

Better benefits and less smell from slurry with new technologies

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Usability and hygienic status of slurry can be considerably improved with new aeration based technologies, new study shows.

Research Scientist Anni Alitalo from Agrifood Research Finland has developed methods of improving the [recycling](#) of manure nutrients, the hygienic status as well as methods of reducing the odor of slurry. The studies are part of Alitalo's thesis.

"A significant share of all manure consists of the slurry. In a global scale, however, only 20 to 40% of the nitrogen content of manure can be recycled. The recycling percentage of other nutrients is even lower," Alitalo says.

Less than 50% of the manure nutrients recycled

Globally, livestock excretes about 100 megatons of nitrogen annually. Less than 50% is recovered and applied to crops. Therefore, the remainder is dissipated into the environment. Manure contains about 1.5 times more phosphorus and three times the amount of potassium compared with mineral fertilizers, but only a fraction of them can be recycled efficiently.

In Alitalo's studies, the usability of slurry was improved by separating and recovering the primary nutrients, phosphorus and nitrogen.

"We were able to proof that phosphorus can be separated with the solids of the slurry. However, it is far more complicated to separate nitrogen from slurry, but that is possible too. In my studies, nitrogen was separated from the liquid fraction by ammonia stripping after biological treatment," Alitalo says.

In her studies, Alitalo developed a pilot scale sequential treatment process, where manure was first treated with biological aeration in a reactor system especially planned for the process. After the biological treatment, ammonia was separated from the manure by ammonia stripping. During the [biological treatment](#), the pH value of the slurry rose. Therefore, the partial separation of nitrogen without chemicals was facilitated.

"The study shows that the amount of chemicals used in the efficient stripping can be considerably reduced. Furthermore, ammonia stripping can be carried out without a strong base, such as sodium hydroxide," Alitalo concludes.

Non-smelly slurry?

Biological treatment was aimed to reduce the odor of slurry and to improve its hygienic status. Slurry from pigs and cattle was treated in aerated tanks, which were filled with microbial seeding material. The dry matter content of the slurry was reduced to 1-2% before the treatment.

After four days, slurry was odorless, or only a slight [odor](#) could be detected.

"The reactor system we developed in this study proofed to be stable and efficient," Alitalo says.

The treatment managed to improve the hygienic status of slurry. The amount of fecal bacteria was reduced even more than 90%.

Basic research and technological development combined

The system described in Alitalo's thesis cannot readily be applied on farms. The research tested basic mechanisms, which can be used in further development of processes suitable for the farm scale. To bring the technology to the farm scale has required remarkable R & D. The treatment for pig slurry is ready for farm use, but the marketing of the technology is depending on the decisions of the investment subsidies of the next EU programming period.

"When new innovations are developed in environmental technology, a profound understanding about the basic mechanisms is required, as well as the combination of excellence from different fields of research. In this study, the excellence of microbiology, chemistry, physical chemistry and technology were combined," Alitalo says.

Alitalo has her scientific background in environmental soil chemistry. She has studied the utilization and reactions of nitrogen from both [manure](#) and mineral fertilizers as well as management of nitrogen use in farms. Her choice of thesis study was greatly influenced by professor Erkki Aura, the grand old man of agricultural sciences in Finland.

"Aura's enthusiasm as well as his wide expertise in science and his way of searching concrete solutions for problems were probably the reasons that brought me to study solutions for the use of slurry, defender of the new thesis," Anni Alitalo recalls.

More information: The thesis is available online:

jukuri.mtt.fi/bitstream/handle...85018/mttiede29.pdf

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