Headworks® INTERNATIONAL

CASE STUDY: House of Raeford, Rose Hill, North Carolina

MBBR Meets New Discharge Standards While Handling High and Fluctuating Organic Loads

Customer: House of Raeford
Industry: Poultry Processing and Slaughter house

Background

Based in Rose Hill, North Carolina, House of Raeford is one of the oldest poultry processing companies in the world. The company's operations started in the early 20th century. Currently, the company operates poultry grow-out operations and processing facilities in four Southeastern states in the USA, including the Carolinas, Georgia, and Louisiana.

THE CHALLENGE

The House of Raeford "Ready to Cook '' poultry processing plant located in Wallace, North Carolina, was experiencing challenges with their existing wastewater treatment system based on conventional activated sludge technology. In addition, the plant wanted to double the treatment capacity due to increasing demand for its products. Duplicating the existing activated sludge system would require a space of more than 100 ft. x 100 ft. There was very little space available at the site for a new treatment plant, so alternative technologies were explored.

Poultry Processing Plant MBBR - Fast Facts	
Wastewater Flow	1,500,000 GPD (1.5 MGD)
BOD_5	Design Influent < 600 mg/L Effluent Req. < 50 mg/L
Total Suspended Solids	Design Influent < 100 mg/L Effluent Req. < 400 mg/L
FOG	Effluent Req. < 100 mg/L
TKN	Influent < 120 mg/l
Temperature	20 - 30°C
pH	6 - 9

The MBBR roughing reactor removes more than 90% of the influent BOD_5 in a footprint that is 1/4th of the conventional activated sludge process. This allowed House of Raeford to double the wastewater treatment capacity with a small increase in footprint. The MBBR process was installed in 2020 and handles varying loads in a small footprint, while producing consistent effluent with soluble BOD_5 of < 50 mg/l.

ActiveCell Solution

The unique and highly effective Moving Bed Biofilm Reactor ("MBBR") system proposed by Headworks Bio would fit the requirements of the plant by fitting within a small footprint (40 ft. x 40 ft.) while still allowing for expansion, meet effluent requirements, reduce odors, and be straightforward to operate. The media fill ratio was set at a low 30% initially and may be filled up to 50%, allowing for a further 66% increase in capacity in the future

Media retention sieves at the outlet of the MBBR reactors.

After evaluating many options, House of Raeford decided to implement the Headworks ActiveCell Roughing Reactor MBBR. The roughing reactor process is a single reactor MBBR in a compact footprint (20 ft. diameter), and it is designed to remove more than 80% of the influent BOD. The existing activated sludge process removes the remaining BOD and ammonia-nitrogen prior to discharge.

Wastewater from the plant flows by gravity from floor drains to a below-grade wastewater collection tank. The wastewater is then pumped to an equalization (EQ) basin that is continuously mixed and aerated with a PD Blower and an air sparging system. The process stream is pumped at a controlled rate to a pretreatment system where total suspended solids (TSS) as well as fats, oils, and grease (FOG) are flocculated, coagulated and separated.

The clarified wastewater is then directed to a collection sump and transferred to the ActiveCell MBBR by flow-controlled transfer pumps.

Clarified wastewater is then biologically treated by the ActiveCell process incorporating a 250,000-gallon ActiveCell bioreactor (< 4 hours HRT). The ActiveCell process biodegrades wastewater using thousands of suspended biofilm carriers that operate in a continuously mixed, aerated environment, in a small footprint. Each biofilm carrier provides an active surface area sustaining heterotrophic and autotrophic bacteria within protected cells.

This dynamic population of bacteria achieves high-rate biodegradation productivity within the system, while also offering process resiliency and automated operation. Inactive microorganisms within the ActiveCell process are continuously sloughed from the biofilm carriers and exit the bioreactors via a wedge wire retaining screen in the form of total suspended solids (TSS) with the treated effluent.

This continuous sloughing action exposes the biofilm to the organic load in the wastewater and provides a self-regulating, high-rate biological treatment process that is responsive to load fluctuations.

The effluent from the MBBR flows by gravity to the existing activated sludge process where it is polished for the remaining BOD5 before discharge.

WATER RESULTS

The MBBR system and the blowers were started up remotely by Headworks due to the COVID pandemic in 2020. Approximately four weeks following system start-up, the system was already reaching the prescribed effluent quality targets of < 50 mg/L soluble BOD. System performance has surpassed design criteria, despite frequently varying influent flows and BOD5 loadings.

The simplicity and reliability of the MBBR system allows this poultry company to stay focused on its core business operations while maintaining permit compliance.

MBBR Reactors