

Municipal Case Study

Fort Wayne, Indiana Three Rivers Protection & Overflow Reduction Tunnel (3RPORT) Project



Fort Wayne tunnel boring machine named MamaJo.

Vortex Flow™

Product:

3RPORT Tunnel Project
Fort Wayne, IN

Engineer:

Black & Veatch
Indianapolis, IN

Installation:

Five Vortex Flow Inserts
Type: Gravity Sewer
Flow ranges: 23 – 91 MGD
VFI Design: 175' Drop Height

Fort Wayne City Utilities is constructing a large tunnel located in the bedrock below the city. Along with the tunnel, there will be an associated network of pipes nearer to the surface. The system, known as Tunnel Works, will collect and transport sewage from locations where Fort Wayne's combined sewer system might overflow during wet weather events to the sewage treatment plant. This is part of the City's long-term control plan to reduce CSO's into their rivers. The tunnel has a life expectancy of 100 years.

The 16' diameter tunnel will be five miles long and constructed approximately 150' – 200' below ground using a tunnel boring machine. The project includes consolidation sewers and nine drop shafts, 4' – 8' in diameter, to convey combined sewer overflows (CSO's) from 22 outfalls along the St Mary's and Maumee Rivers. The drop shafts will direct the combined sewage into the tunnel. The combined sewage will travel through the tunnel to the sewage treatment plant where it will be stored temporarily and treated after the wet weather event is over and when the plant has sufficient capacity.

Five of these drop shafts include IPEX's Vortex Flow™ Inserts to reduce odors and dissipate the energy that would normally cause corrosion issues in such deep drops.

By oxidizing the hydrogen sulfide, the Vortex Flow Insert reduces concrete and metal corrosion to extend the life of the sewer for overall lower total cost of ownership.



The engineers with Black and Veatch knew they needed something to help with the energy dissipation at these drop structures and having worked with IPEX Vortex Inserts in the past, they knew they were the best product for the job.

With no moving parts and requiring virtually no maintenance, the Vortex Flow Insert is a revolutionary technology for eliminating odors and minimizing corrosion in sewer drops. Its patented spiral flow design creates a downdraft that traps odorous gases and sucks them downward toward the bottom where they are entrained back into the sewage flow. Wastewater flows into the top of the Vortex Flow Insert where it is directed around a channel of decreasing radius that accelerates the wastewater flow at a higher velocity. As the accelerated flow is channeled downward, that velocity causes the wastewater to hug the inside walls, creating a negative air core that draws airborne gases downward. Accordingly, there is no need for the city to treat the air surrounding the drop structure with costly odor treatment like chemical injection and biofilters.

At the bottom of the Vortex Flow Insert, the flow enters an energy dissipation pool where the air and gases drawn down the air core are forced back into the wastewater. This process aerates the wastewater with a higher dissolved oxygen concentration, intensifying the chemical oxidation process that neutralizes corrosive agents in the flow. The flow exit of the Vortex is submerged in the dissipation pool so there is no splashing or release of gaseous hydrogen sulphide. The aerated flow continues the process of oxidation down the line.



By oxidizing the hydrogen sulfide, the Vortex Flow Insert reduces concrete and metal corrosion to extend the life of the sewer for overall lower total cost of ownership. Through the process of aeration and oxidation, the overall quality of the wastewater is improved prior to treatment, which can further save on chemical and aerations used in the treatment process. With no moving parts and no corrosion, municipal sewer maintenance costs are dramatically reduced.

IPEX USA, LLC custom designs and builds every Vortex Flow Insert depending on each unique application and project. The Vortex drop height can be as little as 6' or more than 100' tall, and they are sized based on the peak flow that the unit is required to handle. The five Vortex Flow Inserts on the Fort Wayne project range in size from 23 to 91 MGD and all have a 175' drop.

The installed Vortex at drop shaft 6. This unit is designed to handle 36 MGD.