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Editorial

Modified Ludzack Ettinger Process - An Innovation for Removal of Biological Nitrogen

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Editorial

Modified Ludzack Ettinger is the most widely used biological nutrient removal in MBR. In the original MLE-MBR process, the mixed liqueur is recycled from the membrane container to an oxidized container as shown. 1a. However, the dissolved oxygen excess transferred from the membrane container to the anoxic tank may terminate the denitrification procedure. This is a major problem, especially if the waste water easily degradable COD is not enough. To reduce the effect of recycled oxygen, a cascade-type mixed waste recycling has been developed (Figure 1). In this arrangement, the mixed solution in the film container is recycled for aeration thanks and is circulated as an anoxic reservoir. Since 1-2 mg/L of the mixing solution of DO is recycled in an anoxic reservoir in the range of 4 to 8 mg/L of DO, it is kept low in an ORP anoxic reservoir easily without easily introducing biodegradable COD into feed wells. One disadvantage of this cascade type arrangement is that maintaining a high MLSS in anoxic tanks is more difficult than the conventional arrangement (Figure 1) because a mixing lip with a lower MLSS is transferred to an anoxic tank.

In the conventional MLE-MBR process shown in (Figure 1a), QM/AO must be set to 2Q-5Q to prevent MLSS accumulation in the membrane container, thereby limiting the degree of flexibility of the process. For example, although recycling of mixed waste can be slowed down due to the low level of wastewater in the wastewater, mixed liquid has to be recycled in 2Q-5Q to keep low in the MLSS reservoir. On the other hand, the modified MLE, where cascade-type recycling, QO/AO can be controlled regardless of QM/O, depending on the process objectives.

The modified Ludzack-Ettinger process is designed to use nitrate produced in the aeration zone as a source of oxygen for facultative bacteria in the event of the breakdown of raw wastewater in the anoxic pan. The first process in the nursing train is a pre-anoxic tank where mixed wastewater, reclaimed sludge from a scrubber, and mixed nitrate-rich liquor pumped from the outlet end of the aeration tanks are mixed. The waste water serves as a carbon source for bacteria, the back-activated sludge from the scrubbing plant provides micro-organisms, and anoxic recycling pumps provide nitrogen as an oxygen source. The anoxic bowl is mixed but not aerated. Mixers can be floating mechanical or submersible motors equipped with propeller mixers. The basic scheme is illustrated in the above figure. Another option used for denitrification of waste water is the Wurhman process.

Wurhman's process places the anoxic pan after the nitrification zone. This process relies on the nitrate produced in the previous aeration tank as a source of oxygen. The facultative bacteria, which make up most of the MLSS, perform the work of denitrification. In order to control the denitrification process, an organic substance is added to the anoxic tank. Since most of the organic substances contained in the raw waste water were consumed through the aeration tank by aerobic and facultative bacteria, the preparation should be added to the anoxic tank. The source of organic substances can be raw waste water, methanol, acetic acid or other carbonaceous base material. The anoxic bowl is mixed but not aerated. Many facilities use the reaction zone after an anoxic tank to release the nitrogen gas bound in the sludge and to refresh the mixed solution before entering the treatment plant. Denitrification filters serve to remove nitrogen and remove solids. Denitrification filters are generally at the end of the secondary process and are used in advanced processing processes. There are two main process configurations for denitrification filters that are commercially available, with a continuous reverse-flush filter up and up bottom-denitrification filter work in conventional filtering mode and consist of media and supporting gravel over the backlight. Wastewater enters the downstream filter through the dam along the length of the filter bed on both sides. The filter drain exits the filter from the bottom of the filter into a clean well. Regular washing is required at regular intervals. Reverse purification involves air purification and back-flushing with water. During the process, the nitrate is metabolized to nitrogen gas, which encapsulates the filter medium and releases as a gas. The top stream differs in that

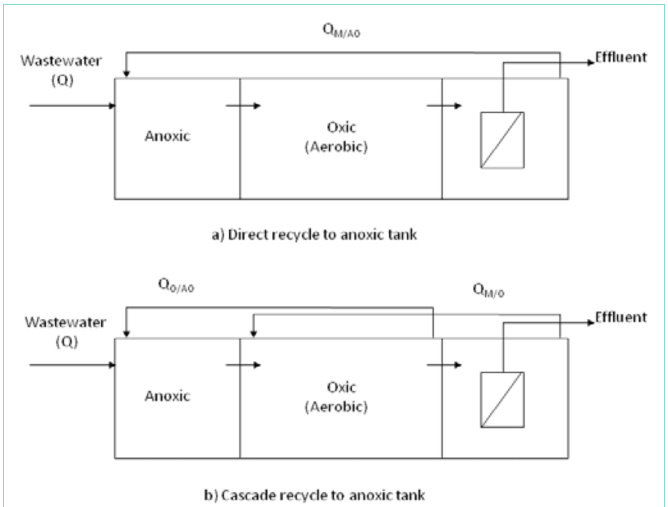

Figure 1: Process of MLE.

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the inlet waste water flows upwards through the filter and the sand. The waste water enters the filter through the inlet pipe and then flows through the filter and the filtrate is discharged from the top of the filter medium. The Bardenpho process, which means biological denitrification and phosphorus removal, is an advanced design for further nutrient removal. As in the Wuhrman and Modified Ludzack-Ettinger process, Bardenpho uses the aerobic zone process to nitrification of wastewater and anoxic zones to denitrification if it is refined by passing through a five-step process that ensures an acceptable level of removal. The process involves five stages which are the first fermentation tank, the second anoxic tank, the 3rd aerobic tank, the fourth anoxic tank and the 5th tank.

The processes and technologies described above show that there are many possible solutions to achieve the required nutrient removal requirements. The choice of the appropriate process depends on the specific conditions of the project. There is no perfect process or technology for each project. Prior to selecting the process, including capital costs, O & M's cost and capacity, O & M costs, the community must evaluate all key factors to determine the best solution. In many cases, it is possible to achieve the pre-selection process where all the assessed costs are considered the best solution.

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