NEW MEXICO

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TEACHER EVAL

If the goal is to prepare students for the next grade, and life, teachers, principal superintendents and PED must ready t evaluation system for next year. Page

Turning oil waste H_2O into energy

NM Tech team: Use of osmosis promising

BY JOHN LARSON
EL DEFENSOR CHIEFTAIN

Using a simple natural process, osmosis, the technology could be an enormous benefit, both environmentally and economically.

The source of the energy? The highly saline and waste water that is produced after being used for oil drilling.

The engineering students recently hosted a three-day workshop on the campus attended by scientists and students from other universities from around New Mexico for discussion sessions and hands-on demonstrations of an apparatus the students are designing and building.

Led by Dr. Frank Huang, professor of environmental engineering, the team's goal is to identify how osmotic power can be developed to reduce the carbon footprint of the oil and gas industry while offsetting operating costs.

"The objective of the osmotic power team is to investigate issues that prevent produced water-based osmotic pressure systems from becoming commercially viable sources of power," Huang said.

The petroleum industry in the southeastern part of the state generates about 22 billion gallons of produced water annually, and 28 billion gallons statewide.

" 'Produced' water is the waste stream generated by oil and gas production," student researcher Kelsy Waggaman said.

"On average, three gallons of produced water is created in the recovery of one gallon of oil."

She said the high level of salt ions present in produced water from oil recovery can create a large chemical potential when paired with fresh water, and this process can be utilized to create osmotic pressure. These components together would act to spin a turbine and generate electricity.

"Osmotic pressure is naturally created when a semipermeable membrane separates two bodies of water with different concentrations of charged ions," she said. The water on the ion-depleted side, will rush to the ion rich side of the membrane because the water molecules have a high affinity for ions, while the membrane keeps the salt ions on one side."

Waggaman said this is demonstrated by the cells in our body, which are mostly fresh water.

"The water we drink has a similar ion concentration to

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Article featuring New Mexico Tech research and participants in the Osmotic Power component for NM EPSCoR's Energize New Mexico project.

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By John Larson

Can oil waste water churn energy?

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that of our cells. If we were to drink seawater, the water in our cells would rush out, collapsing our cells, and severely dehydrating us," she said. "Similarly, the water molecules will inherently move to the ion rich side of the membrane, creating a flow."

In simple terms, extremely salty water and less-salty produced water are fed into separate pipes through filters that remove particles and then fed into the membrane system, which consists of hollow fiber membranes. Less-salty produced water is drawn across the membrane to the extremely salty water by osmosis. The increase in water volume creates a pressure which forces the water through the turbine and generates electricity.

The team is designing and fabricating the fiber membranes.

"Rarely will you find a university that is able to make membranes. We can develop a process to make membranes that fit our need," Huang said. "The students are excited to put it all together."

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JOHN LARSON/EL DEFENSOR CHIEFTAIN

Dr. Yongming Tian holds the osmotic pressure module designed and fabricated in the Civil and Environmental Engineering Department at New Mexico Tech.

Research and the National Science Foundation, a collaborative team from Los Alamos National Labs, Eastern New Mexico University, New Mexico Highlands University, New Mexico State University, and New Mexico Institute of Mining and Technology will be researching osmotic power for the next four years.