WWTP'S OPTIMIZATION

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ABSTRACT

Today's increased pressure on water resources raises even higher awareness in the society and leads authorities and public decision makers to demand higher requirements in the different aspects of water management. These higher requirements for the final wastewater discharge are not only translated on more restrictive emission limit values but also on an increased control frequency.

All the Navigator Company mills are equipped with biological treatment systems such as activated sludge system, sequenced batch reactor and moving bed bioreactor. In this context, the need to adapt or improve performance of existing wastewater treatment plants to meet the new permitting requirements became crucial.

Therefore, the consulting and mill support area of RAIZ – Forest and Paper Research Institute, along with the Navigator Company developed a methodology to improve and optimize effluent treatment plants to meet these new requirements.

The methodology included a step approach starting by an initial audit to effluent treatment plant where all different aspects were analyzed to identify optimization opportunities that were carried to an execution plan. Also in initial stages, a survey of incoming partial effluents was performed allowing a higher visibility for different process area contributions for the incoming loads.

One of the most important aspects is the control variables optimization to guarantee the needed stability of final effluent quality. This optimization aimed to stabilize and improve the following main features of a biological treatment: biodegradation maximization, improved and stable sludge sedimentability, controlled levels of nutrients discharge and ability to cope with production and process perturbations.

With these objectives in mind, it was developed a testing program where variables such as sludge age and nutrient dosage were optimized maintaining all the other process variables constant or under control (dissolved oxygen, temperature, chemical addition, etc.).

This program was applied in two wastewater treatment plants of the Navigator Company mills, and in both cases, it was possible to identify optimizing operating ranges in key parameter like sludge age and nutrient dosage control. During these studies was possible to develop a method of control where was found an optimal sludge age range between 20 – 22 days and for nitrogen, a feedforward control of N:COD ratio ranging from 1,5 to 1,8 and feedback control on the final effluent concentration above 3 mg/l and bellow emission limit value.

Operating the biological systems in these ranges, combined with daily analysis of incoming effluent, allowed clear improvements on levels and stability of sedimentability (reduced Sludge Volume Index and low Total Suspended Solids in effluent) and biodegradation (high and stable COD removal and low BOD in final effluent) warranting the compliance of the new permitting requirements. In a subsequent phase of the program, it was also possible to reduce chemical aids consumption on the effluent treatment area.

Overall, the methodology developed and implemented at The Navigator Company mills was successful on optimizing performance, meeting new requirements and has proven to become WWTP's more robust during variations in the process.

Keywords: biological treatment performance optimization, effluent compliance, wastewater treatment