Nitrogen recovery from animal slurries by ammonia stripping process

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**Abstract.** Although livestock manure is an important source of nutrients for crops, it can become a significant cause of environmental pollution if the manure management chain is not optimal. A nitrogen recovery process could be beneficial to produce a mineral fertilizer that is easy to transport and use on crops. For this reason, physico-chemical nitrogen removal processes such as struvite formation, membrane filtration or stripping of ammonia are more attractive than biological processes, although equally complex in the configurations studied and proposed so far. A simplification of the stripping process is however possible by changing the treatment approach to a slow-release system. The ConservA project (Innovative plant for the Conservative removal of nitrogen from livestock manure and digestate) is an operational group in the EIP-AGRI framework. It involves the design and the construction of a pilot plant that is based on a system where the liquid manure is mixed continuously in a closed reactor where an air flow in the headspace removes the ammonia that is released from the surface of the liquid.

The pilot plant has a tank of 30 m3 to receive the slurry or digestate and a screw press separator to remove the coarse solid. Four reactors of 7.5 m3 each are mechanically mixed and it is possible to heat them by hot water circulation. Each reactor is half filled with slurry and the air flows in the headspace and return to a scrubber, where ammonia reacts with a sulfuric acid solution to form ammonium sulfate. The batch process last from 5 to 15 days according to the type of manure, the temperature and the amount of ammonia to be recovered.

Preliminary test has confirmed the results obtained in laboratory. At a temperature of 40°C (the same of mesophilic biogas plants) more than 90% of the ammonia contained in the liquid can be removed in 10 days of treatment.

 The results of the project, which will also be made available on the website <https://costruzionirurali.unimi.it/ConservA/>, will assess the technology in practical conditions in order to provide farmers the cost-effectiveness of the treatment system, which may allow to respond to regulatory requirements and improve the environmental management of the farm, recovering nitrogen as fertiliser.