Jordan Kleinsmith, assistant plant manager, and Craig Carter, plant manager, with one of several progresssive-cavity pumps used in multiple applications in the Carmel treatment facility.

Pumping Up Technology

AN INDIANA CITY FINDS A VARIETY OF USES FOR PROGRESSIVE CAVITY PUMPS FOR MOVING DIFFERENT WASTEWATER TREATMENT PLANT SOLIDS STREAMS

By Dan Miller

The Indiana city of Carmel has been recognized as one of the best cities in the U.S. to live. Its award-winning wastewater treatment facility is known for using innovative processes and technologies to meet environmental challenges.

The careful, data-driven approach extends even to simpler devices, including sludge pumps. The city used progressive cavity pumps for more than 30 years to move solids. In the 1980s, issues with the pumps led plant management to investigate alternatives.

CHEAPER THAN REPAIR

The team chose a pin-joint, open-hopper, bridge breaker pump to convey gravity-thickened waste activated sludge from a 2-meter thickener at about 6 percent solids. Using a variable-speed drive, the pump maintained a constant level within a small hopper, meeting the challenges of rapidly changing sludge characteristics and variable flow rates from the belt thickener.

As an added benefit for Carmel, the staff found that the innovative technology came at cost lower than repair of the existing pumps. In the early 1990s, encouraged by the performance of the thickened sludge pumps, the city selected SEEPEX PC pumps to feed anaerobically digested sludge at 2 to 4 percent solids to the plant's belt filter presses.

Consistent, low-pulse feeding to any dewatering device is critical for effective dewatering. SEEPEX 6L stator/rotor geometry, which provides a longer pump cavity and better cavity sealing with reduced pulsation, performs well in that application, plant operators say.

PUMP PROTECTION

In a progressive cavity pump, a single-helix rotor turns inside a double-helix stator to create cavities that progress from the suction to the discharge side of the pump. The compression fit between the rotor and stator creates seal lines that keep the cavities separate as they move through the pump with each revolution of the rotor. The design lets PC pumps gently meter and convey fluids of nearly any viscosity in a wide range of temperatures, with or without solids.

The pumps in Carmel were fitted with thermal protection devices that shield the pump stator from run-dry damage. The devices have proven more reliable for protecting pumps than traditional pressure-sensing devices.

In 1997, two pumps were added to move primary solids from the north primary tanks to the anaerobic digesters. Primary sludge consistency can be highly variable, changing the discharge pumping head conditions. Using a centrifugal-style pump under these conditions changes the discharge output, while a PC pump maintains a constant flow.

The Carmel team at first tried to use a percent solids meter to maintain a consistent solids feed to the anaerobic digester. However, when the meter proved unreliable, the pump's ability to deliver a constant flow at a set speed enabled a switch to timed operation, thus maintaining a thick product delivered to the digesters.

FEEDING CENTRIFUGES

Two more SEEPEX pumps were added in 2004 to feed newly added centrifuges, which replaced the belt filter presses for dewatering. The plant per-

sonnel repurposed and installed one of the old belt filter press feed pumps to pump primary sludge from the south primaries to the digesters. The ability of a PC pump to move a variety of solids made the switchover easy.

The city then selected SEEPEX as the pump supplier when installing the nation's first biopasteurization system (Kruger) in 2007. Pumping sludge at 160 to 165 degrees F from the heat exchangers to the pasteurization tanks proved challenging due to high temperatures and intermittent operation.

SEEPEX tested several combinations of rotor and stator materials during a trial period. The city also tested a variety of other pumps before selecting a SEEPEX pump with a defined rotor and stator material combination that proved successful and provided the expected operation and stator life.

The pumps in Carmel were fitted with thermal protection devices that shield the pump stator from run-dry damage.

EASY MAINTENANCE

Recently, Carmel chose a phased approach to deploy SEEPEX PC pumps with Smart Conveying Technology (SCT). The SCT design allows easy access to the pump internals by incorporating split stator halves covered by four metal segments and a smart rotor. The rotor and stator can be changed without special tools and without disconnecting the suction or discharge piping.

The SCT design also extends stator and rotor life, optimizes flow rates, and improves energy efficiency simply by tightening the stator's metal segments at the first signs of wear. This saves the city maintenance, time and money.

This SEEPEX pump in the plant's biopasteurization Class A biosolids process transfers solids at 165 degrees F.

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