Hybrid Landfill Gas Mitigation System Implementation

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Background/Objectives. Over the past two decades there has been a significant increase in the redevelopment of closed landfills. As cities around the nation expand, there is a challenge to provide housing and amenities to a more demanding and increasing urban population. Thus, closed landfills offer great opportunity to convert underutilized land into usable urban spaces where commercial and residential use can be realized. When a landfill is being proposed for redevelopment, a number of challenges arise and a number of constraints must be taken into consideration to design effective landfill gas collection systems that are protective of human health and the environment. Taking into consideration the constraints that come with landfill redevelopment, Langan designed a hybrid landfill gas (LFG) mitigation system to control the potential intrusion of LFG (primarily methane) into an approximately 275,000 square foot recreational building complex that was built atop a former landfill located in North Miami, Florida.

Approach/Activities. The hybrid LFG mitigation system consists of a vapor barrier, a LFG venting system manifold system including three system legs (Legs A, B, and C) installed under the extents of the building complex floor slab, and an above ground riser vent manifold connecting the below grade manifold to the system process equipment. The innovative hybrid system design allows for automatic interchange of passive or active venting of LFG accumulated below the slab of the building complex. The operation of the hybrid venting system is controlled by a programmable logic controller (PLC), motorized valves on active and passive manifold vent piping, and a network of 10 methane gas sensors (nine indoor air and one in-line manifold pipe methane gas sensors) throughout the building complex. The passive portion of the hybrid system is equipped with a motorized valve and a whirlybird roof vent, while the active portion of the hybrid system is equipped with a motorized valve and an explosion proof regenerative blower. A two-step operational scheme and alert system was built into the system controls. The system is normally operated in a passive mode, relying primarily on the LFG convective transport and pressure gradients to mitigate the intrusion of LFG into the building complex. When methane gas is detected at concentrations in excess of 5% of the lower explosive limit (LEL) by any indoor air methane gas sensor, or if methane gas in excess of the 20% of the LEL is detected by the in-line manifold pipe methane gas sensor, the system operation automatically switches to active venting by operating the explosion-proof blower. A telemetry system was installed to provide remote access for system status check-ups, system alarm condition notifications to the local fire department and building security personnel to initiate evacuation procedures with the warning sirens and flashing lights, in the event concentrations of methane gas inside the building are detected at 25% of the LEL or higher.

Results/Lessons Learned. The hybrid LFG mitigation system was installed during building construction. Shake-down and start-up testing was conducted in January 2017, and wiring modifications were required to ensure the proper functionality of the system. During passive operation (blower off), methane concentrations were non-detectable at sample ports on each riser pipe and at the combined system manifold pipe (main header). However, during active operation (blower on), the LEL concentrations were 24% at Leg A, 212% at Leg B, 22% at Leg C, and 290% at the combined manifold sampling port. The blower flow rate is approximately 175

standard cubic feet per minute (scfm) at approximately 11 inches of water vacuum at the blower inlet. The blower emissions are discharged to the atmosphere via a roof top stack. Since commissioning, all nine indoor air methane sensors located in various rooms of the building have shown non-detectable methane readings and no detections of methane have been recorded during the monthly indoor air monitoring events using a GEM 2000 landfill gas monitor.