THERMAL PROCESS SYSTEMS

ExCalibAer™ Applications Report

Speedway, IN

EXCALIBAER

Winning the Race

Speedway, IN - Thermal Process Systems' First Anaerobic Digestion Optimization System Continues to Provide Exceptional Nutrient Removal, Odor Control and Dewatering Improvements.

Speedway, Indiana is home to the world-famous Indianapolis Motor Speedway – site of the Indianapolis 500 – billed as "The Greatest Spectacle in Racing". With a population of almost 12,000 residents, Speedway is a thriving suburb of Indianapolis. On a race weekend, more than a quarter of a million race fans suddenly arrive, unwittingly creating one of the most unique, challenging and predictable peak flow and loading conditions in the USA. This was only worsened by their dewatering operations that returned significant ammonia loads to the plant. The biological liquid-stream treatment simply could not perform properly or consistently meet permit. The Speedway WWTP is a Class IV treatment facility with a design flow of 7.5 MGD and a peak secondary treatment capacity of 8.9 MGD.

The treatment process consists of the following: influent cylindrical fine screen, grit collectors, primary clarifiers, oxygen-activated sludge, secondary clarifiers, nitrification towers and ultraviolet disinfection. Settled solids were traditionally sent to a mesophilic anaerobic digester (MAD) for at least 15 days. The biosolids are dewatered with a belt filter press and pumped to an open-air, covered storage building. A neighboring facility blends these biosolids to create a product to be used on farmland as a fertilizer and soil conditioner.

"The TPS SNDR system practically operates itself. Additionally, there are so many other minor benefits that were realized after we installed the SNDR process, it's amazing no one has come up with this before. Kudos to TPS for doing it right the first time."

Norman C. Berry Jr.
Former Superintendent Town of Speedway WWTP

The Speedway, Indiana WWTP was struggling with challenges from nutrients returned to the plant from dewatering operations. This was identified to be a major cause of plant disruptions and permit violations, especially during times of heavy loading. In 2012, to address these issues, TPS provided their first Storage Nitrification Denitrification Reactor (SNDR) following an anaerobic digester. The SNDR has been used as the nitrogen removal and biosolids conditioning step following over 80 ThermAer™ ATADs. This Aerobic/Anoxic process provides remarkable ammonia reduction and additional volatile solids destruction while eliminating the notorious odors associated with anaerobic digestion.

Speedway has continued to benefit from this system for many years. Meanwhile, TPS has continued to innovate and improve upon the process to develop the ExCalibAer Anaerobic Digestion Optimization System.

Speedway has consistently experienced:

- Reduction in ammonia returned to the head of the plant from dewatering
- Exceptional nitrification and denitrification within the solids process
- Additional Volatile and Total Solids (VS/TS) reduction
- Elimination of safety hazards, problematic odors and corrosion resulting from Hydrogen Sulfide in the dewatering room and solids storage area
- Production of a high-quality, low-odor aerobic biosolids end-product
- Higher cakes solids from dewatering with lower polymer consumption

Prior to the addition of the TPS process, the belt press filtrate returned to the headworks had ammonia concentrations of 800 to 1600 mg/L (up to 2000 mg/L during a race month), often causing the facility to exceed their permitted ammonia limits.

In April 2012, the facility started up the SNDR process following their anaerobic digester. Results showed an unprecedented 98% reduction of ammonia concentrations in the filtrate – far exceeding the expectations of the facility.

The mass of dewatered solids hauled from the facility is much lower due to improved Volatile Solids Reduction (VSR) and enhanced dewaterability. As an added benefit, the SNDR process improved worker safety by decreasing ammonia and hydrogen sulfide odors, making for a much safer and less corrosive atmosphere in the dewatering building and the solids storage area.

The facility has continued to enjoy the benefits of optimized dewatering operations, and has been able to achieve higher cake solids while using less polymer as a result of the aerobic digestion step.

This early version of the ExCalibAer™ process installed at Speedway accomplishes the following:

- Ammonia reduction of 98% in the dewatering filtrate
- 33% decrease in the consumption of polymer
- 30 % Average increase in VSR Additional VSR averaging over 30%
- Elimination of hazardous, corrosive and odorous Hydrogen Sulfide
- Reduced tipping and disposal costs by 30%
- Prevented the need for more costly and invasive liquid-stream expansion & upgrades

ExCalibAer™ - Anaerobic Innovation

Speedway's system is the first, partial version of the TPS ExCalibAer™ Enhanced Anaerobic Digestion Process. TPS has continued to develop and discover ways that aerobic technologies can be used to enhance the performance of Anaerobic Digesters. The full ExCalibAer™ process adds a recycle from the Aerobic Digester and shifts Denitrification to an Acid Digester ahead of the anaerobic digesters. The nitrates fed back through the Anaerobic process provides several additional benefits, even beyond what Speedway has enjoyed:

- Increase in biogas quantity and quality (methane content)
- 90%+ Reduction H2S in Biogas (without added chemicals)
- Struvite Prevention (without added chemicals)
- pH control within the Acid & Anaerobic Digesters
- Separate Hydrolysis step in Acid Digester
- Reduction of Ammonia & H2S Toxicity in the Anaerobic Digester
- Complete digestion process monitoring and control

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