California Energy Commission
Public Interest Energy Research (PIER) Program
Industrial/Agriculture/Water End-Use

Novel Nanoscale Materials Reduce Electricity Needed for Sludge Dewatering

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PIER Industrial/Agriculture/Water End-Use
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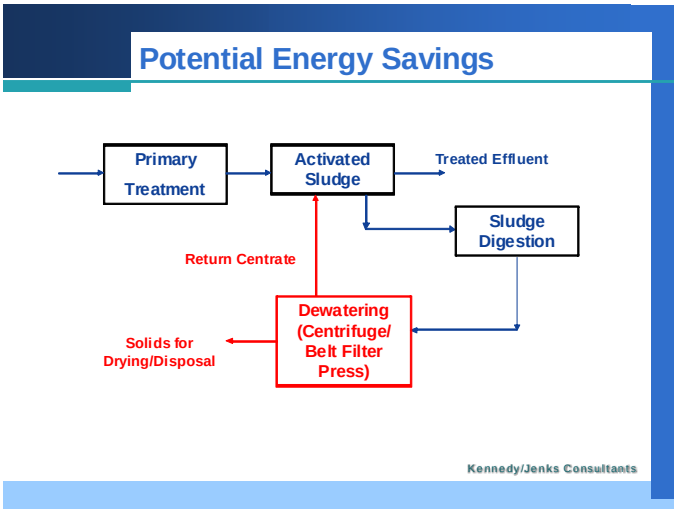
Fact Sheet

The Issue

Sludge treatment and disposal are energy-intensive for wastewater facilities, requiring up to 800 million kilowatt-hours per year in California. The total energy required for wastewater treatment in California is 2 billion kilowatt-hours per year. Part of sludge treatment includes dewatering, a process that removes as much water from digested sludge as possible. Dewatering is necessary to reduce the sludge volume for handling and disposal. However, dewatering using a single filter press is an expensive process, requiring up to 6000 kilowatt hours/year per million gallons per day.

Project Description

This project researches the use of nanoscale materials (a broadly defined set of substances that have at least one critical dimension less than 100 nanometers and possess unique optical, magnetic, or electrical properties) to improve the dewatering processes. The research is based on the results of bench-scale work that showed nanoscale materials enhanced the performance of polymer additives currently used in the dewatering process. The polymer additives improve a parameter called specific resistance to filtration (SRF). The SRF measures flow rate through a filter at an average pressure using a filter press.



Energy reductions in sludge treatment process are colored red.
Source: Kennedy-Jenks

A higher SRF will mean better performance of the filter press, resulting in a dryer sludge. The bench-scale work showed that nanoscale materials added with the polymers increased the SRF by 30 percent to 50 percent.

Anticipated Benefits for California

The objectives are to improve the energy efficiency of wastewater treatment and the environment. The result of this research will be increased water removal from sludge using less energy. The addition of nanoscale materials will increase the volume of water removed from 25 percent to 30 percent. This 5 percent increase will save about 30 percent of

the energy used in the dewatering process (roughly 240 million kilowatt-hours per year).

In addition to reducing the energy requirements of a filter press, the energy required for drying after dewatering will be reduced. The water that has been filtered and returned to the head of the facility will have fewer solids that require energy for aeration. Finally, there will be a reduction of greenhouse gas emissions during shipment for disposal.

Project Specifics

Grant Agreement Number: PIR-10-008
Recipient: Kennedy-Jenks Consultants
City/County: Irvine, Orange County
Application: Nationwide
Amount: $299,956
Cofunding: $174,989 from Kennedy-Jenks Consultants
Term: October 2010 to May 2013

For more information, please contact:

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