Effect of Enhanced Biochemical Processes in the Sewer Collection System on Influent Wastewater Characteristics and Wastewater Treatment Plant Performance

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Short Abstract (less than 100 words)
In-Pipe Technology (IPT) employs sewer collection system bioaugmentation treatment to enhance the sewer biochemical processes by improving the microbiology in the collection system, and provides improved microbiology to the wastewater treatment plant (WWTP). In this presentation, the effect of IPT sewer collection system bioaugmentation on sewer biochemical processes and wastewater characteristics such as the ratio of influent readily biodegradable chemical oxygen demand (rbCOD) to total chemical oxygen demand (COD_T) and COD_T load to the WWTP will be presented. Furthermore, the impact of IPT bacterial metabolic processes on the WWTP operational efficiency will be presented.

Long Abstract (will be used to evaluate the short abstract/ will not be printed anywhere)
The sewer collection system is the conduit for transporting wastewater from various sources to the wastewater treatment plant (WWTP), however, the sewer contains similar WWTP elements as biological processes (e.g., tricking filter reactor, rotating biological contactor, etc.) used in the WWTP. The biochemical transformations in the sewer collection system are mostly initiated by heterotrophic bacteria. Hydrolysis of hydrolysable chemical oxygen demand (COD) and the utilization of readily biodegradable COD (rbCOD) are the most important processes in the sewer collection system. The hydrolysis processes occurring in the sewer collection system have the potential to alter the influent wastewater quality (e.g., ratio of rbCOD to COD_T). The utilization of rbCOD by heterotrophic bacteria using rbCOD as an electron donor for respiration has the potential to reduce the influent load (e.g., COD_T) entering the WWTP. The rbCOD COD_T ratio can further improve nitrogen (N) and phosphorus (P) removal in the WWTP. However, the specific biochemical processes in the sewer collection system depend on the sewer environment (i.e., aerobic/anoxic/anaerobic conditions in bulk water/biofilm/biofilm-sediment phases, and the sewer atmosphere).

In-Pipe Technology (IPT) employs sewer collection system bioaugmentation treatment to enhance the sewer biochemical processes through improving the microbiology in the sewer collection system, and to provide improved microbiology to the WWTP. The IPT bioaugmentation process consists of the automatic continual addition of spore forming facultative Bacillus bacteria at multiple points within the sewer collection system, as specified in an engineered plan. The goals are to i) grow IPT beneficial bacteria in the biofilm throughout the surface of the sewer pipes and thereby enhance the sewer biofilm activity, ii) improve the ability of the converted sewer biofilm and bulk phase IPT bacteria to enhance the conversion of the slowly biodegradable COD to rbCOD, and increase the rate of rbCOD utilization, and iii) continuously supply vegetative beneficial bacteria with the incoming influent to the WWTP to improve operational efficiency.
IPT started sewer collection system bioaugmentation at the Steep Bank/Flat Bank wastewater treatment facility (~2.0 MGD activated sludge process) in Missouri City, TX to reduce influent loading and operational costs at the WWTP. IPT installed approximately 40 G2 microbe dosing units in the sewer collection system that dispense IPT microbiology periodically on a defined interval and volume (24/7) to enhance the sewer biochemical processes. Results from the WWTP data showed that the influent COD load to the WWTP was reduced ~10-15% With-IPT treatment compared to Pre-IPT treatment. Approximately 22±5% of the influent COD\textsubscript{T} entering the WWTP was in the form of rbCOD With-IPT treatment. The WWTP also produced ~37% less sludge With-IPT treatment due to improved IPT bacterial metabolic processes within the plant’s biological processes.

**Keywords:** In-Pipe, Bioaugmentation, Hydrolysis, Biochemical Process, Sewer Collection System, Treatment Improvement, Wastewater.