



# Elevation: Energy Efficiency

By Dennis M. Tulenko & David E. Gallegos

## Colorado wastewater reclamation facility embraces sustainability



Rifle's solar photovoltaic system



Rifle WWRF's headworks ionized air supply ducting



Air ionization models flange mounted to air supply plenum for the facility's headworks

**O**n the western slope of the Colorado Rockies, west of Glenwood Springs and east of Grand Junction, lies the city of Rifle, Colo. In 2009, the city of Rifle completed construction and startup of a state-of-the-art wastewater reclamation facility (WWRF): the 2-million-gal-per-day Rifle Regional WWRF.

Due to growth pressures, the city needed to replace its traditional earthen lagoon-based system with a new facility. The new Rifle Regional WWRF now is a leader in energy sustainability. Glenwood Springs, Colo.-based engineering firm Schmuesser Gordon Meyer Inc. brought local experience, making it a logical choice for the city of Rifle's new facility. The general contractor for the project was Stanek Constructors of Golden, Colo.

Advances in energy-saving technology include a solar photovoltaic (PV) power system, patented solids reduction technology and a unique odor control system utilizing air ionization modules to ionize the supply air to the plant process buildings.

### Solar Power

Rifle submitted its proposed solar energy plan to its utility, Xcel Energy. Following a request for proposal process, the city accepted Maryland-based SunEdison as its solar energy provider, taking advantage of the company's "no upfront costs" program. The city agreed to provide the land required for the solar system and to purchase (at a locked-in rate) all of the solar energy produced by the system for the next 20 years. SunEdison provided the financing system design and all of the equipment used by the facility.

The system is a producing-type system, with excess energy produced sold back to the grid. At a combined production capacity of 2.3 MW, Rifle's two new PV solar energy systems are among the largest combined municipal PV installations in the U.S. The raw water pump station is rated at 600 kW, while the system at the new wastewater reclamation facility is rated at 1.7 MW. The zero-emission systems are estimated to produce more than 4 million kilowatt-hours of clean solar energy over 20 years. Over the first 20 years of production, they are expected to offset more than 125 million lb of carbon dioxide that would have been emitted during the production of electricity from fossil fuels.

### Solids Reduction

Rifle's Cannibal solids reduction system, manufactured by Siemens, is guaranteed to reduce total solids production by 80%. After the solids settle in the clarifiers, a portion is piped back to the oxidation ditches as returned activated sludge; the rest is piped to a sidestream "interchange" bioreactor, where the environment is controlled to reduce aerobic bacteria and promote facultative bacteria.

As the aerobic bacteria weaken, they are consumed by the facultative bacteria, a type of organism that can survive the closely controlled low-oxygen environment, thus reducing the biological solids load. The system then returns the reduced solids to the oxidation ditches, where the aerobic bacteria consume the facultative bacteria and the process continues. The result is a reduction in total

biological waste handling and hauling, and the resulting energy savings.

### Odor Control

For odor control at the facility, polarized air-ionizing hardware supplied by Trans-Tech Energy and Environmental Inc. produces positively and negatively charged oxygen molecules, or ions. A 5,500-cu-ft-per-minute fresh ionized air system was supplied for the influent pump station and headworks, a 2,750-cu-ft-per-minute system for the biosolids (belt filter press) room and a 2,750-cu-ft-per-minute system for the Cannibal screening room.

This technology has been applied successfully at wastewater facilities for odor control in Europe for more than 20 years. Operating systems in the U.S. now have a successful track record of more than 10 years. The ionized air effectively oxidizes most air contaminants, including hydrogen sulfide, ammonia and other organic gases, and it prevents the corrosion of electronics and equipment while saving energy.

The precursors to acid gas formation (e.g., hydrogen sulfide, ammonia and dimethyl disulfide) are oxidized to benign end products, greatly reducing corrosion. For buildings, the modular ionizers can be installed in ductwork on the fresh air supply side of an existing or new ventilation system. Alternatively, small package systems can be installed on lift stations or tanks. The system offers a minimal footprint, low power requirements, zero water usage and no chemical handling or storage.

The Rifle WWRF air ionization systems currently use 1,120 W of power. This represents a total power savings of 96% compared to a collect-and-treat system such as a biofilter. The air ionization systems cost the utility \$980 per year in power and save \$21,659 annually. The energy savings are a result of the reduced pressure drop across the open ionized plenums as compared to a collect-and-treat system's packed media, and the low power draw of the ionizer modules (35W per module). This equates to 164 fewer tons per year of secondary carbon dioxide emissions from the facility as a result of reduced power usage.

### Disinfection

Rifle Regional WWRF also incorporates ultraviolet (UV) light disinfection, eliminating the need for chlorine. The UV radiation deforms the cell structure of microorganisms so that they become harmless and cannot reproduce.

With all of these improvements, the city of Rifle moved into the 21<sup>st</sup> century, recognizing and embracing its new growth with an energy-efficient and sustainable WWRF. WWD

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