

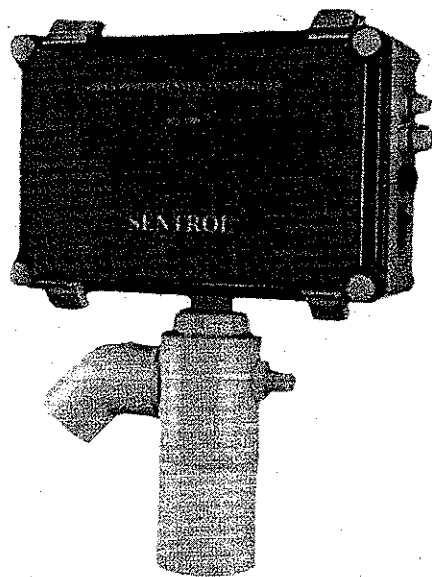
A NEW WAY TO OPTIMIZE POLYMER DOSAGE

Polymer dosage completely determines the performance of a dewatering process, which should produce a dry cake as well as a clean centrate or filtrate. In most wastewater treatment plants, polymer is controlled manually. Typically, overdosage is a common practice to prevent process upsets. However, overdosage does not increase cake dryness and often does little more than increase chemical costs.

The 16-mgd (60 560-m³/d), activated sludge Crooked Creek Water Recla-

The streaming potential system immediately indicates whether too much or too little polymer is being used

Junli Wang



Sentrol Systems Inc.

mation Facility in Norcross, Ga., implemented the streaming potential system for polymer dosage optimization in its centrifuge operations, which produces 15 dry ton/d (14 Mg/d) of solids. The streaming potential system has existed for many years, but has been used primarily in potable water applications. In the system, a sensor monitors centrate from the centrifuge and operators adjust polymer dosage based on the sensor's output signal. After 1 month of operation, the plant has saved 24% in polymer costs.



Sentrol Systems Inc.

facilities. Not only will too much polymer significantly increase operating costs, but it is self-defeating because the same results as underdosage are produced — repellent forces that deter clumping.

The streaming potential system works by monitoring the charge in centrate to determine whether the right amount of polymer is being added. Operators can use this feedback to adjust polymer dosage as necessary.

System Components

The streaming potential system, manufactured by Sentrol Systems Inc. (Lilburn, Ga.), consists of two parts: a streaming potential transmitter and a streaming potential detector (see figure, *Streaming Potential System*, below). A centrate sample flows into the transmitter probe. The relative movement between the piston and probe generates a streaming potential signal in the centrate that is picked up by electrodes in the probe, which sends the signal to a signal-processing unit in the detector.

The unit can display either of two

Process Sampling Data at Crooked Creek

SPD Signal	Cake (%TS)	Polymer dose
2.963	13.53	3.00
2.967	15.90	3.30
2.976	17.33	3.80
2.979	17.12	4.30
2.980	16.23	4.60
2.981	16.21	5.00
2.982	16.18	5.30
2.984	15.48	5.60

SPD = streaming potential detector
%TS = percentage of total solids

How the System Works

Colloidal particles or solids are negatively charged and tend to repel each other. Therefore, solids naturally resist clumping together, which affects separation and dewatering. The main purpose of polymers or other chemicals with positive charges is to make solids electrically neutral before dewatering.

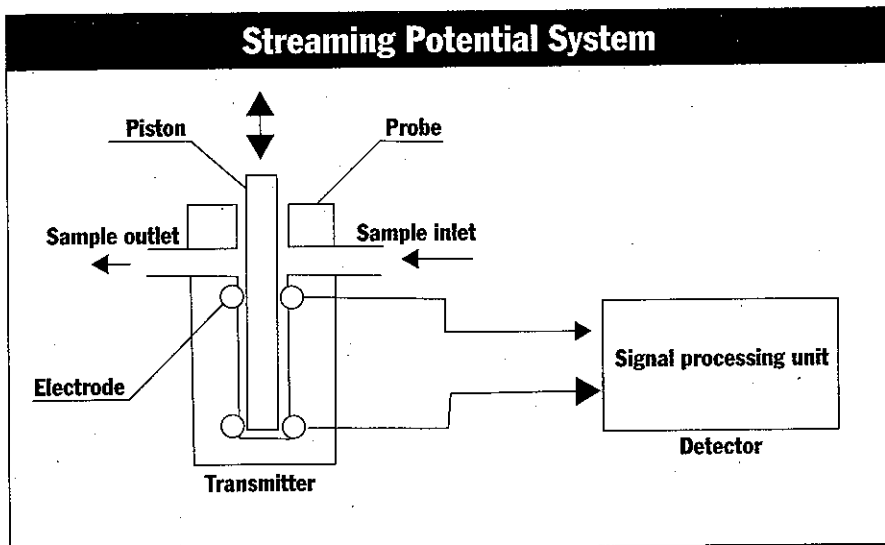
The challenge is knowing how much polymer to dose, as solids concentration varies all the time in most

LED readouts — an absolute or a relative signal reading — within the range of -5 to 5 V DC. The absolute signal is the actual electrical measurement. In theory, optimum polymer dosage occurs when centrate is electrically neutral (0-V DC signal reading).

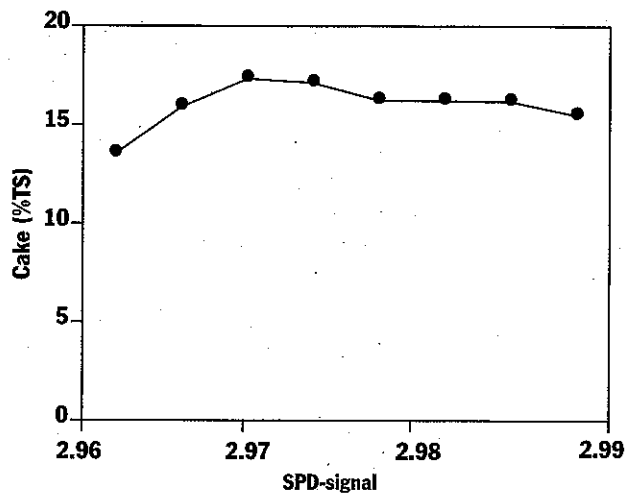
However, each treatment plant has its own desired end result, whether it be increasing cake dryness or reducing polymer cost, so the practical optimum dosage point for each plant is different. The relative signal is used as an arbitrary setpoint set by the facility to achieve its own optimal dewatering standard.

By continuously and reliably measuring the polarity and intensity of electrical charges in the centrate stream, the streaming potential system can indicate whether too much, too little, or an optimal amount of polymer is being dosed. A negative reading indicates underdosage, while a positive reading indicates overdosage.

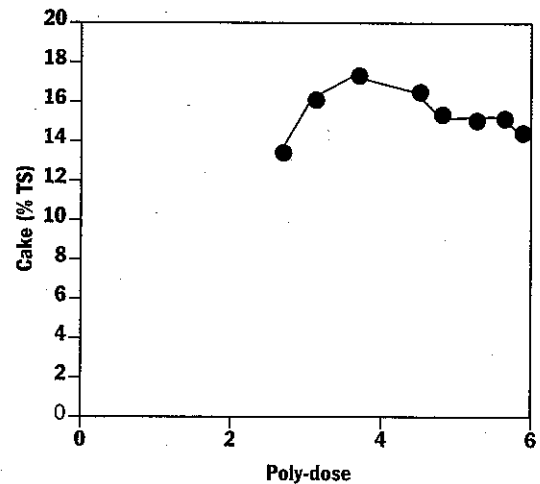
The streaming potential system also can be configured for automatic control applications. Signals are sent



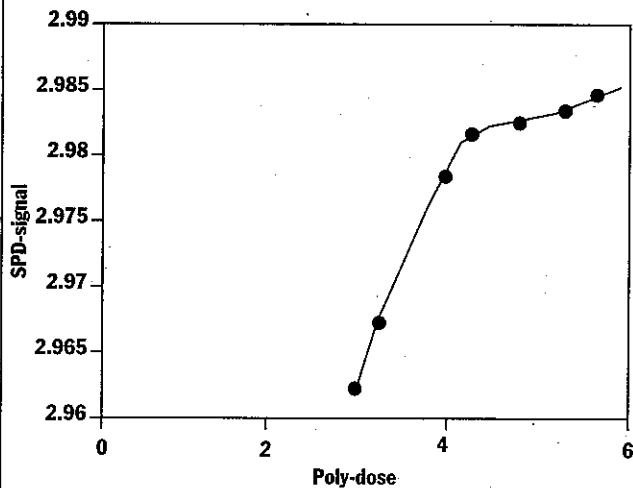
Signal Reading Versus Cake Dryness



Polymer Dose Versus Cake Dryness



Polymer Dose Versus Signal Reading



to a computer that, in turn, controls polymer pumps.

Use at Crooked Creek

A streaming potential system was installed at Crooked Creek in July 1998. The absolute signal would indi-

cate the optimum chemical dosage point, and plant operators would adjust chemical dosage to maintain this optimum point (see table, *Process Sampling Data at Crooked Creek*, p. 23). After 1 month, the plant monthly report showed that polymer cost was greatly reduced while the plant attained the desired cake dryness.

The data collected were compared and graphed, and the resulting curves show that detector signal readings increase with cake dryness (see figure, *Signal Reading Versus Cake Dryness*, above left) until a certain point (2.976) is reached, which is the plant's optimum dosage

point. After that point, even though polymer dosage increases (see figure, *Polymer Dose Versus Signal Reading*, left), cake dryness decreases.

The relationship between polymer dosage and cake dryness confirms this finding (see figure, *Polymer Dose Versus Cake Dryness*, above). Before the optimum dosage point of 3.8, cake dryness increases with polymer dosage, but after that point, cake dryness decreases.

By using the streaming potential system, which costs \$8500, the plant has significantly reduced the cost of polymer per ton of dewatered solids from approximately \$25/ton to \$19/ton, providing a monthly cost savings of \$3000, and an estimated annual savings of \$30 000. During the 1-month test period, the sensor did not clog or require any maintenance.

Junli Wang is a senior design engineer at Sentrol Systems Inc. (Lilburn, Ga.)