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Case Study

Project Title

Anaerobic-Aerobic Communal WWTP Design with Optimized Ammonia Nitrification for Three Camp Sites

Project Snapshot

Client: PT Sumbawa Timur Mining **| Location:** Sumbawa, West Nusa Tenggara

Sector: Gold Mining **| Period / status:** 2023/ Completed

Ganeca Service: Design, Installation, and Process Optimization of Communal WWTP (CSTP)

Project Overview

The client needed a reliable domestic wastewater treatment system to serve three operational camp sites with different daily flow rates while also meeting effluent quality standards including ammonia. Ganeca's role was to design and optimize a Communal WWTP (CSTP) based on an anaerobic–aerobic–sedimentation–UV disinfection process that could be consistently replicated across the three flow scales.

The Challenge

Domestic wastewater from the camps carried a fairly high organic and ammonia load, while the camp sites were spread across different daily flow rates so a single tank size could not be used for all locations. The main challenge was keeping the nitrification process stable at low flow rates, since nitrifying bacteria grow slowly and are prone to washout without an adequate biomass-retention mechanism, as well as ensuring sludge in the sedimentation tank could be collected effectively without relying on intensive manual desludging.

Our Solution

Ganeca designed a four-stage Communal WWTP (equalization–anaerobic, aerobic, sedimentation, and UV disinfection) with capacity and retention time tailored to each camp site, while keeping the aerobic and sedimentation retention times consistent across all locations to maintain treatment performance. To address ammonia, a Return Activated Sludge (RAS) line was added that pumps activated sludge from the sedimentation tank designed with a sloped bottom so sludge collects by gravity toward the withdrawal point back to the aerobic tank, keeping the nitrifying bacteria population intact and allowing stable nitrification of ammonia to nitrate. The sludge age (SRT) for aerobic nitrifying bacteria was designed at 15 days to accommodate their slow growth rate and prevent washout even at low flow conditions. The sloped sedimentation tank design also reduces the need for manual desludging, since sludge collects by gravity toward the RAS pump intake.

Results & Value

Post-commissioning results demonstrate that system design is truly effective in the field, rather than merely a theoretical concept. The RAS and SRT configuration proved capable of maintaining nitrifying bacteria stability, ensuring effective ammonia-to-nitrate conversion, and successfully addressing the challenge of biomass washout during low-flow conditions. Laboratory test results further indicate that ammonia and organic parameters met quality standards, confirming the consistent performance of the

four-stage system (equalization-anaerobic, aerobic, sedimentation, and UV disinfection) across varying flow rates at three camp locations. Additionally, the sedimentation tank's sloped design proved effective in facilitating gravity-driven sludge flow toward the RAS pump, resulting in a significant reduction in the frequency of manual sludge removal operations.

Project Photos

Layanan terkait : Water and Wastewater Treatment Solutions