Integrity
MUNICIPAL SYSTEMS

EVSS
CASE STUDY

City of Jacksonville Seamlessly Transitions to New Emergency Chlorine Scrubber from Integrity Municipal Systems

Incorporated in 1842, the City of Jacksonville (the City) is located in southeastern North Carolina and serves approximately 80,000 residents who rely on the City's robust water and wastewater treatment system. Over the years, the City has conducted significant expansions and upgrades to the water treatment and distribution system to meet the demands of the growing community. A vital component of the City's wastewater treatment infrastructure is the City of Jacksonville Land Treatment Site, a beacon of environmental sustainability and public health protection.

The Land Treatment Site, operational since the 1970s and located at 716 Firetower Road in Jacksonville, efficiently treats and disposes of up to six million gallons of wastewater per day through advanced land application techniques. Additionally, the site promotes environmental preservation and contributes to the local economy by cultivating and harvesting trees on treated land.

Since 1996, the site's existing water treatment system has utilized chlorine gas for disinfection. Despite the effectiveness of this method, the City has grappled in recent years with the significant challenge of operating an aging system that has surpassed its useful life. To address this concern, the City issued a Request for Quotation (RFQ) for a new chlorination system and associated equipment, which included replacing an emergency chlorine vapor scrubber system. After carefully evaluating various scrubber proposals, the City selected Integrity Municipal Systems LLC (IMS) to provide the new system.

Chlorine is commonly added to raw water for disinfection purposes and to make it safe to drink. However, chlorine gas is extremely toxic and presents an immediate danger to life and health at concentrations as low as 10 ppm. To minimize the risks and consequences of an accidental chlorine gas leak, Article 80 of the Uniform Fire Code requires that all sites storing chlorine gas must have a scrubbing system capable of neutralizing a full release from a leaking storage cylinder. An emergency chlorine scrubber not only fulfills this requirement but also plays a vital role in a comprehensive risk management plan by allowing the safe evacuation of chlorine-laden air from a chlorine storage room, thereby neutralizing chlorine gas prior to its discharge into the atmosphere.

The IMS EVS-2000 Emergency Chlorine Scrubber is a once-through wet media emergency scrubbing system designed to treat the release of chlorine gas in accordance with Uniform Fire Code requirements and guidelines. The EVS-2000 system comes pre-assembled, piped, wired, and factory tested to facilitate installation and start-up at the jobsite, and consists of an FRP (fiberglass reinforced plastic) absorber vessel with integral caustic sump, recirculation pump, FRP air exhaust fan, and electrical control panel. All components (fan, pump, control panel) are mounted on a low-profile vessel deck in one place for easy operator access and maintenance.

The EVS-2000 system design consists of a three-stage chemical absorption process with a horizontal crossflow spray system followed by two horizontal crossflow packed bed sections. The

scrubber is situated on top of a caustic storage tank, which is an integral part of the system. An induced draft fan pulls vapors through the scrubber, where direct contact with a recirculating caustic solution result in the complete absorption and removal of chlorine vapors. Prior to exhaust, a high-efficiency mist eliminator removes any residual caustic solution from the gas stream.

The EVS-2000 is designed to treat a one-ton release of chlorine (up to 2350 lbs.) at a release rate of 78 lbs./min, which corresponds to a 30-minute release time as required by the Uniform Fire Code. The 3,000 cfm system air flow rate assures a negative pressure is maintained on the chlorinestorage room.

The system is normally in stand-by mode. When a chlorine leak is detected, a signal is sent to start the system's caustic recirculation pump to ensure proper wetting of packing in the scrubber stages. After a 0 to 5 second adjustable time delay, the exhaust fan starts, and the chlorine-laden air is immediately evacuated through the chlorine scrubber. The time delay, which is typically set for 3 to 5 seconds, ensures that the scrubber is prepared before passing any chlorine-laden gases through it. For safety reasons, the system will continue to operate until manually turned off.

Before installing the new EVS-2000, IMS was responsible for removing the existing emergency scrubber system. As part of the removal process, it was critical to first clean the system using a procedure known as an acid wash for clearing any possibly hazardous materials, ensuring that it could be properly disposed of in compliance with established standards and regulations.

A typical acid wash for a wet emergency vapor scrubber system may require two technicians and take up to five days. The process includes: (1) removing as much of the existing liquid caustic solution as possible and disposing of it; (2) dissolving solids buildup in the scrubber sump with muriatic acid by continuously adding an acid solution; (3) recirculating the acidic solution over the packing media to dissolve solids buildup on the packing; (4) cleaning the spray nozzles; (5) removing the acidic solution and disposing of it. The system is then rinsed again with water prior to final inspection of all internal components.

After the existing system was successfully cleaned and removed, a new state-of-the-art EVS-2000 system was installed in June 2023. The system's compact and packaged design enabled it to be anchored to the existing concrete pad where the previous system had been installed, without requiring any modifications. The expertise and hands-on approach of the IMS personnel ensured a smooth and efficient replacement process, marking a significant step forward in the upgrade of the City's water treatment infrastructure.

The successful implementation of the EVS-2000 Emergency Chlorine Scrubber stands as a testament to the City's commitment to public safety and environmental stewardship. With this cutting-edge system in place, the City ensures not only the well-being and safety of its residents and plant operators, but also the preservation of its surrounding land and natural resources in the event of a chlorine leak.

The City of Jacksonville praised IMS for ensuring a seamless transition, emphasizing their exceptional customer service.

> *"The twenty-five-year-old scrubber was removed, and the new scrubber was set in place. IMS provided a turnkey job with no difficulties and excellent customer service from the planning stage until completion."*
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> **- Brandon Davis, Wastewater Superintendent**
> City of Jacksonville NC

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