Water

SUSTAINABLE TECHNOLOGIES FOR STEPS ENERGY PRODUCTION SYSTEMS

Introduction

PTRC is a not-for-profit research, development and deployment (RD&D) organization in Saskatchewan that supports new and innovative technologies for the oil and gas industry to increase recovery while reducing costs and environmental impacts. Over the last year, PTRC has worked with the members of the PTRC's Sustainable Technologies for Energy Production Systems (STEPS) program and canvassed other Canadian and US producers to address the following water challenges:

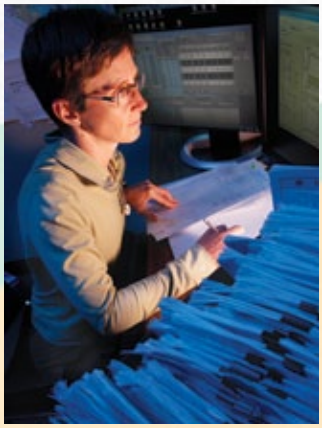
- Cleaning produced water to re-inject for pressure maintenance/waterflooding programs.
- Treating produced and recycled water for improved efficiency of steam generation operations.
- Changing water salinity for improved waterflood performance.
- Removal of bacteria from water prior to injection to minimize formation damage.
- Cleaning frac water prior to disposal or recycling.
- Understanding waterflood processes.
- Addressing public concerns about water use by the oil industry.

Program areas underway

Screening of Ceramic and Polymeric Membranes for the Optimization of Produced Water Treatment – The goal of this research program is to test polymeric and ceramic membranes for the filtration of water at the micro, ultra and nano scales. The objective is to design low-cost membranes for effective water filtration prior to re-injection.

Smart Water Injection for Light-Medium Carbonate Oil Reservoirs – This project will test a new process of low salinity or "smart water" injection for improving light-medium oil recovery from carbonate oil reservoirs. It will understand and describe the physics of fluid flow/interaction in porous media, to add new reserves, to reduce the environmental impact of excessive water production and to derive guidelines for developing carbonate oil reservoirs under smart water injection.

Low Salinity Waterflood Feasibility in Western Canada – This study will conduct a literature survey on low salinity waterflooding and the means to produce low salinity water. This information will help to develop candidate reservoirs from the Saskatchewan Research Council (SRC)/PTRC waterflood database. The study will also undertake experimental work on cores to better understand the processes.



Above: Dr. Norm Freitag and Principal Research Technologist Ray Exelby, both of SRC, examine a PVT apparatus.

Left: Gay Renouf, Senior Research Scientist at SRC, is assembling a database of Western Canadian waterfloods that is shedding light on best practices for this technology.

Enhanced Waterflooding Database – This work will continue to build the SRC/PTRC waterflood database, developed over a number of years and used to create analogues for heavy oil waterflooding. The study will focus on chemical enhancements of waterfloods, collecting data from government sources. Production declines will be examined before and after chemical waterflooding, production trends will be investigated, and water-oil ratios examined.

Wells and Pairs Database for Heavy Oil Waterflooding – This study builds on SRC's years of statistical work on heavy oil waterfloods. Previous research demonstrated the importance of the final water-dragging phase and of high water/oil ratio (WOR) operation. The goal is to determine the best operating practices during late stage waterflooding. A team will constructed a new database of injector-producer pairs, and improve the current database on individual wells.

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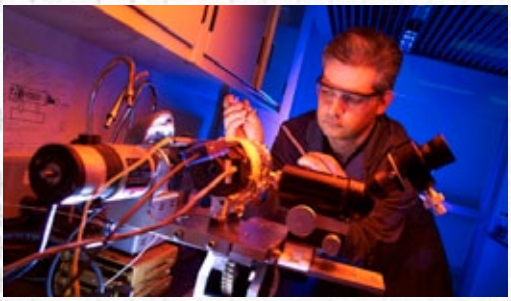
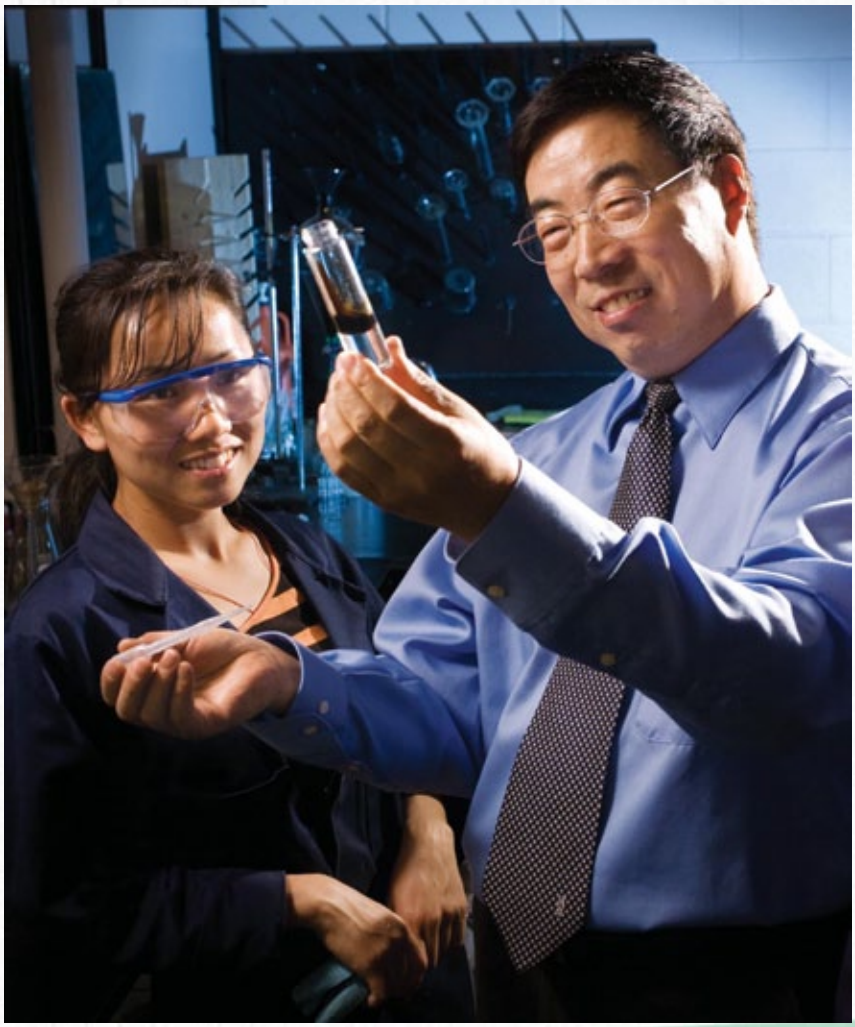
New projects

MFD (Microencapsulating Flocculating Dispersion) Field Test (oil removal from produced water) – This polymer additive to produced water aggregates oil and, with further treatment, either makes it float or sink to allow easy removal of most of the oil in water. The technology will be field tested using a trailer-mounted unit capable of testing a water flow of 50-100 m^3 per day (equivalent to a small battery).

De-salination of water – New Mexico Tech. (NMT) has developed a technology for application to the potash industry for de-salination of water. The technology uses a membrane and forward osmosis of the fresh water through the membrane, leaving a much reduced stream of high concentration water for disposal. There are some enhancements needed to the membrane to improve the flow conditions. This project would work closely with NMT to develop the technology for use in an oil field. If effective, this technology could be used in conjunction with the MFD and filtration technologies mentioned above.



Above: Saskatchewan Research Council technologist Kevin Rispler uses a radial core flood apparatus.



Right: Dr. Mingzhe Dong of the University of Calgary works with doctoral student Haiyan Zhang.

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