An exploration of barriers for commercializing phosphorus recovery technologies

Phosphorus is an essential element in sustaining modern day farming practices and is expected to deplete within the next 100 years. However, phosphorus utilisation efficiencies in most countries are below 20%, making the implementation of suitable phosphorus recovering technologies urgent and necessary. In spite of intensive research and development, there are only a few commercial recovery facilities being implemented. Therefore, there is a need to identify potential roadblocks/hurdles in a systematic manner. To this end, technology readiness level, process economics and sensitivity analyses were novelly integrated and employed to evaluate the opportunities and hurdles during the implementation of current phosphorus recovery technologies. The enhanced methodology is demonstrated via a case study, revealing that only struvite crystallization is sufficiently mature to be industrially implemented. Under most scenarios evaluated, struvite crystallization can be profitable or break-even if financial assistance is provided from policy-makers. Sensitivity analysis showed that overall profitability is highly sensitive to raw materials cost and product sale price, while phosphorus concentration in waste streams has less effect. Such an assessment could be extended to identify barriers in other resource recovery technologies.