Assessment of the removal and potential recovery of nutrients for the production of biofertilizer, through chemical precipitation of circular economy in a slaughterhouse plant

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Abstract

Large-scale meat production uses considerable amounts of water for production processes, resulting in wastewater. Excess nutrients may cause eutrophication of the receiving water bodies, decrease oxygen and harm aquatic life.

Modern companies work under circular economy concepts. Thus, this study assesses methods of removal of P, NH4, and NO3 precipitated as struvite and/or hydroxyapatite to be marketed as bio-fertilizers.

The wastewater treatment plant consists of a mechanical screen where coarse solids are removed, a DAF unit followed by a biological treatment system with two anaerobic lagoons operating in parallel, followed by an anoxic/aerobic lagoon, and a secondary settler.

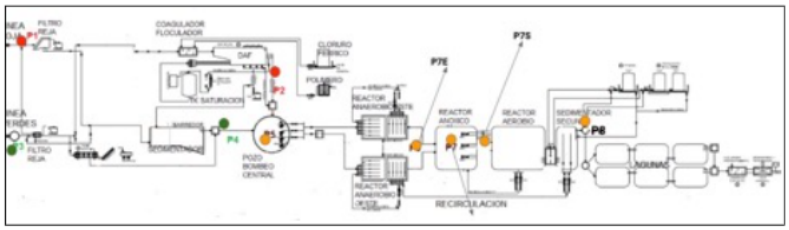

Figure 1. Sampling points

In the following table the results obtained from the sampling campaigns are shown.

Parameter (mg/L)	TCOD	PO4-P	NH4-N	Ca	Mg	TSS
P1	5260	7	2634	16	27	9650
P2	5883	2	2943	24	32	1240
P3	7557	125	3841	8	21	9690
P4	14157	60	7108	11	11	1710
P5	7953	31	3992	11	33	1750
P7E	1185	22	603	15	14	780
P7M	1243	17	630	17	17	890
P7S	1315	20	668	22	11	420
P8	894	9	451	17	12	240

The point selected for the nutrient recovery assessment was at the exit at the anaerobic reactor (P7E). Jar-tests were carried out at room temperature (27°C). Calcium precipitation resulted in a 96% total phosphorous removal by using $Ca(OH)_2$ at 23:1 optimal ratio, pH 7, while struvite precipitation with $MgCl_2$ x 6 H_2O, at 25:1 ratio, pH 10, obtaining a phosphorous removal efficiency of 78.5%.

Keywords: Slaughterhouse wastewater, nutrient recovery, circular economy.