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**Vortex Flow** 

## Dropping Flows, Odors, and Cost in Orange County, CA

California's Orange County Sanitation District (OCSD) is the third largest wastewater agency west of the Mississippi River, safely collecting and treating about 230 million gallons of wastewater daily from more than 2.5 million residents, 21 cities, and more than 450 square miles of service area.



CALIFORNIA'S DRANGE COUNTY SANITATION DISTRICT COLLECTS AND TREATS 230 MILLION GALLONS OF WASTEWATER DAILY FROM MORE THAN 2.5 MILLION RESIDENTS, 21 CITIES, AND MORE THAN 450 SQUARE MILES OF SERVICE AREA.

With more than 600 full-time staff, 580 miles of sewer pipe, and two treatment plants, OCSD releases treated water into the Pacific Ocean through a 120-inch diameter offshore pipeline that extends five miles from shore about 200 feet below the surface.

As a recipient of the National Environmental Achievement Award for excellence in operations, OCSD is known for their cost-effective and environmentally friendly projects and methods, including the daily reclamation of 10 million gallons of treated wastewater for landscape irrigation, groundwater protection, and industrial use. When it came time to replace outdated pumps fed by a 30-inch diameter sewer line in the city of Irvine, OCSD once again implemented a costeffective solution.

## A Unique Diversion Strategy

At the south side of the John Wayne Airport employee parking lot, which lies just north of Main Street in Irvine, OCSD needed to safely and effectively divert sewage flow from a 30-inch diameter sewer line to the 66-inch Main Street trunk located 10 feet below.

"On the downstream end of the 30-inch pipe, we had a pump station that needed to be refurbished and upgraded. We knew that the potential flow during a wet weather event was more than the existing size pumps could handle, yet we didn't want the cost of installing larger pumps," explains Chuck Winsor, collection facilities manager for OCSD. "We decided to build a diversion structure that would allow us to intercept the flow and send it either down the 30-inch pipe as usual or divert some or all of the flow to the larger capacity 66-inch pipe below."

To effectively drop the flow from the 30-inch pipe down to the 66-inch pipe, OCSD needed to deploy a vertical drop in the alternate sewer pipe alignment inside a new 84-inch diameter manhole downstream from the diversion structure. Hydrogen sulfide ( $H_2S$ ) gas and



TO EFFECTIVELY DROP FLOW FROM A 30-INCH SEWER PIPE DOWN TO A 66-INCH PIPE WHILE PREVENTING ODORS, ORANGE COUNTY SANITATION DISTRICT INSTALLED A VORTEX FLOW INSERT INSIDE A NEW 84-INCH DIAMETER MANHOLE IN IRVINE, CA.



other odors are common in conventional sewer drops due to turbulence, causing many municipalities to ban them or use more costly methods such as a gradual grade, which substantially increases sewer pipe length.



TO INTERCEPT FLOW AND SEND IT DOWN THE EXISTING 30-INCH PIPE OR DIVERT SOME OR ALL FLOW TO THE LARGER CAPACITY 66-INCH PIPE, THE ORANGE COUNTY SANITATION DISTRICT INSTALLED A DIVERSION STRUCTURE UPSTREAM OF THE VORTEX FLOW INSERT.

To avoid odors and additional expense, OCSD implemented the Vortex Flow Insert from IPEX USA LLC (www.ipexamerica.com), a leading supplier of thermoplastic piping systems. 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.

## A Cost-Effective Drop

The Vortex Flow Insert's 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. Once the flow is channeled downward, that velocity causes the flow to hug the inside walls, creating a negative air core that draws airborne gases downward.

"By installing the new diversion structure and the Vortex Flow Insert, we ended up with a lot more flexibility in how we manage the wastewater flow. In dry weather we can still use the 30-inch sewer, and in a really high-flow situation or for maintenance purposes, we can instead divert flown down through the Vortex to the 66-inch sewer," says Winsor. "We still refurbished the pumps at the downstream end of the 30-inch sewer, but with the diversion and Vortex, we didn't need to upgrade the size of the pumps or deal with odors. That was a significant cost reduction."

While the Vortex Flow Insert leaves sewer drops smelling better, they also save money by extending sewer life and reducing maintenance costs. By oxidizing dissolved H2S, the Vortex Flow Insert reduces



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concrete and metal corrosion to extend the life of the sewer for overall lower total cost of ownership. The Vortex Flow Insert also eliminates the need for costly odor treatment like chemical injection and biofilters while improving wastewater quality prior to treatment. With no moving parts, no corrosion, and no need for sealed manholes, municipal sewer maintenance costs are dramatically reduced.

## Neither the First nor the Last

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 5 feet or more than 100 feet tall, and they are sized based on the peak flow that the unit is required to handle.

"When we began the Irvine diversion project north of Main Street, we originally provided incorrect information on the peak flow, and our first Vortex Insert was undersized. When we put the flow through, it splashed and created turbulence and odors," says Winsor. "Even though we provided wrong information, IPEX worked with us to determine the correct size, and they replaced the unit with a larger Vortex Insert able to handle the peak flow and prevent splashing. In the end, we ended up with no odors and a better space where we can lower a person down to a platform above the water level that allows maintenance to be performed."

Ken Thompson, Inc., a general engineering contractor in Corona, CA, was responsible for the installation of the Vortex Insert for OCSD, which required shoring the drop manhole due to clay soil and high groundwater. "Despite the wet conditions and having to replace the first Vortex, the entire installation went very smoothly. IPEX stepped up beyond expectation to ensure that the system operated efficiently and effectively removed odors," recalls Dan Deming, executive vice president for Ken Thompson, Inc. "We don't see many new products in this industry, but once in awhile someone comes up with something innovative, and the Vortex is one of them. We hope to install more of them in the future." The Vortex installed by OCSD in Irvine was ultimately sized for 10 million gallons per day (MGD) for peak wet weather flow, but it wasn't the first Vortex OCSD installed; nor will it be the last.

"In 1968, we installed a sewer pipe in Big Canyon near Newport Beach with about 10 to 15 feet of cover. About 3 or 4 years later, the hilltops on either side of the canyon were flattened for the building of luxury homes. The dirt spoil from the hilltops was pushed into the canyon, which raised the surface elevation above our sewer pipe by about 30 feet, putting our sewer line 40 to 45 feet below the surface," explains Winsor. "After several years, the pipe was starting to crack due to the large amount of fill on top of it. We needed to upgrade and raise that section of pipe by 25 to 30 feet, but at the downstream end, we needed to drop back down to the original sewer. That was our first successful encounter with the Vortex Flow."

After positive experience with the Vortex Flow Insert and associated service during the Big Canyon and Irvine projects, OCSD has once again found themselves in need of effectively dropping a sewer line while eliminating odors and corrosion. At their Huntington Beach Wastewater Treatment Plant No. 2, OCSD is installing a large new headworks area and replacing one of the off-site pump stations. The pump station needs to ensure that the flow is discharged at higher elevation at the downstream end and then effectively dropped down to the treatment plant into the new headworks. OCSD has already installed a 40 MGD Vortex Flow Insert for the sewer drop at the treatment plant, which will be operational in 2011 when the new pump station is complete.

"We've been very happy with the Vortex Flow Insert and the service we receive from IPEX," says Winsor. "The product does what it is supposed to do—as long as it is sized correctly. IPEX has a good reputation for quality and stands by their products, which we appreciate."

