

## Abstract

The steadily increasing worldwide demand in meat has coupled an also increasing animal waste or manure production. Within the scientific community, manure related environmental problems are being considered for reducing the related annoyance to the environment from intense farming. These problems can be ammonia volatilization and greenhouse gas emissions. Manure management strategies, such as solid-liquid separation, are having an increasing demand between farmers. Manure separation eases its application in agriculture and reduces the volumes to handle. After manure solid-liquid separation, the obtained liquid fraction can be further treated using membrane technologies. Membranes can concentrate these liquid fractions, which are rich in nitrogen (N) and potassium (K). Phosphorus (P) is present in a lesser extent. A strategy with best economic potential for recovery of N-P-K could include a decanter centrifuge or a screw press during mechanical solid-liquid separation and membrane technologies for the obtained liquid phase. However, the main limitation of membranes is their tendency to foul. This reduces water flux across them significantly as well as their life time. Microfiltration membranes showed to be a good candidate for recovering P from digestate liquid fractions. Ultrafiltration membranes could also concentrate P from digestate liquid fractions. Moreover, the presence of heavy metals during ultrafiltration was significantly affected by the pretreatment strategy, especially when using flocculants and coagulants during centrifugation. Reverse osmosis membranes were used for recovering nitrogen. During chemical cleaning, an alkaline cleaning using NaOH solution at high temperature and an additional membrane soaking period could maintain the membrane ageing tendency at minimal levels without significant changes in the membrane salt rejection capacity. Finally, forward osmosis membranes showed to be a good alternative for concentrating digestate liquid fractions and nitrogen. However, significant limitations due to internal concentration polarization are related to this technique. This leads low permeate fluxes, slight increasing salt reverse flux and ammonia leaking which could limit the application of forward osmosis membranes as a concentration strategy.