Oil Field Waste Stream as a Source of Electrical Power

Lyle A. Johnson and Everett Walker

Rocky Mountain Oilfield Testing Center

The U.S. Department of Energy's (DOE) Rocky Mountain Oilfield Testing Center (RMOTC) has developed a program to demonstrate the use of hot oil field waste streams as a source of electrical power. ROMTC is presently conducting two projects. The first project is with Ormat Nevada Inc. The U.S. Department of Energy (DOE) entered into a Cooperative Research and Development Agreement (CRADA) with Ormat to demonstrate small scale power generation using the hot water/brine produced during the production of oil. In many oilfields, the produced fluid temperature is below 220 °F, but it is still hot enough to generate significant electrical power. To verify this concept, an air cooled factory integrated, skid mounted standard design 250 kW Ormat organic Rankine cycle (ORC) power plant was installed by RMOTC at the Naval Petroleum Reserve No.3 (Teapot Dome Oilfield), north of Casper Wyoming

The ORC power unit was designed to use 40,000 bpd of 170 °F produced water from the field's Tensleep formation to vaporize the working fluid, isopentane. The projected gross power from the unit would be 180 kW (net of 132 kW). The system was installed in August 2008 and placed into service September 2, 2008. Through the first six months, the unit operated relatively trouble free and above the design predictions and also above the equipment rating. The operating above the equipment rating caused mechanical problems. The operation of the equipment including problems and solutions will be covered.

The second project is with the DOE's Office of Energy Efficiency and Renewable Energy (EERE). The project is to expand the testing facility for geothermal power units up to 250 kW. This will include the continued the operation of the existing air-cooled geothermal unit and the installation and operation of a liquid-cooled unit at the same facility. The facility will be set up for the testing of additional units. The second part of this project is to develop a testing facility for testing and development of new geothermal systems up to 75kW. This facility will have the ability to test multiple air- or liquid cooled units at a given time. This facility has a 210°F water source. The progress of this program will be presented.