction in w/w %

	N (%)	P (%)	K (%)
Solid fraction	**0.81**	**3.96**	**1.54**
Liquid fraction	**0.32**	**0.12**	**1.58**