



# SMART-Plant

*Scale-up of low-carbon footprint  
material recovery techniques in existing  
wastewater treatment plants*



## SCENA

*Short-Cut Enhanced Nutrients Abatement*

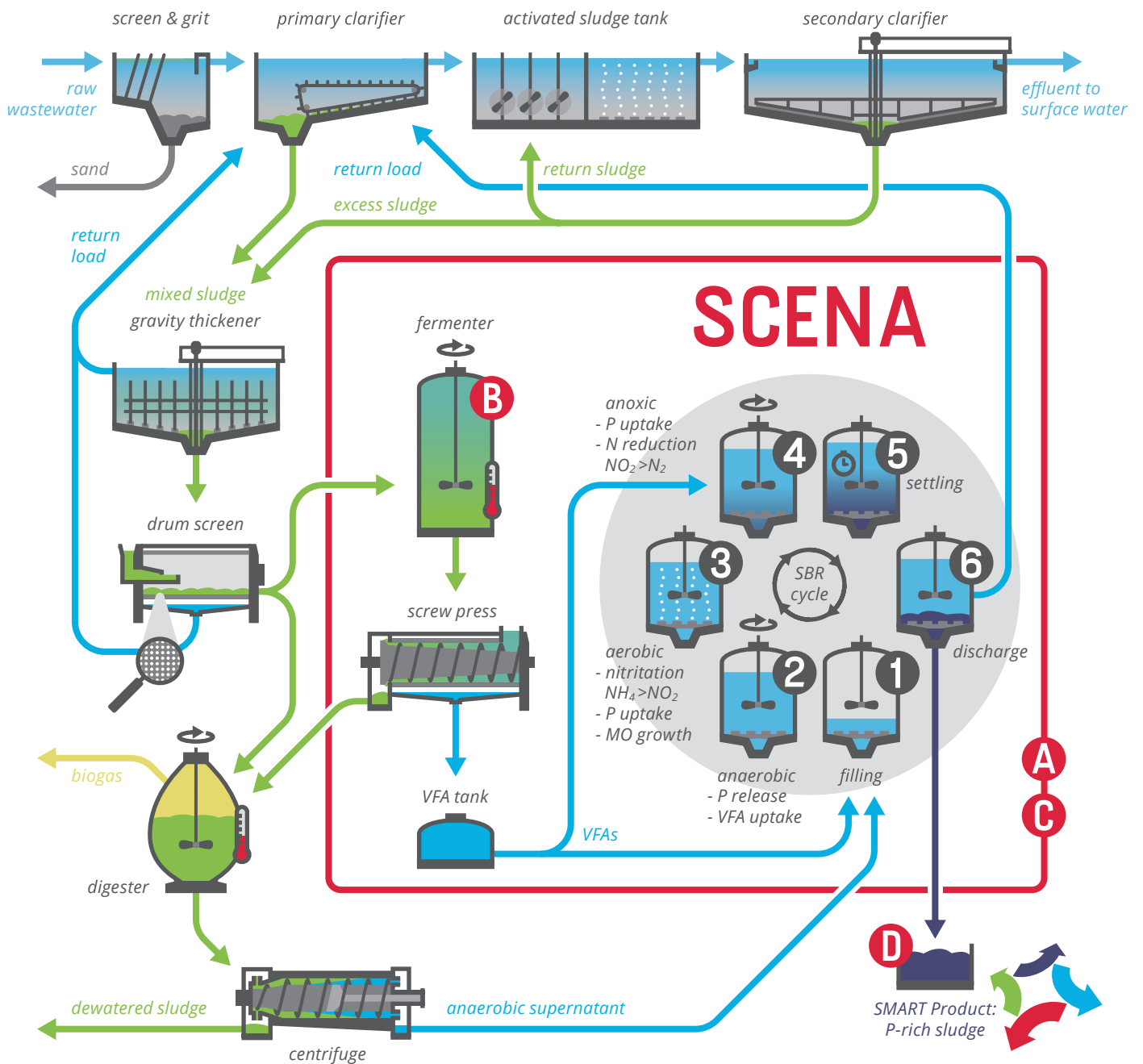
### *Energy-efficient Nutrient Removal from Sludge Liquor without External Carbon Source*

Sludge dewatering effluent after anaerobic digestion represents a highly concentrated stream of nitrogen and phosphorus, which may contribute up to 25% of the total load of the mainline WWTP. The SCENA process developed by the University of Verona aims to eliminate nitrogen and phosphorus from sidestream liquors by means of a short-cut biological process via nitrite and volatile fatty acids (VFAs) produced from acidogenic fermentation of sewage sludge. The process avoids the use of an external carbon source, which decreases the operational costs and the excess sludge production.

Within the SMART-Plant project, the SCENA process is demonstrated at full-scale within the wastewater treatment plant of Carbonera (Italy). The system treats

40-50 m<sup>3</sup>/d of anaerobic reject water under reliable and stable conditions and removes more than 75% of nitrogen and phosphorus. The produced excess sludge with a P content of up to 5% can be a valuable product for use as agricultural fertilizer.





## Unique Selling Points

- A** Low-energy nutrient removal from sludge liquor
- B** Biological N and P elimination without chemicals or external carbon source
- C** Stable and robust operation compared to other biological processes
- D** P-rich sludge can be valorized as organic fertilizer

	Nitrification Denitrification	Deammoni- fication	SCENA
External C Source	Yes	No	Bio-based VFAs from sewage sludge
Type of inoculum	conventional activated sludge	Deammoni- fication inoculum	conventional activated sludge
Cost and Energy	High	Medium	Low